# Electrical & Instrumentation Operation & Maintenance Manual

# For the

# Iqaluit Wastewater Treatment Plant –

# Conversion & Expansion – Phase 1

# Iqaluit, Nunavut

## Chapter 1

**Year of Completion:** 2006

**Original Scope:** Design and upgrade existing Wastewater Treatment Plant to meet current and future demands.

**This manual has been updated to include:**

| Date | Description of Change |
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## Iqaluit Wastewater Treatment Plant – Conversion & Expansion – Phase 1

## Project History

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|---|---|
| **The City of Iqaluit:** | **City of Iqaluit Public Works & Engineering**<br>**P.O. Box 460**<br>**Iqaluit, NU X0A 0H0**<br><br>**Mr. Geoff Baker**<br>**Phone: (867) 975-8502**<br>**Fax: (867) 975-8505** |
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| **Mechanical Subcontractor:** | **Sifec North Inc.**<br>**P.O. Box 727 1519 Federal Road**<br>**Iqaluit, NU X0A 0H0**<br><br>**Mr. Guy Fauteux, Pres. P.Eng.**<br>**Phone: (866) 437-4001**<br>**Fax: (450) 430-7106** |
| **Electrical Subcontractor:** | **Sifec North Inc.**<br>**P.O. Box 727 1519 Federal Road**<br>**Iqaluit, NU X0A 0H0**<br><br>**Mr. Guy Fauteux, Pres. P.Eng.**<br>**Phone: (866) 437-4001**<br>**Fax: (450) 430-7106** |
| **Instrumentation Subcontractor:** | **Sifec North Inc.**<br>**P.O. Box 727 1519 Federal Road**<br>**Iqaluit, NU X0A 0H0**<br><br>**Mr. Guy Fauteux, Pres. P.Eng.**<br>**Phone: (866) 437-4001**<br>**Fax: (450) 430-7106** |

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# For the

# Iqaluit Wastewater Treatment Plant – Conversion & Expansion – Phase 1

# Iqaluit, Nunavut

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| | |     cw3230.dll
| | |     cw3230mt.dll
| | |     owl501f.dll
| | |     OWL501T.DLL
| | |     owl52f.dll
| | |     owl52t.dll
| | |
```

```
|  |  \---Temp
|  |          Acrobat_Reader505enu.exe
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|  +---me station patch
|  |  |  FileValidation_JUPITERC$.csv
|  |  |  PatchFileValidator.exe
|  |  |  R104232828 hang 10 min startup.zip
|  |  |  R111534098 network tab .zip
|  |  |  R114652954 new cp551cu not reconise.zip
|  |  |  R125232308 auto logout .zip
|  |  |  R126636677 numeric input.zip
|  |  |  RSViewME 3.20 Patch List - 12 02 2005 k.pfv
|  |  |  RSViewME 3.20 Patch List - 12 02 2005.pfv
|  |  |
|  |  +---R104232828 hang 10 min startup
|  |  |      FTDProjectData.dll
|  |  |
|  |  +---R111534098 network tab
|  |  |  \---R111534098
|  |  |          HardwareDatabase.xml
|  |  |          rioconfig.dll
|  |  |          RSLinxNG.EXE
|  |  |
|  |  +---R114652954 new cp551cu not reconise
|  |  |      HardwareDatabase.xml
|  |  |
|  |  +---R125232308 auto logout
|  |  |      MERuntime.exe
|  |  |
|  |  \---R126636677 numeric input
|  |          GfxLwControls.dll
|  |          MEDlgServer.dll
|  |
|  +---MILLTRONICS dolphin software (lit xxx)cfg
|  |  |  dolphin_plus.zip
|  |  |  lit101.prm
|  |  |  lit101config file dolphin.prm
|  |  |  lit101orcafile.pdf
|  |  |  lit102config file dolphin.prm
|  |  |  lit102orcafile.pdf
|  |  |
|  |  \---dolphin_plus
|  |          Autorun.inf
|  |          DATA.TAG
|  |          data1.cab
|  |          data1.hdr
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| |       lang.dat
| |       layout.bin
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| |       Setup.exe
| |       SETUP.INI
| |       setup.ins
| |       setup.lid
| |       Version 1_5.txt
| |       _INST32I.EX_
| |       _ISDel.exe
| |       _Setup.dll
| |       _sys1.cab
| |       _sys1.hdr
| |       _user1.cab
| |       _user1.hdr
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| +---RSView ME doc
| |   RSView ME Vol1.pdf
| |   RSView ME Vol2.pdf
| |   RSView MEInstallation Guide.pdf
| |   RSView32-um001_-en-e.pdf
| |   RSViewME-Tech Broch.pdf
| |
| \---software rs view studio machine
|       2711P-UM001C-EN-P.pdf
|       InstallME.pdf
|       meusers1.pdf
|       meusers2.pdf
|       RSView ME 3.20 Getting Starting Tips Rev 2.pdf
|
+---LABORATORY EQUIPMENT
|   Electronic Balance.pdf
|   YSI 55 DO Meter.pdf
|
+---MECHANICAL HEATING
| | DOWFROST HD MSDS File_26416.pdf
| | HEAT CONTROL VALVE  v8043.pdf
| |
| \---AXIOM HYDRONIC SYSTEM FEEDER
|       AXIOM SF100 peration and Maintenance.pdf
|       SF100.pdf
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+---MECHANICAL PUMPS
| | Grundfos VersaFlo.pdf
| | Grunfos UPS Manual.pdf
| | Myers Sump Pump Manual.pdf
```

```
|  |
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|         courbe Np 3153 Lt imp 414, 11,2 kw.pdf
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|         Iqualuit.lifting equip..pdf
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|  |      PROCESS flex 12-16IN.pdf
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|  +---ORBINOX valve
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|  |      16in-3636R-2in-Sq-Nut-2M-Ext.pdf
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|  |  Supply fan.pdf
|  |  WWTP AHU-3 ControlValve BOX .pdf
|  |
|  \---AHU
|         Twin City Fan BAF Drawings.pdf
|         Twin City Fan Bearing Bulletin.pdf
|         Twin City Fan Installation & Maintenance Manual.pdf
|         Twin City Fan.pdf
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|         B-300.pdf
|         ENB300.pdf
|
+---PROCESS SALSNES FILTER
|  |  11510-Salsnes Filter.doc
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|  |  26200000LL_Spare_Parts_Housing.pdf
|  |  26202101LL_Spare_Parts_Housing_Assembly.pdf
|  |  26300000_Spare_Parts_Sludge_Compartment.pdf
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| | 26500100_Spare_Parts_Frame_Assembly.pdf
| | 26500200_Spare_Parts_Guiding_Roller_Complete.pdf
| | 26500300_Spare_Parts_Under_Roller.pdf
| | 26500400_Spare_Parts_Drive_Roller_Complete.pdf
| | 26502200_Spare_Parts_Guiding_Roller_Assembly.pdf
| | 70002100_001 Manufacturer Warranty.pdf
| | 70006100_002 Completion test form.pdf
| | 70007100_001 Technical specifications.pdf
| | 70009100_001 Installation report.pdf
| | 70010100_001 Inspection and maintenance.pdf
| | 70011100_001 Operation Journal.pdf
| | 70013100_001 Training.pdf
| | 76001100_001 Declaration of conformity_eng.pdf
| | 76004100_001_Installation guide SF6000.pdf
| | 76005100_001 Operators manual SF 6000_english.pdf
| | BA WELL_72-4-20.pdf
| | Content_english_SF6000.pdf
| | Cover_english_SF6000.pdf
| | Iqaluit SF6000 Electrical Info.pdf
| | Kaeser Blower Manual.pdf
| | Kaeser Brochure.pdf
| | Kaeser Oil MSDS.pdf
| | Lafert ACMotor User Manual.pdf
| | Lafert Motors Safety, Installation and Maintenance.pdf
| | Manual BB68c Engelsk.pdf.pdf
| | Motovario NMRV Brochure.pdf
| | Motovario Worm Gear Reducer Catalogue.pdf
| | Motovario Worm Gear Reducer Manual.pdf
| | PI Well72. 4-20mA.pdf
| | PLC Panel Op Interface Description (superceded).pdf
| | Sodeca.doc
| | Spare Parts Complete.pdf
| |
| \---TOSHIBA VFD
| MTE RL line-loadreactor.pdf
| s11_SER.pdf
| Toshiba S11 Instruction Manual.pdf
| VF-S11-Manual-EN.pdf
|
\---PROCESS SCREW SCREEN
Eurodrive F Catalogue.pdf
Eurodrive Mounting Positions.pdf
SEW Eurodrive Operating Manual.pdf

## INDEX OF DRAWINGS
## (LOCATED AT THE END OF CHAPTER 4)

**E-1: Electrical Single Line Diagram**

**E-2: Power & Systems Lower Floor Plan**

**E-3: Power & Systems Upper Floor Plan**

**E-4: PLC Control System (Schematic)**

**E-5: Motor Starter Schematic/PLC System Rack Layout**

**E-6: Electrical Panel Diagram**

**E-7: MCC-2 Elevation Detail**

**E-8: Motor Starter Control Schedule**

**I-1: PFD – Pumping & Preliminary Screening P&ID**

**I-2: PFD – Solids Handling & Outfall P&ID**

**I-3: PFD – Upper Level Instrument Location Drawing**

**I-4: PFD – Lower Level Instrument Location Drawing**

**I-5: PFD – Screen Drive Motor Control Schematic**

**I-6: PFD – Gas Detection Loop Diagram**

# Chapter 3

# BACKGROUND AND DESIGN DATA

## 3.1 General

The discussion in this document includes the background and design data for the electrical and instrumentation systems provided in the Iqaluit Wastewater Treatment Plant (WWTP) – Conversion & Expansion – Phase 1.

## 3.2 Background

Earth Tech (Canada) Inc. (ET) was retained by the City of Iqaluit to undertake the design of improvements/upgrades to the Iqaluit WWTP, and provide inspection services during the construction stage of the project.

Further information is provided in the following reports:

- "Structural Review of the Process Tanks at the Iqaluit Reclamation Facility" prepared by $CH_2M$ Gore & Storrie.
- "Sewage Treatment Plant Investigation" prepared by Earth Tech (Canada) Inc.
- "Completion Study for the Iqaluit Wastewater" prepared by $CH_2M$ Hill.

As part of this project, it is the City's intention to address the deficiencies and issues identified in these previous reports. Furthermore, it is the City's desire to convert the existing facility to a conventional activated sludge secondary treatment plant to meet the projected flows and loadings for a 20-year design horizon.

The objectives of the design team are to:

- Provide a complete operation system to meet the needs of the community and also to address the specific characteristics of its location;

- Provide a simple operational design with features suited to the community and avoid processes or equipment that require highly specialized technical skills or sophisticated maintenance procedures;
- Maximize the re-use and integration of salvageable components within the existing facility; and
- Minimize life cycle costs of the facility.

## 3.3 New Process Description

Phase 1 incorporates only the headwork's ("preliminary treatment") of the new WWTP. The new headwork's building houses the following components for Preliminary Treatment:

- New influent pumping;
- Relocated existing screw screens;
- New fine screening equipment;
- New valves; and
- New PLC-based control.

## 3.4 Electrical (General)

All electrical systems installed within the new facility are both code compliant and energy efficient. Electrical distribution is sized to accommodate the as-built requirements and future expansion of the treatment systems and/or pumping requirements of the facility.

## 3.5 Electrical Wiring

The plant electrical and controls system wiring is provided by Teck cabling or wiring contained in conduit.

### 3.5.1 Power Distribution Systems

The electrical service for Phase 1 is provided from the existing Main Distribution Panel (MDP), located in the lower level Motor Control Centre (MCC). Power is distributed from existing MDP through two new 3P 200A circuit breakers. One breaker feeds the new MCC-2, located in Upper Level Electrical Room 3. The other breaker feeds panel 6B and panel 2B also located in Upper Level Electrical Room 3. Refer to electrical single line diagram E-1 at the end of Chapter 4 for detailed power distribution.

Note: The existing MDP and the new MCC-2 will both be revamped during WWTP Phase 2 future expansion.

### 3.5.2 Motor Control Centre – 2 (MCC-2)

MCC-2 is configured to operate various process and mechanical equipment.

Refer to Chapter 6 of the Process Operations and Maintenance Manual for the WWTP operating procedures relating to this equipment.

Refer to MCC diagram E-7 and Controls Table on E-8 at the end of Chapter 4 for details.

### 3.5.3 Distribution Panel 6B

A 347/600 V, 42-circuit distribution panel feeds the 347/600 V loads. The 347/600 V loads include exterior and interior lighting for Phase 1 WWTP expansion, the Headworks Hoist and the Hot FEW Booster Heater. A 3P-50A circuit breaker feeds transformer TX-2, which feeds distribution panel 2B.

Refer to electrical panel diagram E-6 at the end of Chapter 4 for details.

### 3.5.4 Distribution Panel 2B

A 120/208 V, 42-circuit distribution panel powers various single phase headwork's components.

Refer to electrical panel diagram E-6 at the end of Chapter 4 for details.

## 3.6 Process Controls and Alarms

The overall wastewater treatment process is controlled utilizing a Programmable Logic Controller (PLC) based on the Allen Bradley SLC 500 series. This PLC system includes the Facility Control System and any related communication and operator interface components. The Human Machine Interface (HMI) operator interface system is provided by a single personal computer (PC), located in the plant office. The main control panel of the facility is located in Electrical Room 3. The PLC system generates discrete output signals to the auto dialler for critical alarm reporting. The PLC is remotely accessible via a modem in the HMI PC, and the corresponding Ethernet link between the PC and PLC.

### 3.6.1 Wastewater Treatment Process Control

Phase 1 of the WWTP is controlled utilizing a PLC with an HMI. The overall WWTP is depicted on the Process and Instrumentation Diagrams (P&ID). The process that is used at the WWTP is Primary Treatment, which consists of the following unit processes:

- Raw Wastewater Pumping;
- Raw Sewage Screening;
- Primary Treatment (Filtration); and
- Solids Handling.

Refer to Drawings I-1 through I-6 at the end of Chapter 4 of this Manual for the overall wastewater treatment process instrumentation schematic.

Refer to Chapter 6 of the Process Operations and Maintenance Manual for the WWTP operating procedures relating to this equipment.

## 3.7 Telecommunications/Alarm Dialer

The WWTP has a dedicated phone line for the facility alarm dialer. When the facility is unoccupied, alarms requiring operator intervention will be annunciated on both the PLC and to the operator via an auto dialer.

Refer to Chapter 6 of this Manual for the Alarm configuration.

## 3.8 WWTP Gas Detection

The WWTP gas alarm detection system consists of two LEL and two $H_2S$ detectors, a central control panel. Visual and audible annunciation are included in both the Headworks Room and on the building exterior.

**END OF CHAPTER 3**

# Chapter 4

# SCHEMATICS AND FUNCTIONAL DATA

## 4.1 Power Distribution Schematic

**(Refer to Drawings E-1 to E-3 at the end of this section)**

| No. | Component | Location | Function Performed | Remarks |
|---|---|---|---|---|
| 1 | 400A Main Distribution | Existing MCC Room | Provides service to facility. | Lower Level |
| 2 | 400A Transfer Switch | Existing MCC Room | | |
| 3 | 3P 200 Amp circuit breaker TO Panel 6B | 400A Main Distribution Panel | Protect circuit to MCC-2 | |
| 4 | 3P 200 Amp circuit breaker to Panel 2B | 400A Main Distribution Panel | Protect circuit to panel 6B | |
| 5 | TVSS | MCC 1 | Power Condition Monitor | |
| 6 | Distribution panel 6B | Upper level, Electrical Room 3 | | |
| 7 | 3P 50A Sub breaker , Panel 6B | Panel 6B | Protect circuit to panel 2B | |
| 8 | 45Kva Transformer to Panel 2B | Electrical Room 3 | Provide power to panel 2B | |
| 9 | Distribution panel 2B | Electrical Room 3 | | |
| 10 | Motor Control Center #2 | Electrical Room 3 | Provides service to facility | |
| 11 | MCC-2 Ground Grid | Electrical Room 3 | | |
| 12 | Future connections MCC 2 | Electrical Room 3 | | Future Expansion |
| 13 | Gas Detection Control Panel | Electrical Room 3 | Annunciates Gas Alarms | |
| 14 | Light Control panel | Electrical Room 3 | Controls exterior lighting | |
| 15 | Sump Pump Control Panel | Lower Level | Controls Sump pumps | |
| 16 | Raw Sewage Pump P-102 | Lower Level | Refer to Process O&M Manual. | |

| No. | Component | Location | Function Performed | Remarks |
|---|---|---|---|---|
| **17** | Raw Sewage Pump P-103 | Lower Level | Refer to Process O&M Manual. | |
| **18** | Raw Sewage Pump P-104 | Lower Level | Refer to Process O&M Manual. | |
| **19** | Sump Pump P-11 | Lower Level | Refer to Process O&M Manual. | |
| **20** | Sump Pump P-12 | Lower Level | Refer to Process O&M Manual. | |
| **21** | Unit Heater UH-09 | Lower Level | Refer to Mechanical O&M Manual | |
| **22** | Unit Heater UH-10 | Lower Level | Refer to Mechanical O&M Manual | |
| **23** | Air Handling Unit AHU-03 | Lower Level | Refer to Mechanical O&M Manual | |
| **24** | Screw Screen SSCR-105 | Screening Room | Refer to Process O&M Manual. | |
| **25** | Screw Screen SSCR-105 | Screening Room | Refer to Process O&M Manual. | |
| **26** | Primary Filter PF-108 Filter Drive | Screening Room | Refer to Process O&M Manual. | |
| **27** | Primary Filter PF-108 Auger Drive | Screening Room | Refer to Process O&M Manual. | |
| **28** | Unit Heater UH-12 | Screening Room | Refer to Mechanical O&M Manual | |

## 4.2 Instrument Locations

**(Refer to Drawings I-1 to I-4 at the end of this section)**

| No. | Component | Location | Function Performed | Remarks |
|---|---|---|---|---|
| 1 | HS-102A/HS-103A/ HS-104A | Raw Wastewater Pump LCP | HOA Switches for P-102, P-103 and P-104 | |
| 2 | HS-102B/HS-103B/ HS-104B | Raw Wastewater Pump LCP | Speed Control Pots for P-102, P-103 and P-104 | |
| 2a | SI-102, 103, 104 | Raw Wastewater Pump LCP | Speed Indicators for P-102, P-103 and P-104 | 0 – 100% speed |
| 3 | HS-102C/HS-103C/ HS-104C | Raw Wastewater Pump LCP | E-Stop for P-102, P-103 and P-104 | |
| 4 | HS-102D/HS-103D/ HS-104D | Headworks Room | E-Stop for P-102, P-103 and P-104 | |
| 5 | VFD-102, VFD-103, VFD-104 | MCC 2 | Variable Frequency Drives for P-102, P-103 and P-104 | |
| 6 | LE/LIT-101 | Raw Wastewater Lift Station/Headworks | Level indication Lift Station. | Analog signal to PLC |
| 7 | LSHH-104 | Raw Wastewater Lift Station | Alarm High Level Lift Station | |
| 8 | FE/FIT101 | Raw Wastewater Lift Station outlet pipe | Raw Wastewater Flow. | Analog signal to PLC |
| 9 | LE/LIT-102 | Screw Screen Inlet Header tank | Level Header Tank | Analog signal to PLC. |
| 10 | LSHH-103 | Screw Screen Sewage Inlet Header tank. | Screw Screen Inlet Header High Level Alarm | |
| 11 | Motorized Valve SV-105 | FEW Feed to Screw Screen (SSCR-105) | Screw Screen Washing | |
| 12 | Motorized Valve SV-106 | FEW Feed to Screw Screen (SSCR-105) | Screw Screen Washing | |
| 13 | HS-105A/B/C/D | Motor Control Center (MCC) | HOA Switch, Forward, Reverse, Stop Pushbuttons Screw Screen 1. (SSCR-105) | MCC Control |
| 14 | HS-106A/B/C/D | Motor Control Center (MCC) | HOA Switch, Forward, Reverse, Stop Pushbuttons Screw Screen 2. (SSCR-106) | MCC Control |

| No. | Component | Location | Function Performed | Remarks |
|---|---|---|---|---|
| **15** | HS-105E/F/G/H | Pendant Station at SSCR-105 | HOA Switch, FWD/REV Switch, Jog Pushbutton, ESD | Local Control |
| **16** | HS-106E/F/G/H | Pendant Station at SSCR-106 | HOA Switch, FWD/REV Switch, Jog Pushbutton, ESD | Local Control |
| **17** | VFD-108A | Salsnes Control Panel | Variable Frequency Drives for Salsnes Filter Drive | |
| **18** | VFD-108B | Salsnes Control Panel | Variable Frequency Drives for Salsnes Auger Drive | |
| **19** | HS-108 | Salsnes Filter | E-Stop for Salsnes Filter | |
| **19A** | HS-108A | MCC 2 | HOA Switch for Salsnes Power | No Auto Control |
| **19B** | HS-108B | Salsnes Control Panel | On/Off Switch for Salsnes Controls | |
| **19C** | HS-108C | Salsnes Control Panel | Reset/Silence Pushbutton for Salsnes Control Panel | |
| **20** | LT-106 | Salsnes Filter | Level Transmitter for Salsnes Inlet level | |
| **21** | SV-114 | Salsnes Filter | Control Valve for V-114 | |
| **22** | SV-120 | Salsnes Filter | Solenoid valve on Hot FEW Inlet | |
| **23** | SV-121 | Salsnes Filter | Solenoid valve on Cold FEW Inlet | |
| **24** | AE/AIT-110 | Solids Handling Bay | $H_2S$ Sensor/Transmitter | |
| **25** | AE/AIT-112 | Headworks Room | LEL Sensor/Transmitter | In Lift Station |
| **26** | AE/AIT-113 | Solids Handling Bay | $H_2S$ Sensor/Transmitter | |
| **27** | AE/AIT-114 | Headworks Room | LEL Sensor/Transmitter | At Ceiling |
| **28** | AAH-110 to 114 | Electrical Room 3 | Gas Alarm Panel | |
| **29** | HN-101 | Headworks Room | | |
| **30** | HN-102 | Building Exterior (Rear) | | |
| **31** | BA-101/101A | Headworks Room | | |
| **32** | BA-102/102A | Building Exterior (Rear) | | |

| No. | Component | Location | Function Performed | Remarks |
|---|---|---|---|---|
| 33 | BA-103/103A | Building Exterior (Front) | | |
| 34 | LIT-501 | FEW storage tank | Level in FEW Tank | Analog signal to PLC. |
| 35 | LAH-501A | Exterior Wall By Fill Station | Warning of High water level in FEW tank. | Blue Light |
| 36 | LAL-501 | Exterior Wall By Fill Station | Warning of Low water level in FEW tank. | Red Light (On until LAH) |
| 37 | LAH-501 | Exterior Wall By Fill Station | Warning of High water level in FEW tank. | Horn |
| 38 | TSL-102 | Screenings Dump Trailer Bay | Low Temperature in Trailer Bay. | |

## 4.3 Motor Control Centre

**(Refer to Drawing E-7 at the end of this section)**

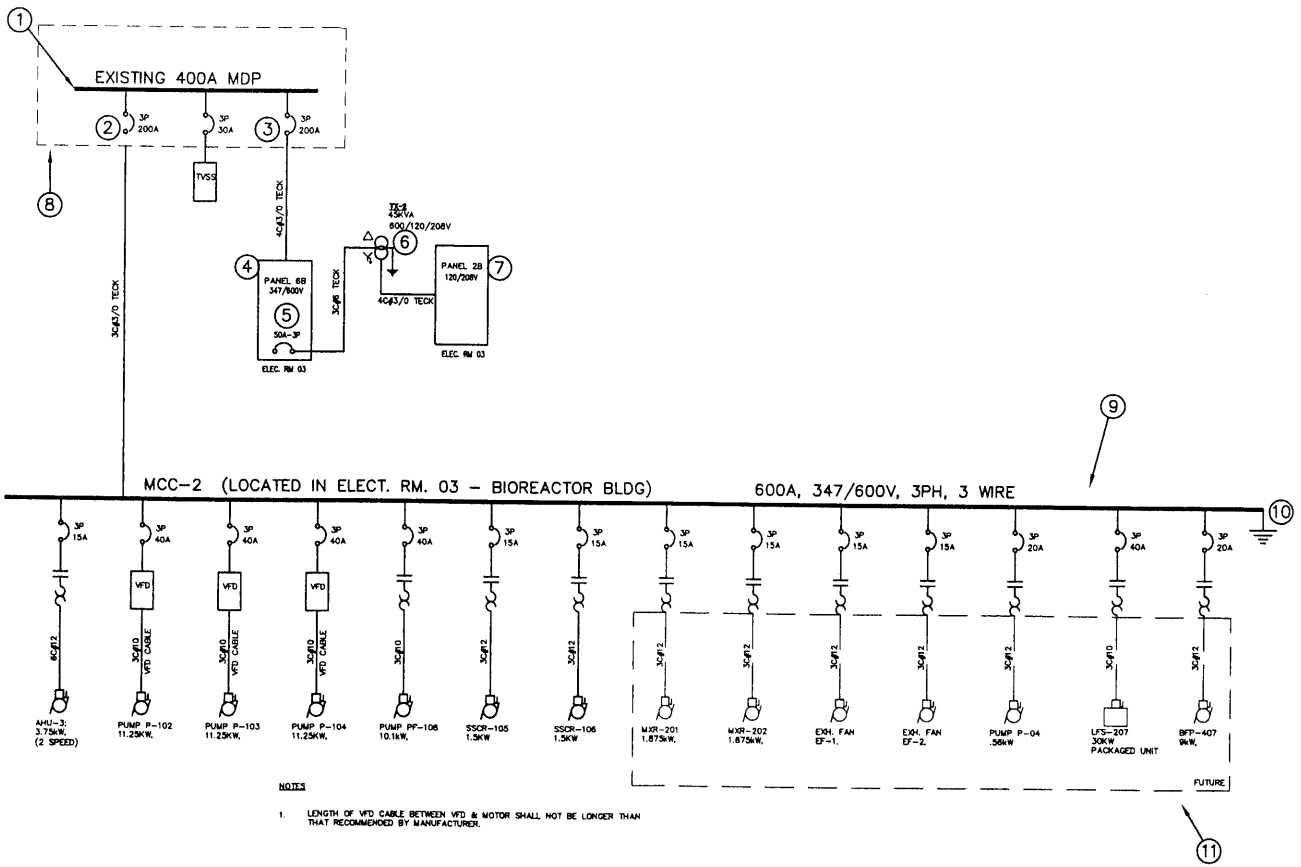
**Motor Control Centre**

| No. | Component | Location | Function Performed | Remarks |
|---|---|---|---|---|
| 1 | Incoming Lugs | MCC Cabinet | Connection to field devices. | |
| 2 | Supply Fan AHU-03 3.75 kW | MCC Cabinet | Refer to Mechanical O&M Manual. | |
| 3 | Exhaust Fan AHU-03 3.75 kW | MCC Cabinet | Refer to Mechanical O&M Manual. | |
| 4 | Spare | MCC Cabinet | | Space for Future Expansion |
| 5 | Spare | MCC Cabinet | | Space for Future Expansion |
| 6 | P-04 | MCC Cabinet | Refer to Mechanical O&M Manual. | |
| 7 | Salsnes Filter PF-108 ___ kW | MCC Cabinet | Refer to Process O&M Manual. | |
| 8 | Future | MCC Cabinet | | Space for Future Expansion |
| 9 | Future | MCC Cabinet | | Space for Future Expansion |
| 10 | Future | MCC Cabinet | | Space for Future |

**Motor Control Centre**

| No. | Component | Location | Function Performed | Remarks |
|---|---|---|---|---|
| | | | | Expansion |
| **11** | Future | MCC Cabinet | | Space for Future Expansion |
| **12** | FEW Pump #1 | MCC Cabinet | Refer to Process O&M Manual. | |
| **13** | FEW Pump #2 | MCC Cabinet | Refer to Process O&M Manual. | |
| **14** | FEW Pump #3 | MCC Cabinet | Refer to Process O&M Manual. | |
| **15** | Screw screen SSCR-105 1.5kW | MCC Cabinet | Refer to Process O&M Manual. | |
| **16** | Screw screen SSCR-106 1.5kW | MCC Cabinet | Refer to Process O&M Manual. | |
| **17** | Pump P-102 11.25Kw (VFD) | MCC Cabinet | Refer to Process O&M Manual. | |
| **18** | Pump P-103 11.25Kw (VFD) | MCC Cabinet | Refer to Process O&M Manual. | |
| **19** | Pump P-104 11.25Kw (VFD) | MCC Cabinet | Refer to Process O&M Manual. | |
| **20** | Empty Space | MCC Cabinet | | Space for Future Expansion |

**END OF CHAPTER 4**




# ELECTRICAL SINGLE LINE DIAGRAM.

Iqaluit

| DRAWING |
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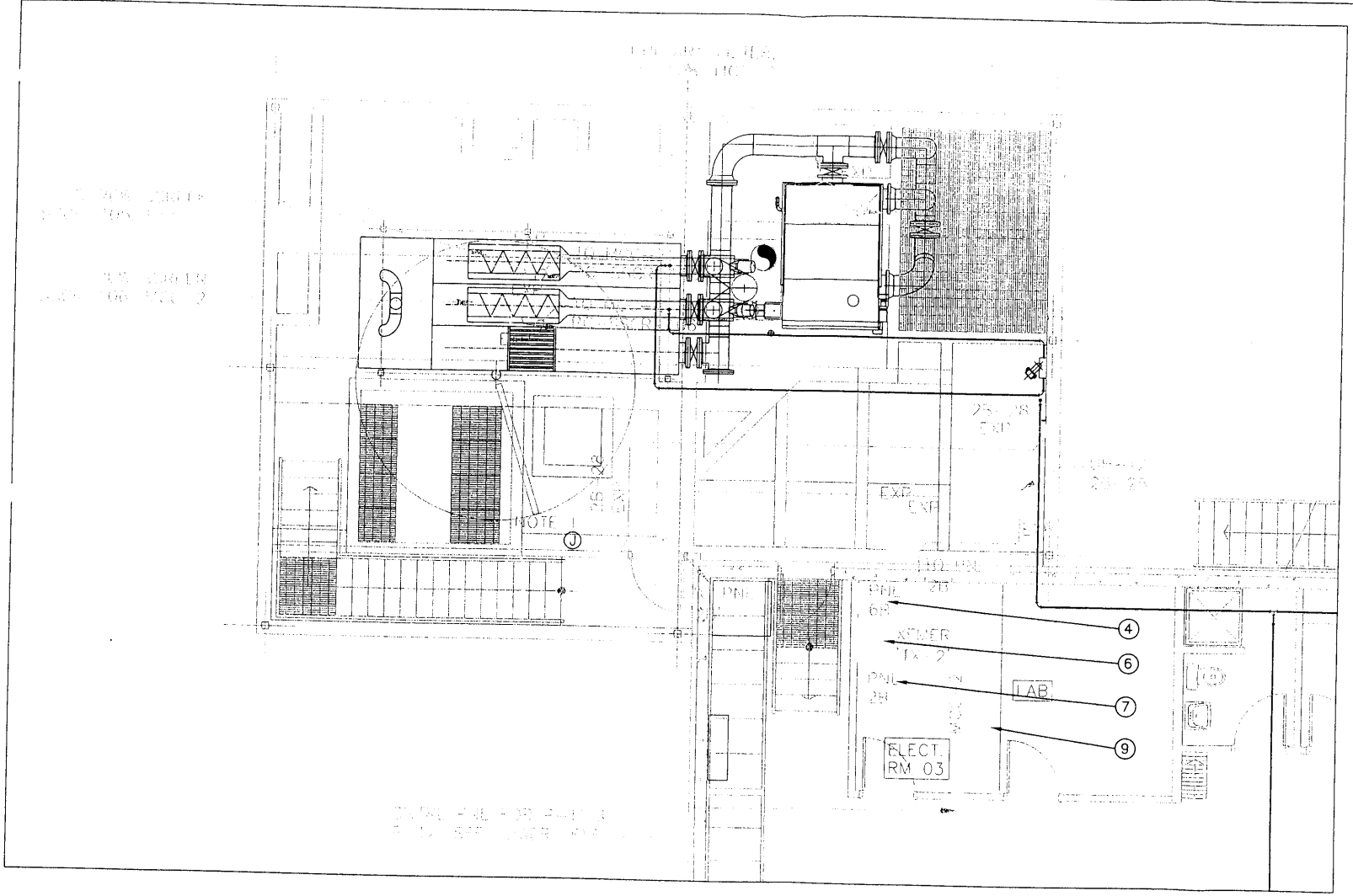
| E-1 |

EARTH TECH
Earth Tech (Canada) Inc.
Edmonton, AB 780-488-6800
Yellowknife, NWT 867-873-6318



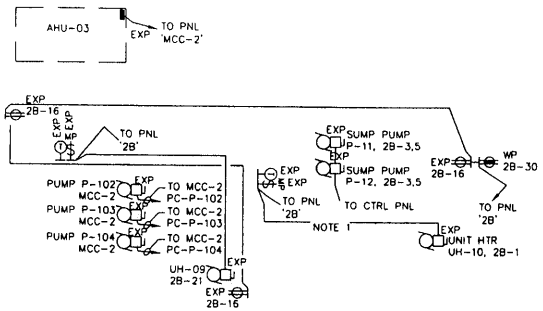

# POWER & SYSTEMS UPPER FLOOR PLAN.

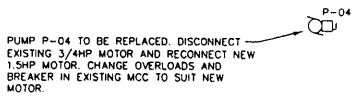
N.T.S.

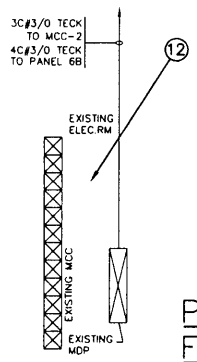
Iqaluit

| DRAWING |
| --- |
| E-3 |

EARTH TECH
Earth Tech (Canada) Inc
Edmonton, AB 780-486-6800
Yellowknife, NWT 867-873-6316




## SYMBOL SCHEDULE

| | |
|---|---|
| | FLOURESCENT FIXTURE, 4', 2 LAMP ENCLOSED, GASKETTED. |
| | HID TYPE, HPS EXTERIOR WALL MOUNT FIXTURE |
| | BATTERY PACK |
| | REMOTE HEAD |
| 101 | LUMINAIRE TYPE, SEE DRAWINGS |
| | LINE VOLTAGE SWITCH |
| MP | MOTOR PROTECTION SWITCH, C/W PILOT SWITCH |
| | TELEPHONE OUTLET |
| | CABLE OUTLET |
| | PANEL |
| EF-1 | MOTOR ID TAG |
| | 120 VOLT RECEPTACLE |
| | MOTOR, PUMP DESIGNATION |
| T | LINE VOLTAGE THERMOSTAT |
| J | JUNCTION BOX |
| | DISCONNECT SWITCH |
| F | FIRE ALARM |

# POWER & SYSTEM LOWER FLOOR PLAN.

N.T.S.

Iqaluit

DRAWING

E-2

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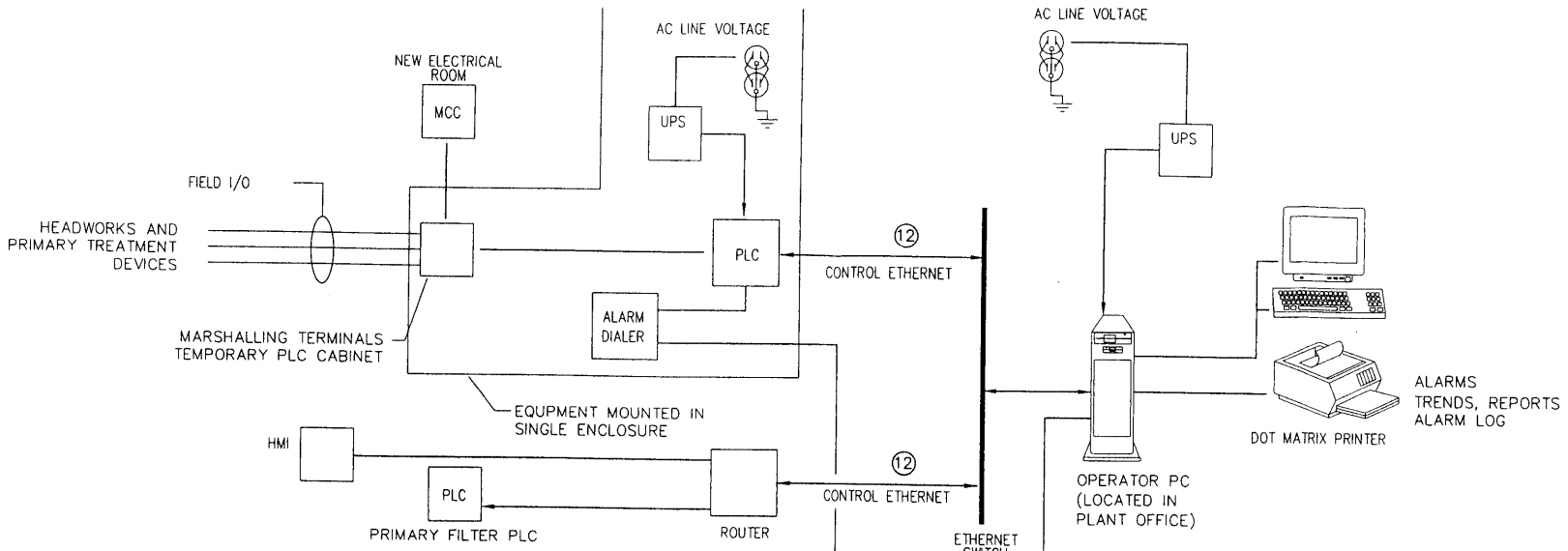


NOTES:

1) TEMPORARY PLC CABINET TO INCLUDE THE I/O MARSHALLING TERMINALS, PLC UPS, 24 VOLT POWER SUPPLY, PLC, AND INTERPOSING REALAYS AS REQUIRED

2) DIVISION 17 RESPONSIBLE FOR THE SUPPLY, WIRING, INSTALLATION, PROGRAMMING, AND COMMISSIONING OF ALL COMPONENTS INDICATED ON THE DRAWINGS AND AS DETAILED IN THE PROJECT SPECIFICATIONS

1/1113 PLC CONTROL SYSTEM (SCHEMATIC)
SCALE: 1/125

SCALE: N.T.S.

Iqaluit

DRAWING E-4

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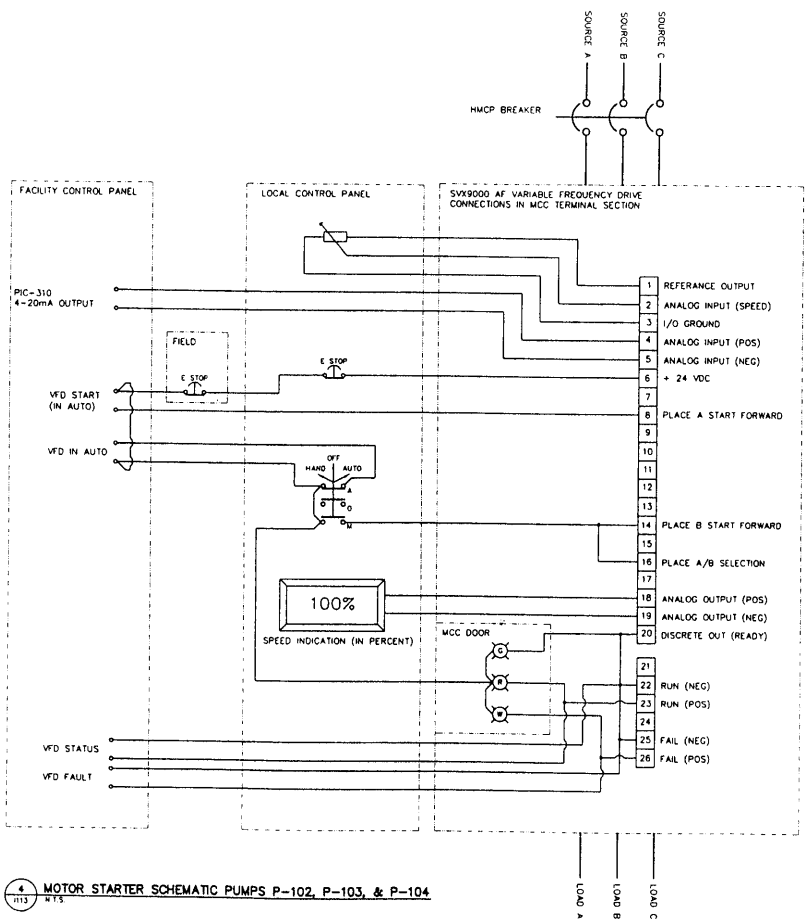


4 / 1113 MOTOR STARTER SCHEMATIC PUMPS P-102, P-103, & P-104
N.T.S.

| | SLOT |
|---|---|
| POWER SUPPLY | |
| 1747-L553 PROCESSOR | 0 |
| 1746-IA16 | 1 |
| 1746-IA16 | 2 |
| 1746-OX8 | 3 |
| 1746-OX8 | 4 |
| 1746-NI8 | 5 |
| | |
| 1746-NO4I | 6 |
| 1746-IV8 | 7 |
| 1746-IV8 | 8 |
| SPACE | 9 |

3 / 1113 PLC SYSTEM RACK LAYOUT
N.T.S.

SCALE: N.T.S.

Iqaluit

DRAWING E-5

EARTH TECH

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## PANEL 6B

| DESCRIPTION | KW | BKR. | CIRCUIT NO. | BKR. | KW | DESCRIPTION |
|---|---|---|---|---|---|---|
| EXTERIOR LTG-HEADWORKS | | 1P15A | 1 — 2 | 1P15A | | LTG- UPPER HEADWORKS |
| EXIT LIGHTING | | 1P15A | 3 — 4 | 1P15A | | LTG- LOWER HEADWORKS |
| | | | 5 — 6 | 1P15A | | LIGHTING - ELEC RM 03 |
| | | | 7 — 8 | | | |
| | | | 9 — 10 | | | |
| | | | 11 — 12 | | | |
| | | | 13 — 14 | | | |
| | | | 15 — 16 | | | |
| | | | 17 — 18 | | | |
| | | | 19 — 20 | | | |
| | | | 21 — 22 | | | |
| | | | 23 — 24 | | | |
| | | | 25 — 26 | | | |
| | | | 27 — 28 | | | |
| | | | 29 — 30 | 1P15A | | SPARE |
| | | | 31 — 32 | 1P15A | | SPARE |
| | | | 33 — 34 | 1P15A | | SPARE |
| SPARE | | 1P15A | 35 — 36 | 1P15A | | SPARE |
| SPARE | | 1P15A | 37 — 38 | 3P | | |
| SPARE | | 1P15A | 39 — 40 | | | TRANSFORMER TX2 |
| SPARE | | 1P15A | 41 — 42 | 50A | | |
| TOTAL | | | | | | TOTAL |

MAINS: 225A
MOUNTING: SURFACE

VOLTS: 347/600V
LOCATION: ELECT RM. 03
FED FROM: EXISTING MDP
ENTER AT: TOP

## ELECTRICAL LEGEND

- H.I.D. LUMINAIRE - WALL MOUNTED
- WALL MOUNTED EXIT LIGHT - DIRECTIONAL ARROWS AS INDICATED
- FLUORESCENT LUMINAIRE - SURFACE MOUNTED OR SUSPENDED
- PEC — PHOTO ELECTRIC CELL
- LINE VOLTAGE SWITCH
- (#) — LUMINAIRE TYPE
- DUPLEX RECEPTACLE
- GFI DUPLEX RECEPTACLE
- MOTOR
- DISCONNECT SWITCH
- M — MANUAL MOTOR STARTER C/W PILOT LIGHT
- MAGNETIC MOTOR STARTER
- THERMOSTAT
- PANELBOARD
- COMBINATION VOICE/DATA OUTLET
- WALL MOUNTED TELEPHONE OUTLET
- EXP — EXPLOSION PROOF

## PANEL 2B

| DESCRIPTION | KW | BKR. | CIRCUIT NO. | BKR. | KW | DESCRIPTION |
|---|---|---|---|---|---|---|
| UH-10-headworks lower | | 1P15A | 1 — 2 | 2P | | SPARE |
| SUMP PUMP P11/12 | | 2P | 3 — 4 | 30A | | SPARE |
| (headworks lower) | | 30A | 5 — 6 | 1P15A | | SPARE |
| SPARE | | 1P15A | 7 — 8 | 1P15A | | SPARE |
| SPARE | | 1P15A | 9 — 10 | 1P15A | | SPARE |
| SPARE | | 1P15A | 11 — 12 | 1P15A | | SPARE |
| SPARE | | 1P15A | 13 — 14 | 1P15A | | SPARE |
| SPARE | | 1P15A | 15 — 16 | 1P15A | | RECEPT - headworks |
| SPARE | | 1P15A | 17 — 18 | 1P15A | | SPARE |
| SPARE | | 1P15A | 19 — 20 | 1P15A | | SPARE |
| UH-09-headworks lower | | 1P15A | 21 — 22 | 1P15A | | SPARE |
| SPARE | | 1P15A | 23 — 24 | 1P15A | | SPARE |
| UH-12-headworks upper | | 1P15A | 25 — 26 | 1P15A | | SPARE |
| RECEPT. - Bio area | | 1P15A | 27 — 28 | 1P15A | | RECEPT - headworks |
| RECEPT. - Bio area | | 1P15A | 29 — 30 | 1P15A | | RECEPT. EXT. GFI BKR |
| SPACE | | | 31 — 32 | | | SPACE |
| SPACE | | | 33 — 34 | | | SPACE |
| SPACE | | | 35 — 36 | | | SPACE |
| SPACE | | | 37 — 38 | | | SPACE |
| SPACE | | | 39 — 40 | | | SPACE |
| SPACE | | | 41 — 42 | | | SPACE |
| TOTAL | | | | | | TOTAL |

MAINS: 225A
MOUNTING: SURFACE

VOLTS: 120/208 VOLTS
LOCATION: ELECT RM. 03
FED FROM: XFMR TX2
ENTER AT: TOP

# ELECTRICAL PANEL DIAGRAM.

SCALE: N.T.S.

Iqaluit

DRAWING E-6

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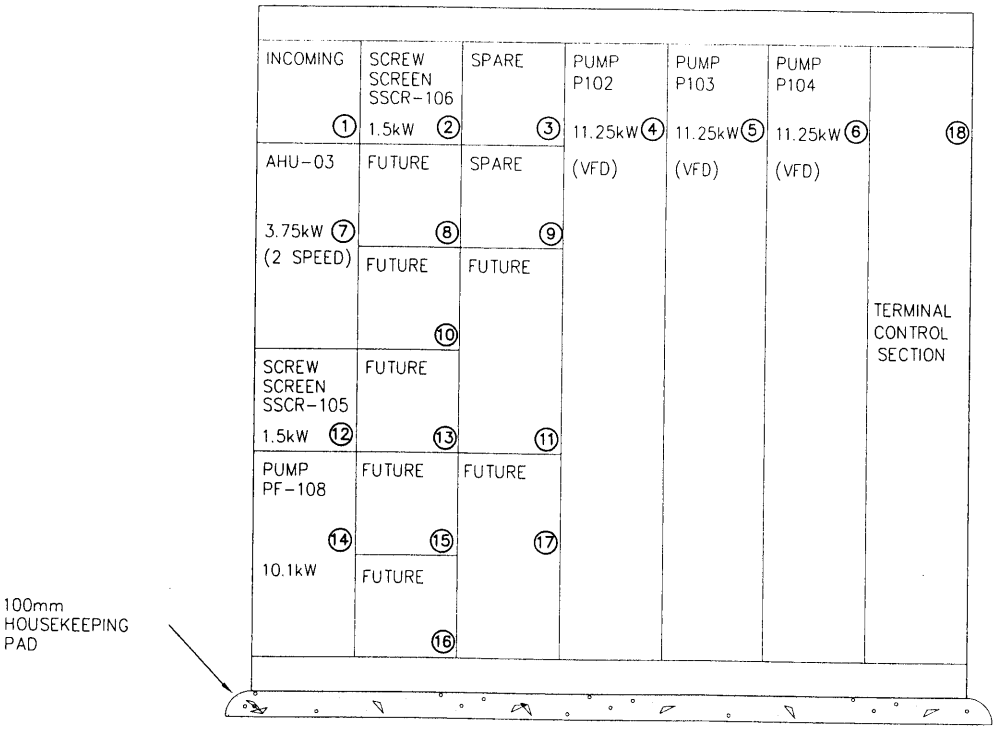
# MCC-2




## MCC-2 ELEVATION DETAIL

N.T.S.

Iqaluit

DRAWING

E-7

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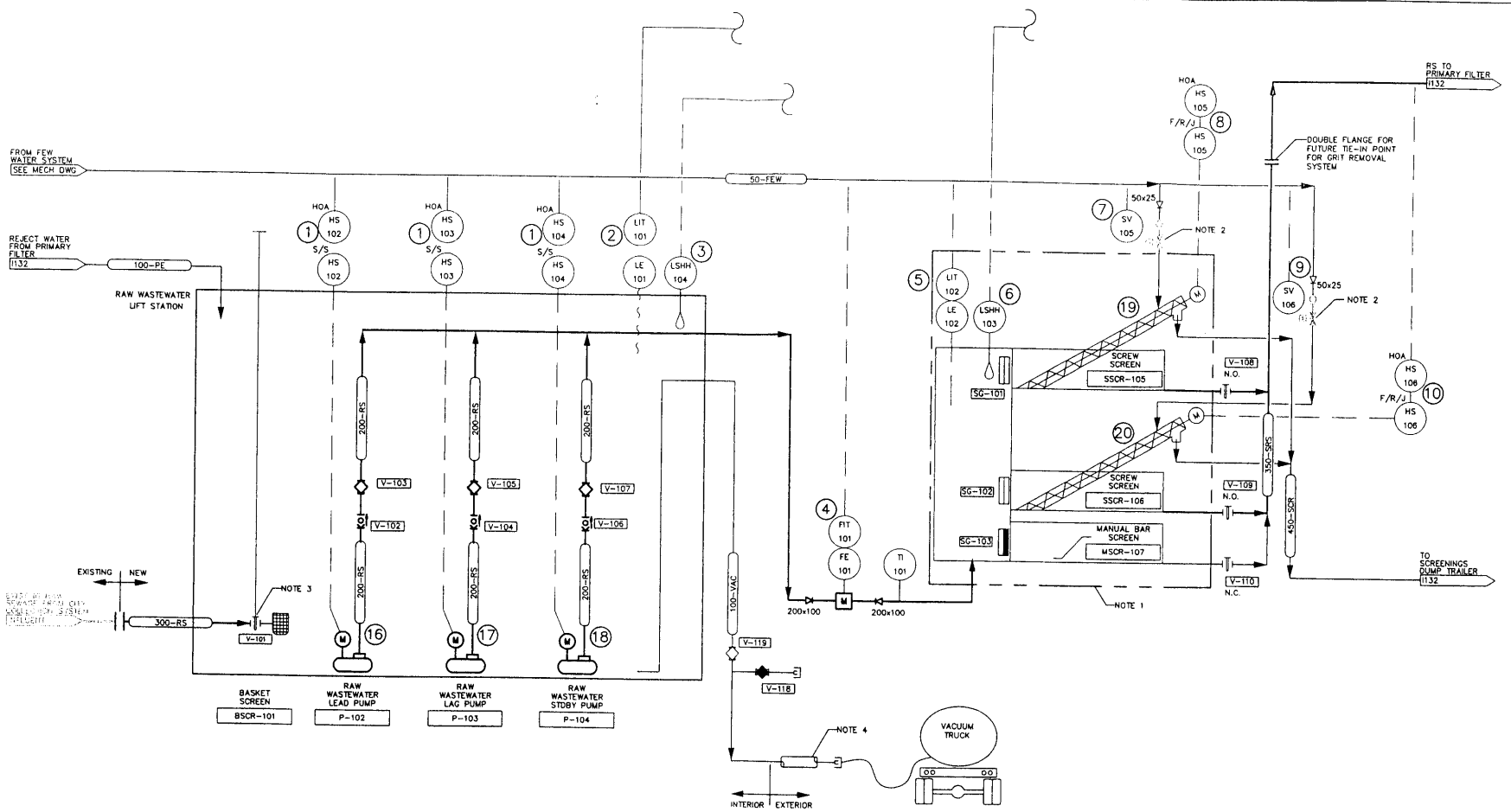
# MOTOR STARTER AND CONTROL SCHEDULE

E – DIVISION 16
M – DIVISION 15
U – USERS EQUIPMENT
X – PROVIDE

1 - STOP-START
2 - ON-OFF
3 - HAND-OFF-AUTO
4 - PILOT LIGHTS
5 - CONTROL RELAY
6 - TIMING RELAY
7 - DOUBLE VOLTAGE RELAY
8 - THERMISTORS
9 - ELAPSED TIME METER
10-
11 - SOLENOID
12 - MOTORIZED DAMPER
13 - FLOAT SWITCH
14 - PRESSURE SWITCH
15 - FLOW SWITCH
16 - SAIL SWITCH
17 - CONTROL TRANSFORMER
18 - THERMOSTAT
19 - INTEGRAL CONTROL PANEL
20 - FIRE ALARM SHUT DOWN
21 - FREEZE PROTECTION
22 - FIRE PROTECTION
23 - HIGH LIMIT
24 - LOW LIMIT
25-
26 - L.V. THERMOSTAT
27 - C.O. DETECTOR
28 - VARIABLE SPEED SW
29 - VFD IN MCC
30 - VFD AT EQUIPMENT
31 - REDUCED VOLTAGE STARTER IN MCC
32 - REDUCED VOLTAGE STARTER AT EQUIPMENT

| EQUIPMENT No. | LOCATION | EQUIPMENT | SUPPLIED UNDER | INSTALLED UNDER | WIRED UNDER | EQUIP'T RATING HP | TOTAL kW | RUNNING kW | STANDBY kW | VOLTAGE | PHASE | PANEL AND CIRCUIT No. | MAGNETIC STARTER: MANUAL | IN COVER: TOGGLE | KEY | PUSH BUTTON | PILOT LIGHT | MAGNETIC | COMBINATION | REDUCED VOLTAGE | TWO SPEED | BREAKER TYPE | FUSE TYPE | CONTROL TRANS. | AUXILIARY CONTACT | IN COVER: STOP-START | ON-OFF | HAND-OFF-AUTO | ON LIGHT - RED | ENERGIZED LTG-GREEN | CSA ENCLOSURE TYPE | LEGEND ABOVE | NOTES | SUPPLIED UNDER | INSTALLED UNDER | WIRED UNDER | LOCATE AT MOTOR: DISCONNECT SWITCH | TOGGLE SWITCH | JUNCTION BOX | RECEPTACLE | WEATHER PROOF | LEGEND ABOVE | LEGEND ABOVE | NOTES | SUPPLIED UNDER | INSTALLED UNDER | REMOTE CONTROL: LEGEND ABOVE | LEGEND ABOVE | LEGEND ABOVE | NOTES | SUPPLIED UNDER | INSTALLED UNDER | INSTRUMENT LOOP DIAGRAM # | INTERLOCK WITH EQUIP. NO. | FEEDER TAG | FEEDER DETAILS | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AHU-03 | 2nd FL. SCREENS BUILDING | SCREENS BUILDING VENTILATION SYSTEM SUPPLY FAN & EXHAUST FAN | M | M | E | 5.0 | 3.75 | | | 600 | 3 | MCC-2 | | | | | | | | | | | X | | X | X | | | | | | | | | E | E | E | X | | | | | | | | E | E | E | | | | | | | 6C/12 + GND | 2 SPEED MOTOR SINGLE POINT CONNECTION |
| P-11 | HEADWORKS LOWER FLOOR SUMP | SUMP PUMP | M | M | E | .75 | .56 | | | 120 | 1 | 28-3,5 | X | X | | X | | | | | | X | | | | X | | | | | | | E | E | E | X | | | | | | | | E | E | E | | 13 | | M | E | | P-11 & P-12 CTRL PANEL Duty/Stanby |
| P-12 | HEADWORKS LOWER FLOOR SUMP | SUMP PUMP | M | M | E | .75 | .56 | | | 120 | 1 | 28-3,5 | X | X | | X | | | | | | X | | | | X | | | | | | | E | E | E | X | | | | | | | | E | E | E | | 13 | | M | E | | P-11 & P-12 CTRL PANEL Duty/Stanby |
| UH-09 | HEADWORKS, LOWER FLOOR | UNIT HEATER | M | M | E | FRAC | .38 | | | 120 | 1 | 28-21 | X | X | | X | | | | | | X | | | | X | | | | | | | E | E | E | X | | | | | | | | E | E | E | | | | | | | 2C/12 + GND | |
| UH-10 | HEADWORKS, LOWER FLOOR | UNIT HEATER | M | M | E | FRAC | .38 | | | 120 | 1 | 28-1 | X | X | | X | | | | | | X | | | | X | | | | | | | E | E | E | X | | | | | | | | E | E | E | | | | | | | 2C/12 + GND | |
| UH-11 | REMOVED | UNIT HEATER | | | | | | | | | | |




# PFD – PUMPING & PRELIMINARY SCREENING P&ID.

SCALE: N.T.S

| Iqaluit | DRAWING |
|---|---|
| | I–1 |

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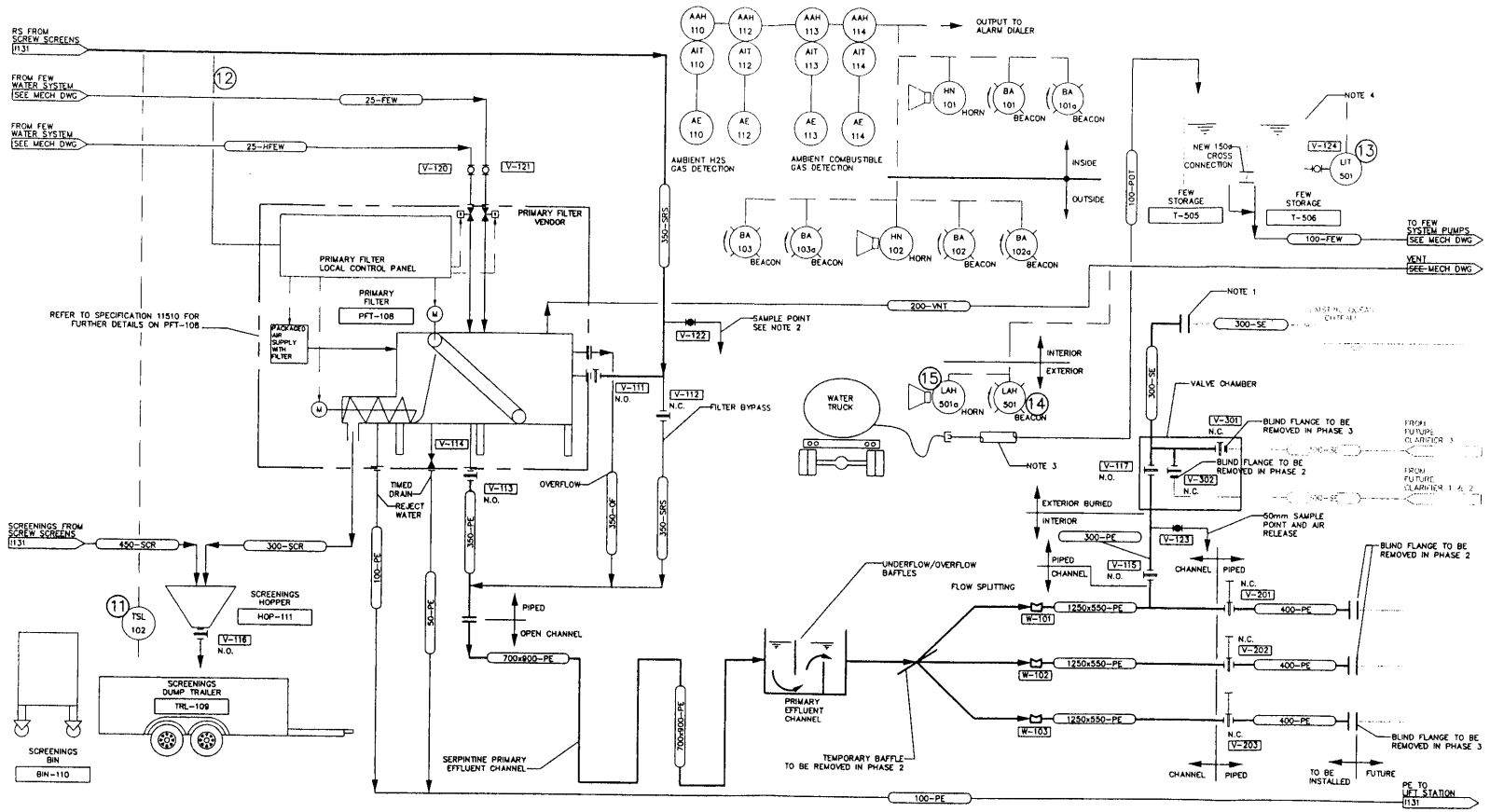


# PFD __ SOLIDS HANDLING & OUTFALL P&ID.

SCALE: N.T.S.

| | | |
|---|---|---|
| Iqaluit | DRAWING | EARTH TECH |
| | 1-2 | Earth Tech (Canada) Inc<br>Edmonton, AB 780-486-6800<br>Yellowknife, NWT 867-873-6316 |

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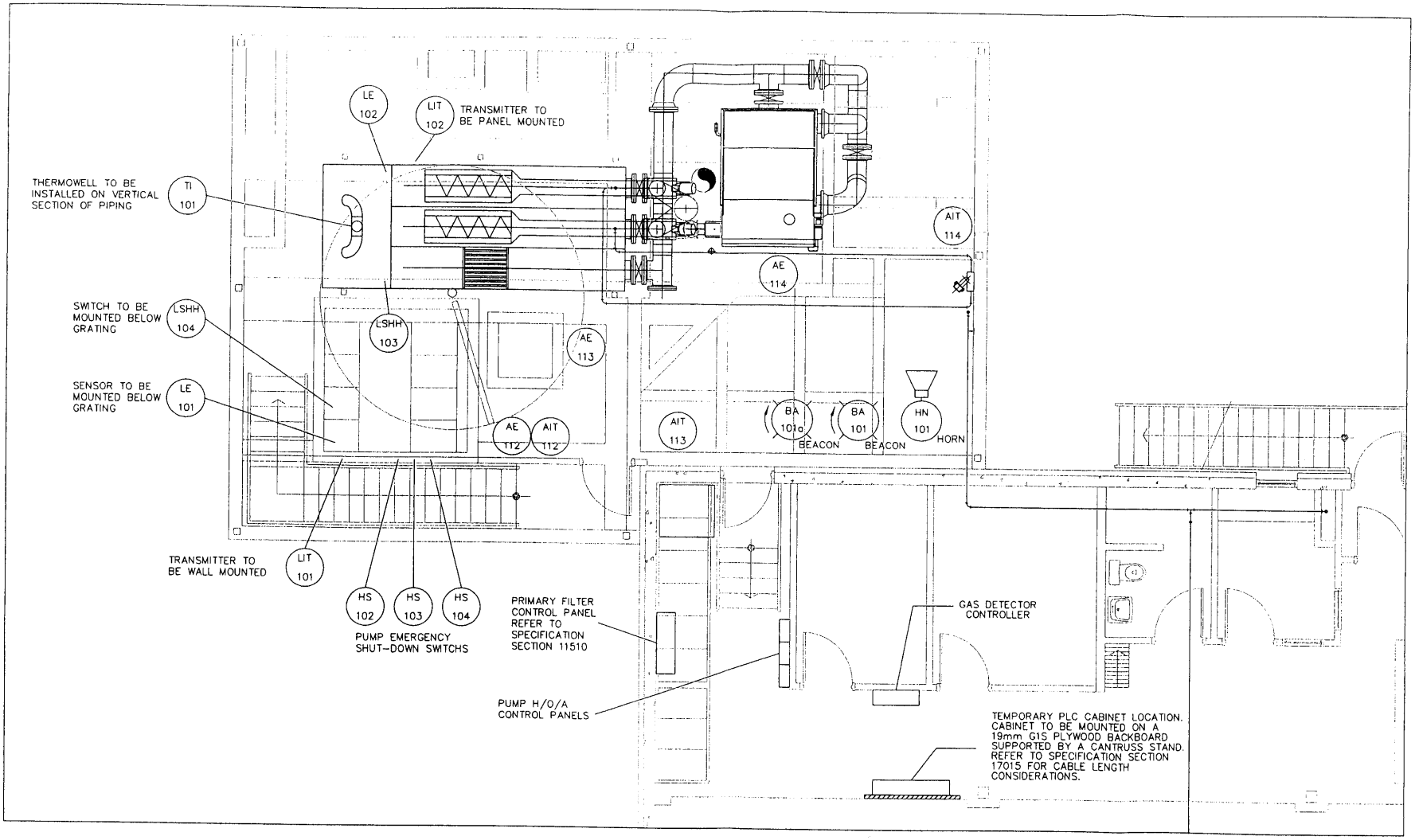


# UPPER LEVEL INSTRUMENT LOCATION DRAWING.

SCALE: N.T.S.

| Iqaluit | DRAWING | EARTH TECH |
|---|---|---|
| | 1-3 | Earth Tech (Canada) Inc<br>Edmonton, AB 780-486-6800<br>Yellowknife, NWT 867-873-8316 |

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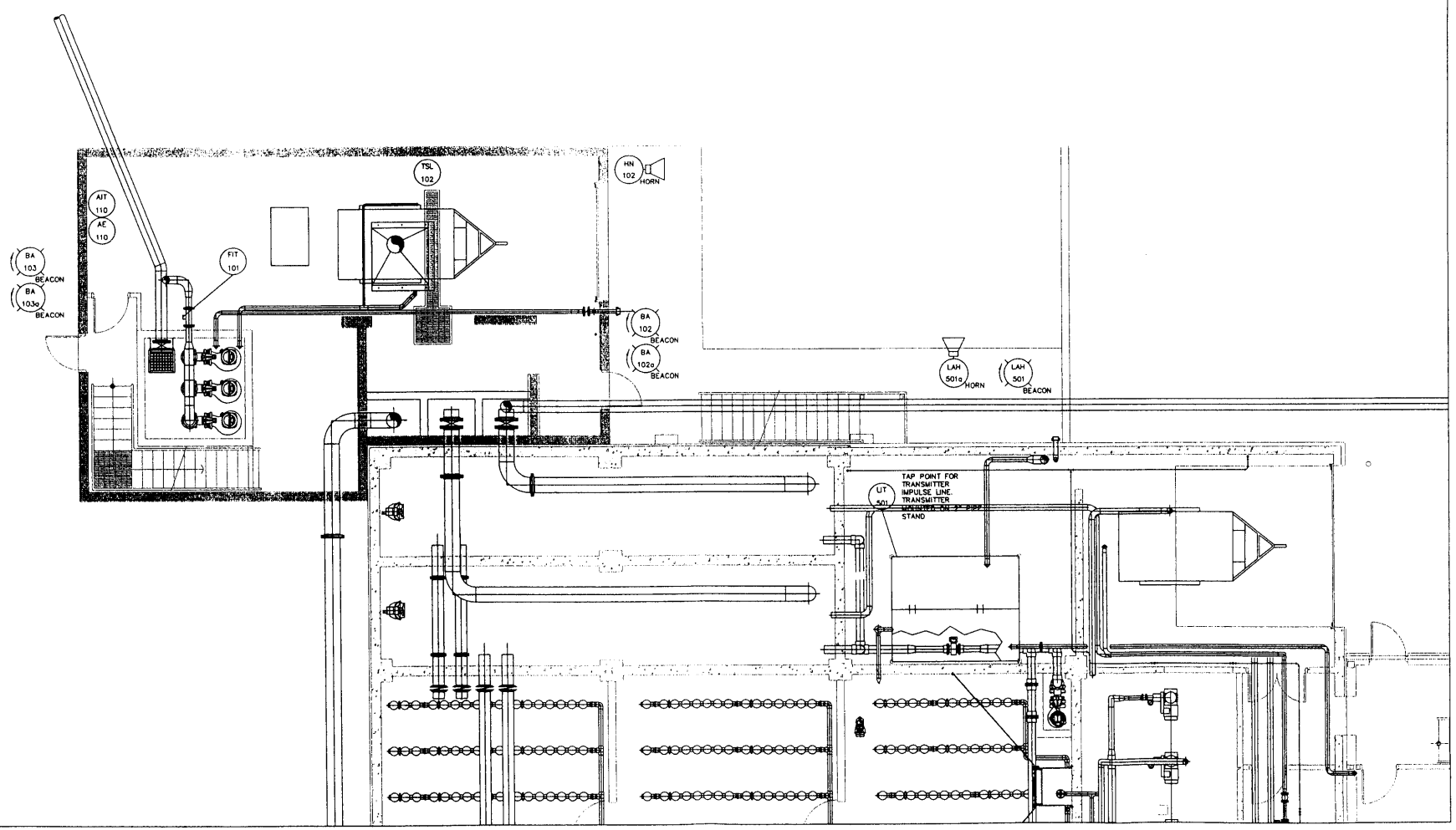


SCALE: N.T.S

# LOWER LEVEL INSTRUMENT LOCATION DRAWING.

Iqaluit

DRAWING 1-4

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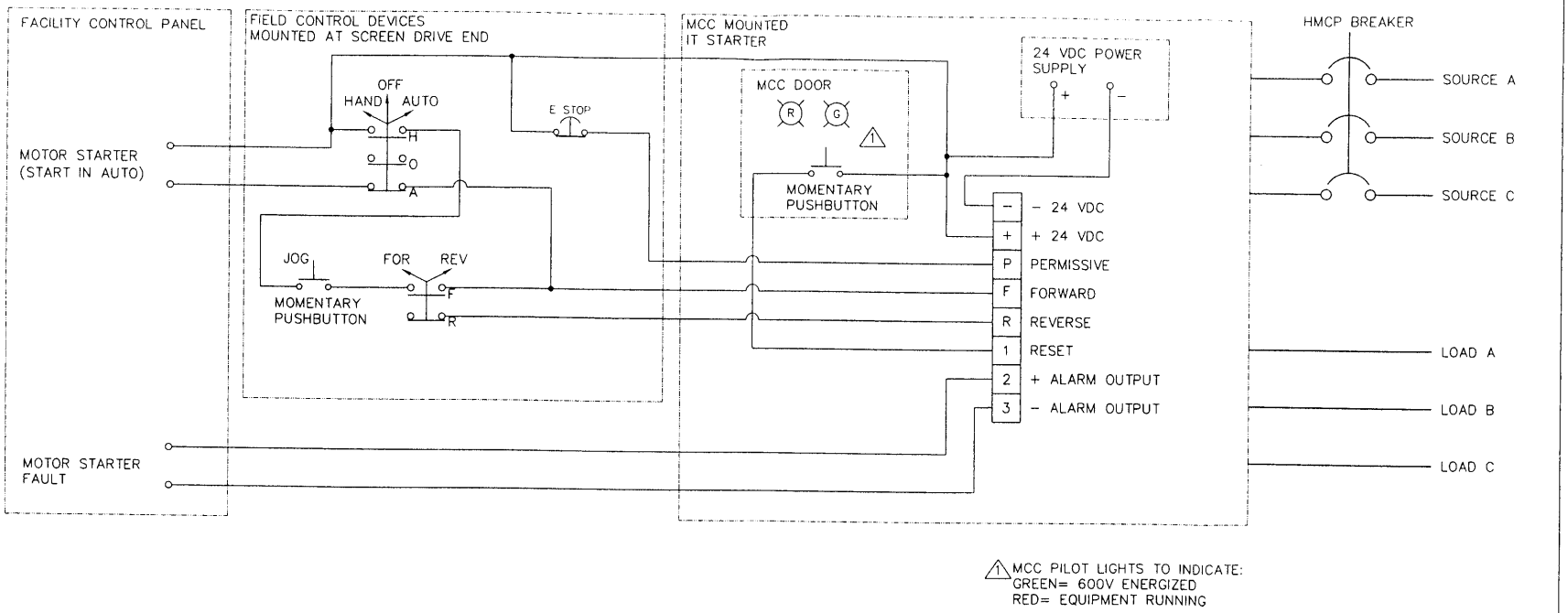
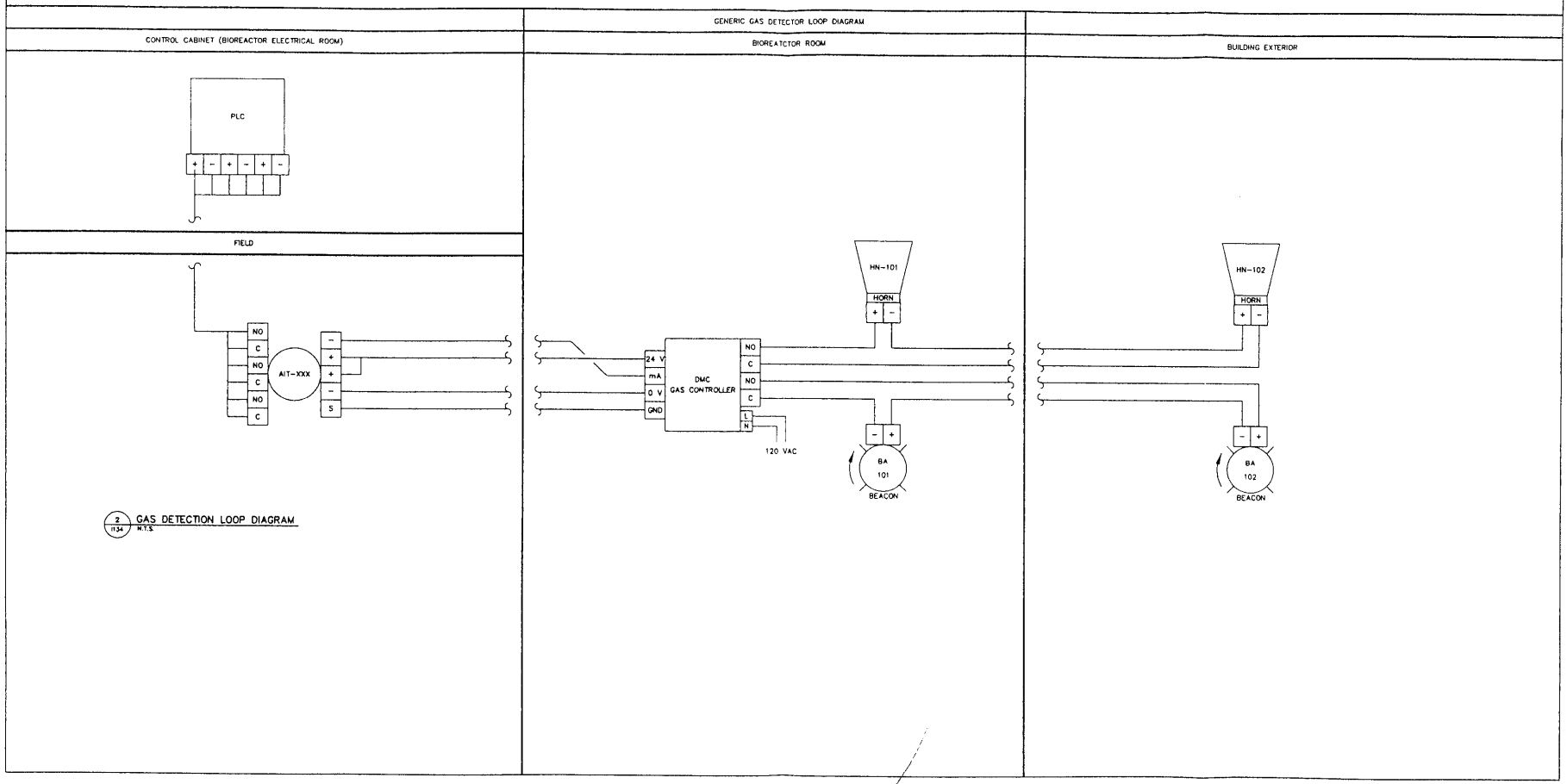



# SCREEN DRIVE MOTOR CONTROL SCHEMATIC.

SCALE: N.T.S

| Iqaluit | DRAWING | EARTH TECH |
|---|---|---|
| ᐃᖃᓗᐃᑦ | I-5 | Earth Tech (Canada) Inc<br>Edmonton, AB 780-488-6800<br>Yellowknife, NWT 867-873-8316 |




2 / 1134 GAS DETECTION LOOP DIAGRAM
N.T.S.

# GAS DETECTION LOOP DIAGRAM.

SCALE: N.T.S.

Iqaluit

| DRAWING |
|---|
| 1-6 |

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# Chapter 5

# COMPONENT DETAILS

## 5.1 Power Distribution Schematic

**(Refer to Drawings E-1 and E-2 and E-3 at the end of Chapter 4)**

**Power Distribution Schematic**

| No. | Component | Details | Setting | Remarks |
|---|---|---|---|---|
| 1 | 400A Main Distribution Panel | Cutler Hammer PRL3000 | 1200A Main Bus Rating 347/600 Volts | Existing |
| 2 | 400A Transfer Switch | Cutler Hammer Robonics | | |
| 3 | 3P 200 Amp circuit breaker TO Panel 6B | | | 200A/3P |
| 4 | 3P 200 Amp circuit breaker to Panel 2B | | | 200A/3P |
| 5 | TVSS | Transient Eliminator Advanced Protection Technologies | | |
| 6 | Distribution Panel 6B | Square D | | 42 Circuits 250 Amperes 600Y/347 Volts |
| 7 | 3P 50A Sub breaker , Panel 6B | Square D | | 50A/3P |
| 8 | 45 kVA transformer to Panel 2B | Square D | | 600Δ/208Y120 |
| 9 | Distribution Panel 2B | Square D | | 42 Circuits 225 Amperes 120/208 Volts |
| 10 | Motor Control Center MCC 2 | Square D | | Electrical room 3 |
| 11 | MCC-2 Ground Grid | | | |
| 12 | Future connections MCC 2 | | | |
| 13 | Gas Detection Control | BW Technologies | | |

**Power Distribution Schematic**

| No. | Component | Details | Setting | Remarks |
|---|---|---|---|---|
| | Panel | CR-4000 | | |
| **14** | Lighting Control Panel | Square D | | |
| **15** | Sump Pump Control Panel | | | |
| **16** | Raw Sewage Pump P-102 | | | |
| **17** | Raw Sewage Pump P-103 | | | |
| **18** | Raw Sewage Pump P-104 | | | |
| **19** | Sump Pump P-11 | | | |
| **20** | Sump Pump P-12 | | | |
| **21** | Unit Heater UH-09 | | | |
| **22** | Unit Heater UH-10 | | | |
| **23** | Air Handling Unit AHU-03 | | | |
| **24** | Screw Screen SSCR-105 | | | |
| **25** | Screw Screen SSCR-105 | | | |
| **26** | Primary Filter PF-108 Filter Drive | | | |
| **27** | Primary Filter PF-108 Auger Drive | | | |
| **28** | Unit Heater UH-12 | | | |

## 5.2 PLC Control Schematic

**(Refer to Drawings I-1 to I-6 & E-4 to E-6 at the end of Chapter 4)**

**PLC Control Schematic**

| No. | Component | Details | Setting | Remarks |
|---|---|---|---|---|
| 1 | HS-102A/HS-103A/ HS-104A | | | Hand Off Auto (HOA) Switch |
| 2 | HS-102B/HS-103B/ HS-104B | | | Speed Pot |
| 2A | SI-102, 103, 104 | Yokagowa UM331E | 0-100 % Speed | |
| 3 | HS-102C/HS-103C/ HS-104C | | | ESD |
| 4 | HS-102D/HS-103D/ HS-104D | | | ESD |
| 5 | VFD-102, VFD-103, VFD-104 | Telemechanique Altivar 78 | | |
| 6 | LE/LIT-101 | Milltronics Multiranger 100 | | Non-contacting Ultrasonic |
| 7 | LSHH-104 | | | Ultrasonic Tip Sensitive |
| 8 | FE/FIT101 | | | Electro/Magnetic |
| 9 | LE/LIT-102 | Milltronics Multiranger 100 | | |
| 10 | LSHH-103 | | | |
| 11 | Motorized Valve SV-105 | Belimo LF-24 | | 24 VDC |
| 12 | Motorized Valve SV-106 | Belimo LF-24 | | 24 VDC |
| 13 | HS-105A/B/C/D | | | |
| 14 | HS-106A/B/C/D | | | |
| 15 | HS-105E/F/G/H | | | |
| 16 | HS-106E/F/G/H | | | |
| 17 | VFD-108A | Toshiba VF-S11 | | |
| 18 | VFD-108B | | | |
| 19 | HS-108 | | | |
| 20 | LT-106 | | | |
| 21 | SV-114 | Burkert 0330 | | 24 VDC |

**PLC Control Schematic**

| No. | Component | Details | Setting | Remarks |
|---|---|---|---|---|
| **22** | SV-120 | Burkert 5782A | | 24 VDC |
| **23** | SV-121 | Burkert 5782A | | 24 VDC |
| **24** | AE/AIT-110 | BW Technologies | 0 – 100 ppm | $H_2S$ |
| **25** | AE/AIT-112 | BW Technologies | 0 – 100 ppm | $H_2S$ |
| **26** | AE/AIT-113 | BW Technologies | 0 – 100 % | LEL |
| **27** | AE/AIT-114 | BW Technologies | 0 – 100 % | LEL |
| **28** | AAH-110 to 114 | BW TechnologiesCR-4000 | | |
| **29** | HN-101 | | | |
| **30** | HN-102 | | | |
| **31** | BA-101/101A | Edwards 96CD2R-N5 | | 120 VAC |
| **32** | BA-102/102A | | | |
| **33** | BA-103/103A | | | |
| **34** | LT-501 | | | |
| **35** | LAH-501A | | | |
| **36** | LAL-501 | | | |
| **37** | LAH-501 | | | |
| **38** | TSL-102 | | | |

## 5.3 Motor Control Centre

**(Refer to Drawing E-7 at the end of Chapter 4)**

**Motor Control Centre**

| No. | Component | Details | Setting | Remarks |
|---|---|---|---|---|
| 1 | Incoming Lugs | | | |
| 2 | Supply Fan AHU-03 3.75 kW | | 30 A | |
| 3 | Exhaust Fan AHU-03 3.75 kW | | 15 A | |
| 4 | Spare | | 30 A | Space for Future Expansion |
| 5 | Spare | | 7 A | Space for Future Expansion |
| 6 | Glycol Heating Pump | | 7 A | |
| 7 | Salsnes Filter PF-108 | | 30 A | |
| 8 | Future | | 7 A | Space for Future Expansion |
| 9 | Future | | 15 A | Space for Future Expansion |
| 10 | Future | | 15 A | Space for Future Expansion |
| 11 | Future | | 3 A | Space for Future Expansion |
| 12 | FEW Pump #1 | | 15 A | |
| 13 | FEW Pump #2 | | 15 A | |
| 14 | FEW Pump #3 | | 15 A | |
| 15 | Screw screen SSCR-105 1.5kW | | 15 A | |
| 16 | Screw screen SSCR-106 1.5kW | | 15 A | |
| 17 | Pump P-102 11.25Kw (VFD) | | 30 A | |
| 18 | Pump P-103 11.25Kw (VFD) | | 30 A | |
| 19 | Pump P-104 11.25Kw (VFD) | | 30 A | |

**Motor Control Centre**

| No. | Component | Details | Setting | Remarks |
|---|---|---|---|---|
| **20** | Empty Space | | | |

## END OF CHAPTER 5

# Chapter 6

# OPERATING PROCEDURES

## 6.1 General

The operations portion of this manual should be read in conjunction with Chapter 6 of the Process and Mechanical Operations and Maintenance Manuals. The operating procedures described in this section will relate to the WWTP Electrical and Controls systems.

## 6.2 Facility Power and Standby Power System

The WWTP facility is powered by existing local service. A Standby Generator automatically starts and assumes the full plant load on power failure. The power is switched by a Robonic Transfer Switch. Automatic louvers control the temperature in the Generator Room.

### 6.2.1 Controls

#### 6.2.1.1 Generator

The generator has a control panel attached with control switches and monitoring indicators. The main control has a rotary switch to select between OFF RESET, AUTO, MANUAL START and COOLDOWN STOP. There is an E-stop that can be used to instantly stop and disconnect the generator from the electrical system.

There is a toggle switch labelled Panel Lights that can be used to supply light to the controls.

The Control Panel has a monitoring interface that displays monitored information and a set of LED lamps for alarm status. These are discussed in detail in the manufacturer's O&M Manual.

#### 6.2.1.2 Transfer Switch

The transfer switch is located in the old Electrical Room. It has a selector switch for AUTO and TEST, a green indicator lamp for Normal Power and a Red indicator lamp for Emergency Power. It also has a rotary handle that shows the present operating mode and that can be used for manual operation. The manual handle drives the switch when turned in the counter-clockwise direction and freewheels when turned in the clockwise direction. An indicator is located behind the handle and points to the present switch position (Normal, Off, Emergency, Off).

#### 6.2.1.3 Ventilation Louvres

The ventilation louvers are controlled locally by a dedicated temperature controller. This is described in detail in the Process and Mechanical O&M Manual.

### 6.2.2 Emergency Generator

#### 6.2.2.1 Automatic Operation

With the selector switch in AUTO, the generator will start when line power fails. It operates until line power is restored. When line power is restored, it continues to run under no load for ___ minutes to allow the engine to cool down.

#### 6.2.2.2 Manual Operation

The generator can be started manually by placing the selector switch in the MAN START position. The generator will run regardless of the line power condition. The generator is stopped by placing the selector switch in the COOL DOWN STOP position. The generator will go through a cool down cycle and then stop. If the generator has not been running under load, the switch can be set directly to the OFF RESET or AUTO position.

#### 6.2.2.3 Emergency Stop

If the Emergency Stop button is pushed, the main breaker will be tripped and the generator will stop. Before the breaker can be reset, the selector switch must be set to the OFF RESET position. When the breaker is reset, the selector switch can then be set to the desired position.

### 6.2.3 Transfer Switch

#### 6.2.3.1 Automatic Operation

With the selector switch in the AUTO position, the transfer switch will automatically switch to backup power on loss of line power. On return of line power, it will first switch to the Off position. If the power is stable, it continues on to the Normal position.

#### 6.2.3.2 Test

When the selector switch is set to the TEST position, the Emergency Generator will start and the Transfer Switch will switch the load to the generator. When the switch is returned to the AUTO position, the switch returns the load to the normal line power. The generator shuts down after its Cool Down period.

#### 6.2.3.3 Alternate Test Procedure

The system can be fully tested by opening the Main Incoming Breaker located to the right of the Transfer Switch. This simulates a power failure and tests all components of the system, including the power sensor. When the breaker is reset, the Transfer Switch returns the load to normal line power, and the generator shuts down after its Cool Down period.

## 6.3 Gas Detection

### 6.3.1 General

Combustible and $H_2S$ gases are continuously monitored in both the Main Process Room and in the Sludge Handling Basement. Audible alarms are installed in the Main Process Room and on the exterior of the building. High and Low Alarm Beacons are installed in the Main Process Room and on the exterior of the building, both at the front and the back.

Low Alarms are a notification of increasing gas concentration before dangerous levels are reached. High Alarms indicate a dangerous condition and will result in increased ventilation as well as a callout alarm from the Autodialler.

### 6.3.2 Sensor Heads

A Combustible Gas Sensor and an H2S Sensor are located in each of the rated process areas. The Combustible Gas sensors are mounted remotely from the transmitters at ceiling level. The H2S Gas Sensors are mounted remotely from the transmitters. The sensor in the basement is mounted near floor level. The sensor in the Main Process Room is located in the Raw Water Wetwell.

Each sensor/transmitter is connected to a central controller by a self-powered 4 – 20 mA loop.

### 6.3.3 Controller

The controller for all four sensor heads is located in the New Electrical Room. This unit controls all of the alarming functions including both the horns and beacons. In addition, it supplies signals to the PLC indicating high gas alarms and controller fault.

The controller is equipped on its face with LCD readouts for each connected sensor, with the Combustible reading scaled in % LEL and the $H_2S$ reading scaled in ppm. There are LEDs for each sensor to indicate Low Alarm, High Alarm and Fault.

There are two foil switches provided on the face of the controller. "Lamp Test" will light all of the LEDs on the face of the controller. "Reset Alarm" must be pressed when

an alarm condition no longer exists to reset the unit. This ensures that the cause of the alarm is maintained until the operator can arrive on site and assess the alarm condition. Without this feature, the operator will not know the specific cause of a callout.

## 6.4 Wastewater Treatment Process Controls System

The WWTP operates on a continuous basis in automatic mode. When the plant is called to start and all equipment is in automatic mode, the Main PLC will control and operate the plant. Various conditions of alarms are detected and reported to the main PLC. Some will shut the plant equipment down and others will turn on back-up equipment.

Operator interaction with the system is largely through the HMI located in the plant office. These operating procedures are discussed in detail in Section 6 of the Process and Mechanical Operations & Maintenance Manual.

### 6.4.1 RSView

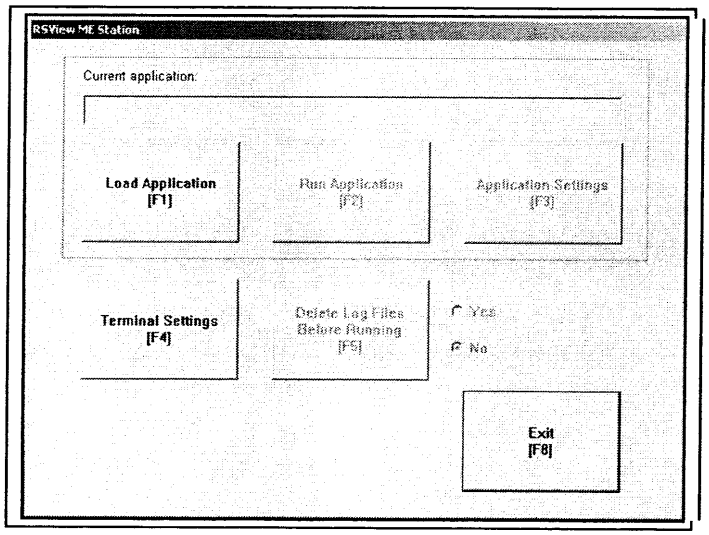
#### 6.4.1.1 Starting RSView

RSView starts automatically when the computer is started.

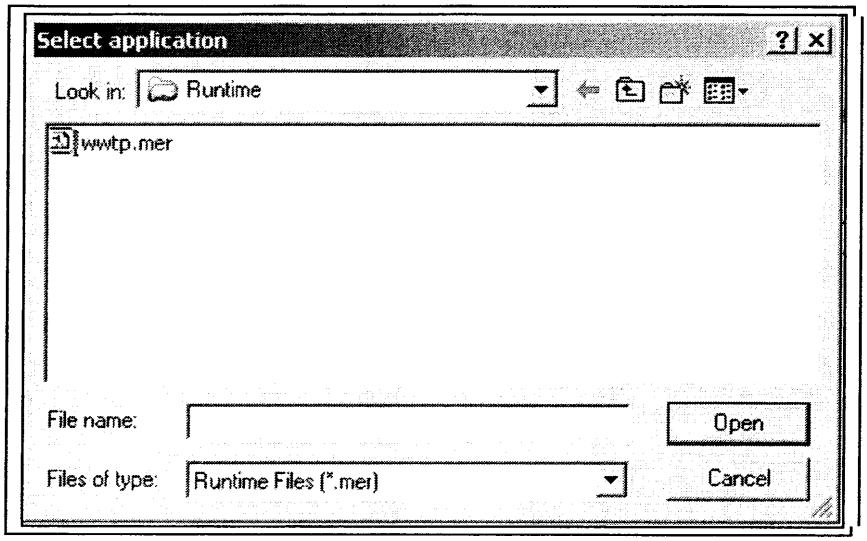
If the program is stopped for any reason, it can be restarted by rebooting the computer or by following the procedure below:

1. Double click on the RSView ME Station icon on the

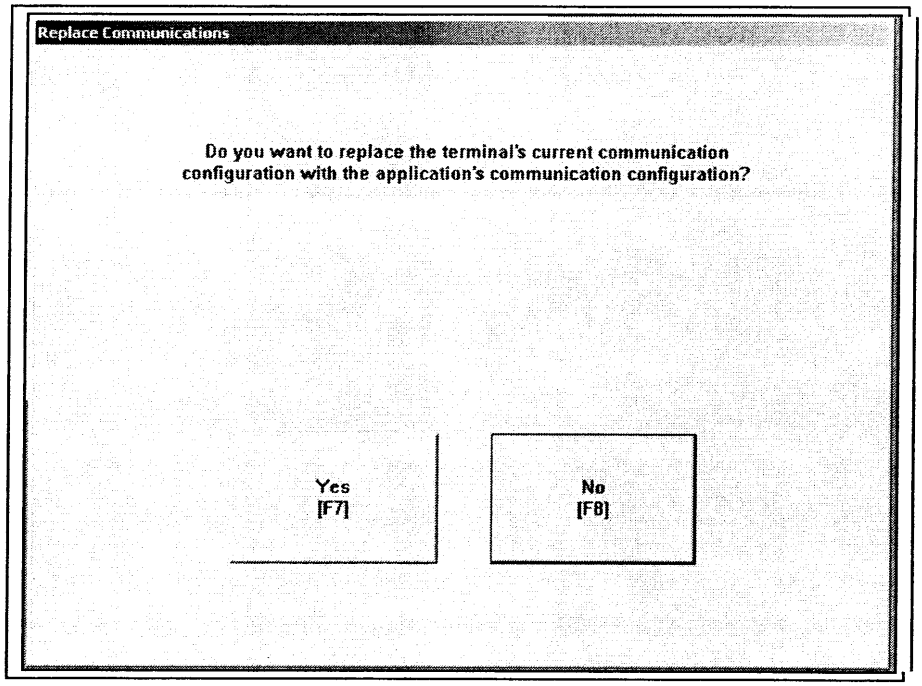
desktop.
2. Click on the Load Application button on the RSView Station pop-up.



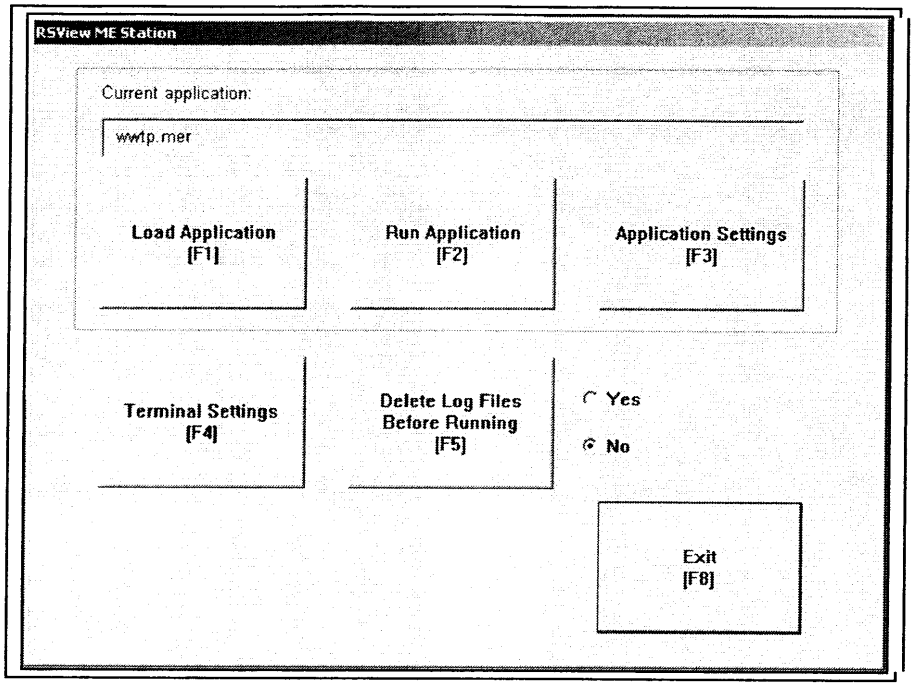
3. Select "wwtp.mer" and click on the Open button.




4. Click on the "Yes" button on the next screen



5. Click on the "load Application" button on the next screen.

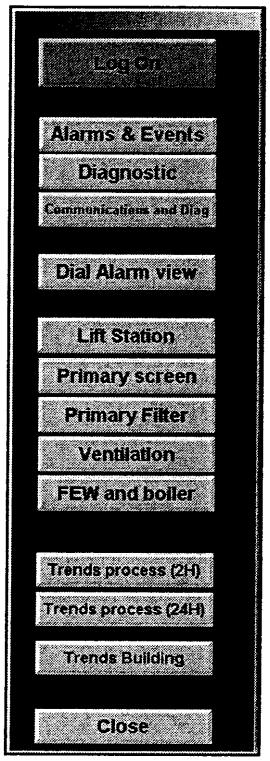



### 6.4.1.2 Navigation

Every screen has two buttons in the top right hand corner, "Previous" and "Menu".

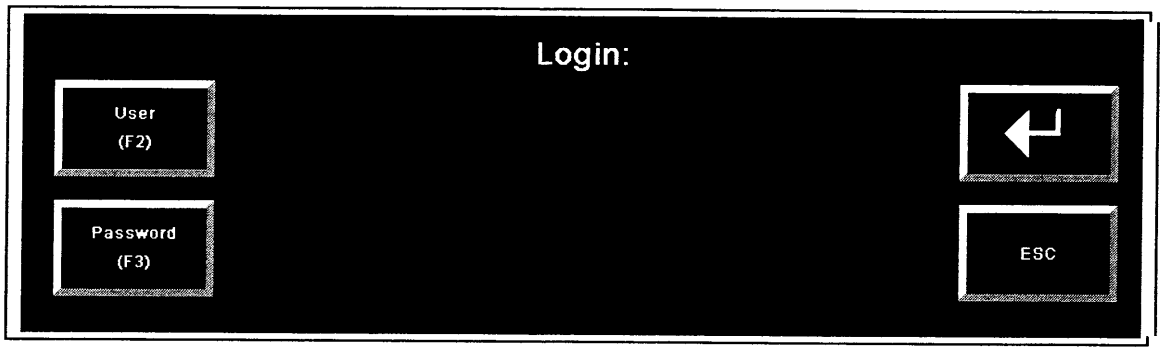
Clicking on "Previous" at any screen will return the display to the previous process screen.

Clicking on "Menu" will display the Navigation Menu on the right hand side of the display. Clicking on a button will either change to the associated screen, or in some instances open a pop-up.



### 6.4.1.3 Log On

RSView will display all equipment status, set points and values without loggin in to the system. However, it will not allow any changes to be performed until logged in. To log in, click on the "Log On" button on the Menu. The following pop-up will appear.




Click on the "User" button and type your user name. Click on the "Password" button and type your password. Click on the "Enter" arrow button to complete the Login.

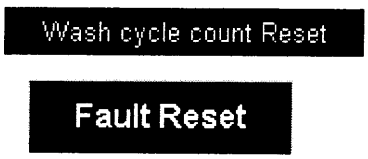
### 6.4.1.4 Controls

Several standard controls are used throughout the screens. These include selector buttons, data entry boxes and sliders.

Selector Buttons

Selector buttons come in three styles, action buttons (e.g. Reset) single action buttons (e.g. manual operation buttons) and multiple selector buttons (e.g. Lead, Lag, Standby).

Action buttons are labelled with the description of the action they will perform. They are momentary and simply perform the action described on the button.

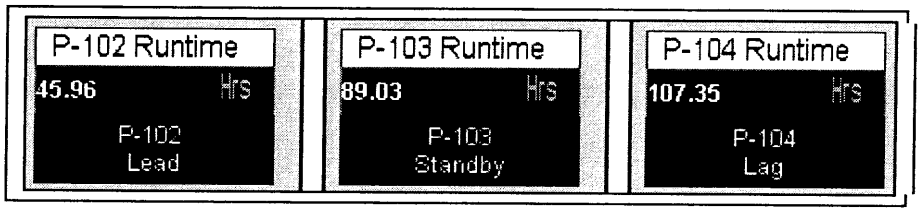


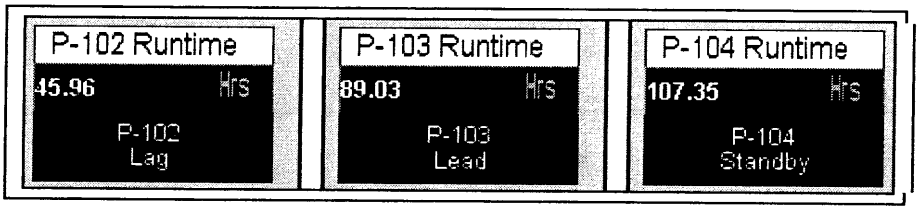
Single selection buttons have two states and must be clicked to change between the two states.

The action that will be performed by clicking the button is used as the button label.

When a button is clicked, the label changes to the opposite action.

Multiple selector buttons are linked buttons that have more than two states (e.g. Lead, Lag Standby buttons). When one of the buttons is clicked, it changes the state of all the linked buttons, to ensure that no state is duplicated.



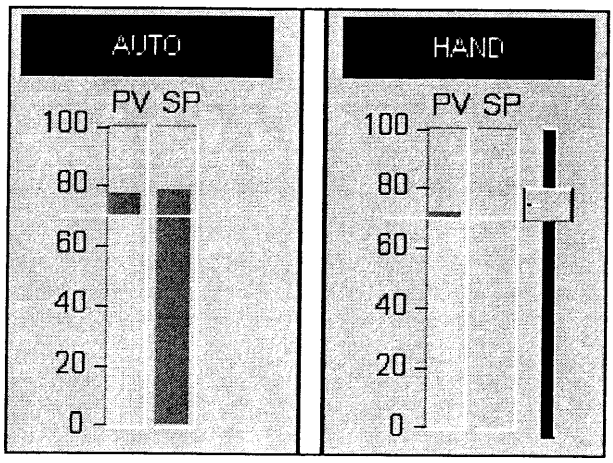




Data Entry Boxes

Data Entry Boxes are composed of DN and UP button with a data field in between. Clicking on the DN or UP button will change the data by one unit in the selected direction. Holding the DN or UP button will increment the data in the selected direction. The rate of change increases with the length of time the button is held down.

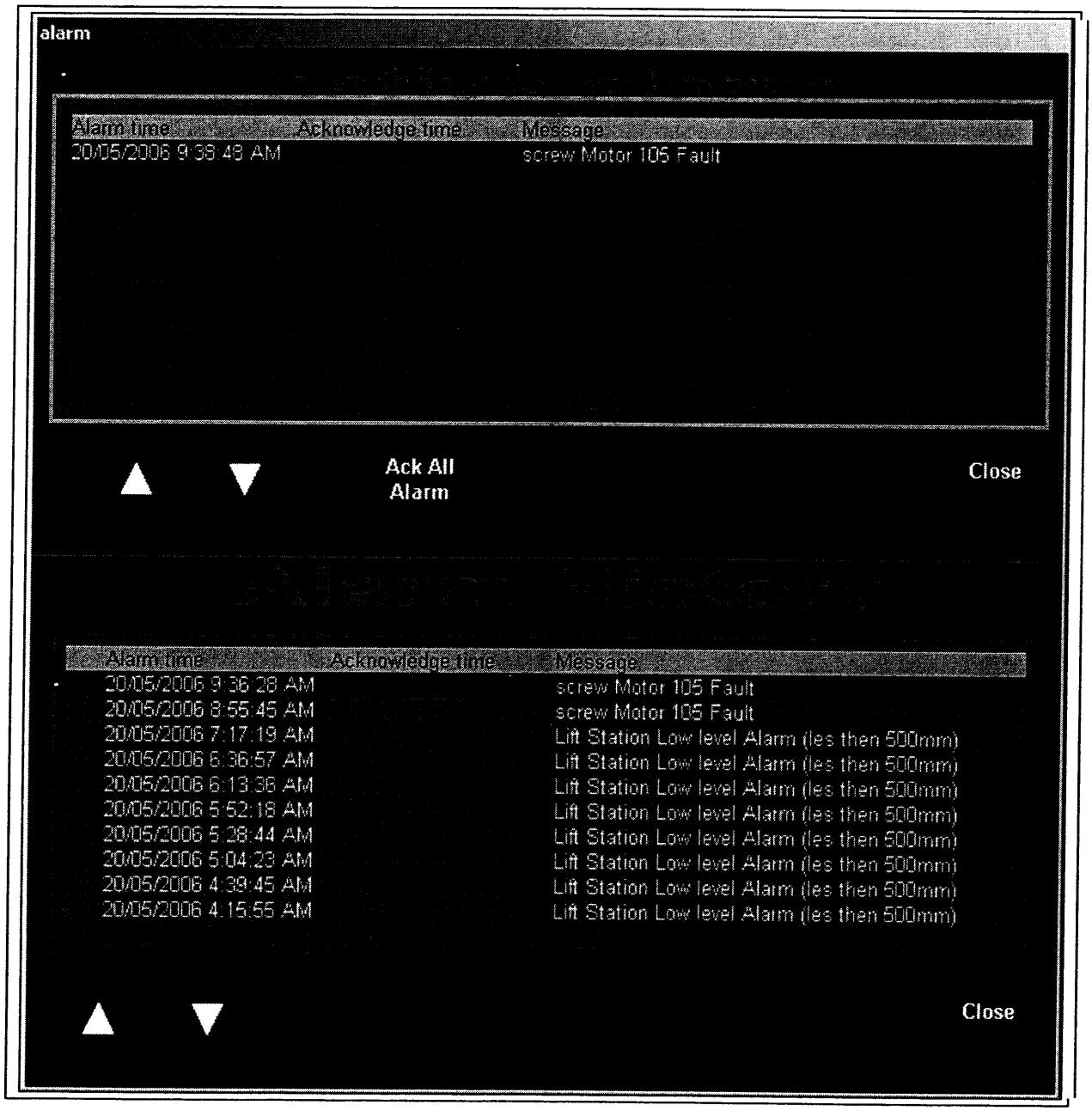
Sliders

Sliders are used to manually set the speed on controllers. In AUTO, they are invisible and unavailable. When a controller is set to HAND, the slider becomes visible and usable.



### 6.4.1.5 Alarms & Events

Alarms are annunciated on the HMI. Clicking on the Alarms & Events button on the Navigation Menu brings up the Alarms pop-up screen. This screen is divied into two sections, with Active Alarms displayed on the upper section and Alarm History displayed on the lower section. Clicking on either section will make it the active window, indicated with a green border.



Active alarms can be acknowledged, but will remain on the Active Alarm section until out of alarm. At this time, they will be transferred to the Alarm History section, whether they have been acknowledged or not.

The time that an alarm is acknowledged is printed with each alarm.

Alarm List

| Process Alarms | HV Alarms |
|---|---|
| Lift station Pump 102 VFD in Fault | FEW Pump #1 Fail |
| Lift station Pump 102 Leak Alarm | FEW Pump #2 Fail |
| Lift station Pump 103 VFD in Fault | FEW Pump #3 Fail |
| Lift station Pump 102 Leak Alarm | Filtered Effluent Water Critical Low level < 300mm |
| Lift station Pump 104 VFD in Fault | Filtered Effluent Water Critical Low Level < 200mm , All Pumps Stop |
| Lift station Pump 102 Leak Alarm | Filtered Effluent Water Critical Low Pressure (FEWPSL-2 - ON > 10 min) |
| Lift Station High Level Alarm (more than 3600mm) | Gas Monitoring Equipment Fail |
| Lift Station Transmitter Failure (LIT101 Fail) | Gas Alarm - AHU to High Speed |
| Lift Station Low Level Alarm (less than 300mm) | AHU EXHAUST FAN FAIL |
| Lift Station Pump Failure (only one remaining) | AHU FREEZE (BELOW 0°C, MORE THEN 5 MIN) |
| Screw Motor 105 Fault | AHU SUPPLY FAN FAIL |
| Screw Motor 106 Fault | HEATING, LOW GLYCOL TEMPERATURE < 30°C |
| Both Screw Fail (Primary Screen) | Trailer Room Low Temperature ( less than 1°c) |
| Primary Screen High Level Alarm (More than 750mm) | |
| Primary Screen Transmitter Failure (LIT 102) | |
| Primary Filter Blower Alarm | |
| Primary Filter Blower Fan Alarm | |
| Primary Filter , Filter Belt Drive VFD Fail | |
| Primary Filter , Auger Drive VFD Fail | |

Alarm handling and troubleshooting are discussed in the Section 6 of the Process & Mechanical O&M Manual

The Alarm Dialler is discussed further in Section 6.3.2 below.

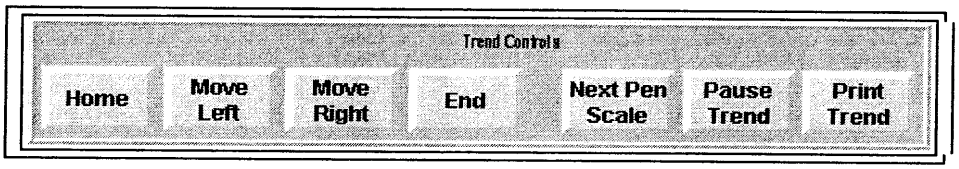
### 6.4.1.6 Trends

Trends are provided for both Process and HV. The process trends are available in both 2 hr and 24 hr spans. The 2 hr trend is useful for seeing short term changes, while the 24 hr trend is useful for evaluating the operation over a longer period.

The HV trend is only available in an 8 hr span.

The Process trend is divided into two trend groups, Levels/Flow and Speeds. The Levels/Flow group logs the Influent Flowrate and the levels in the Influent Wetwell, the Screw Screen Feed Channel, the Filter and the FEW Supply Tank. The Speeds group logs the speeds of the Raw Water Pumps and the Primary Filter Belt Speed.

There is one set of screen controls set in between the two trend groups. It is only active on one trend at a time. Click anywhere on the trend to set it as active. A green "halo" appears around the active trend.




The Home button moves the trend to show the first recorded data.

The Move Left button moves the visible portion of the trend to the left.

Move Right button moves the visible portion of the trend to the right.

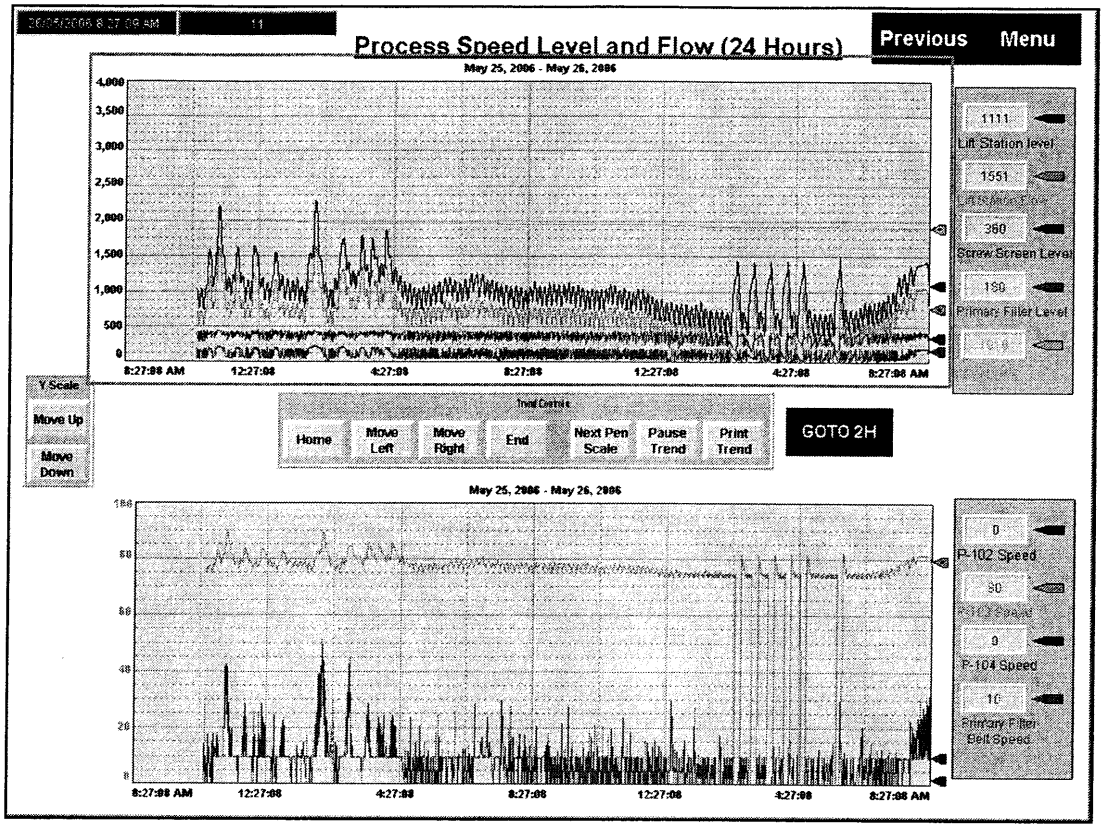
The End button sets the right hand edge of the trend to the present time.

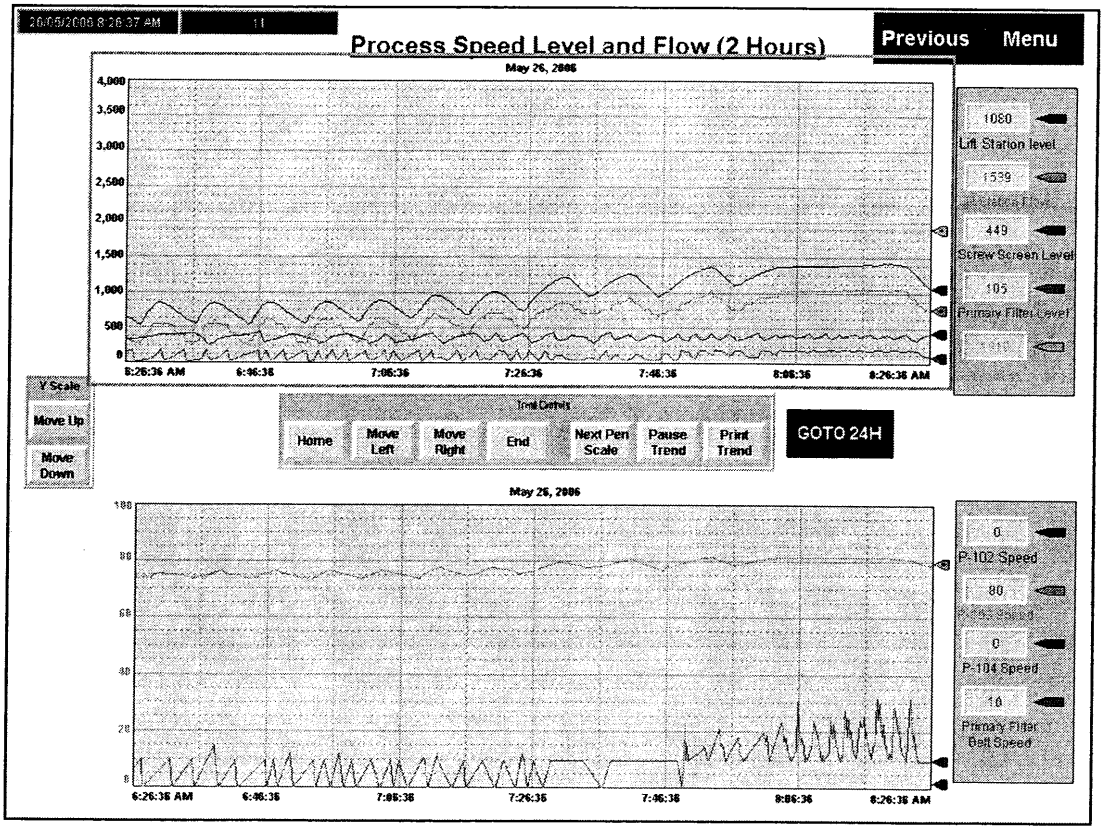
The pen scales are all the same for each trend group, so the Next Pen Scale button is not effective.

The Pause Trend button will cause the trending to halt until released.

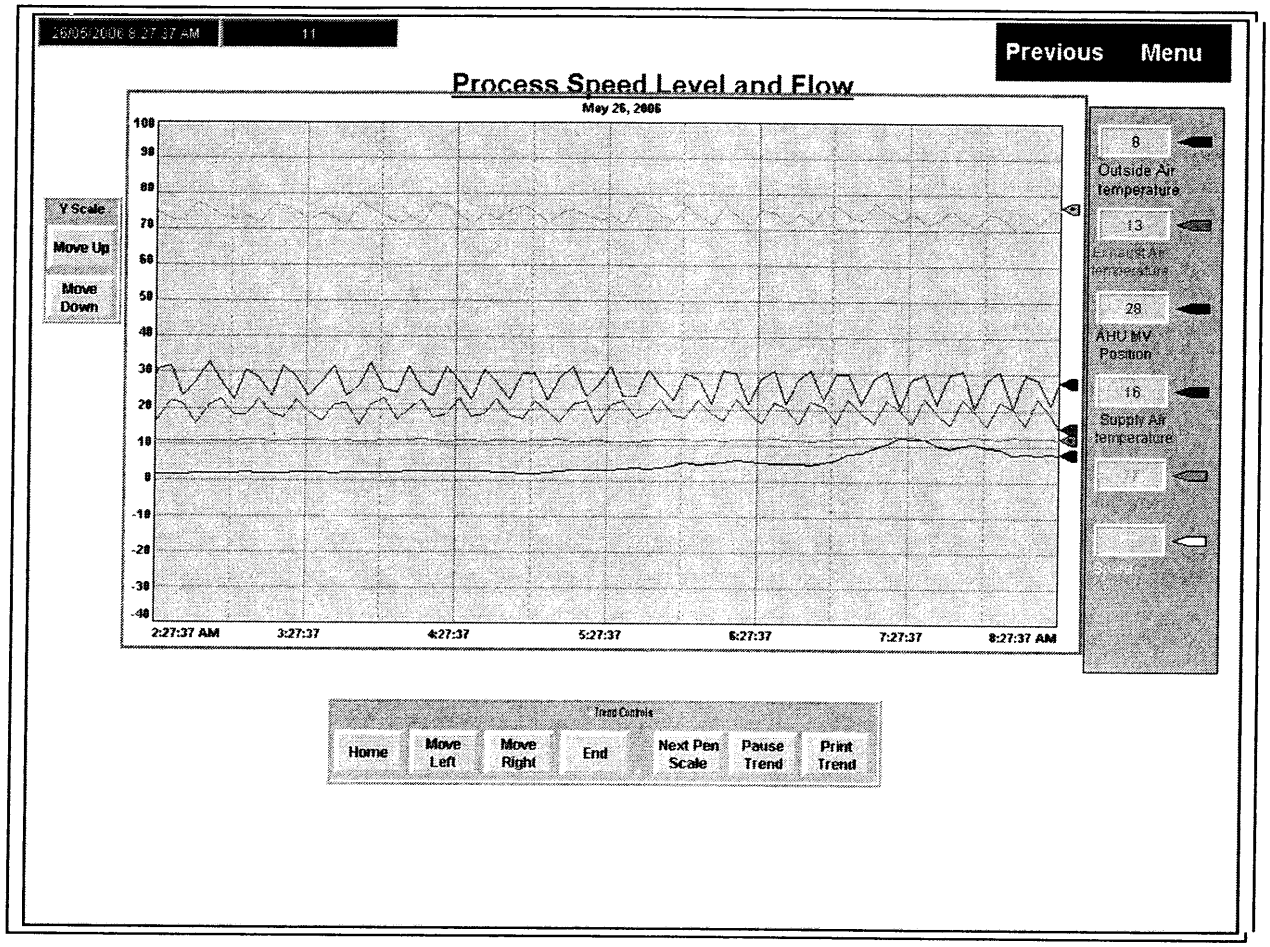
The Print Trend button prints a trend to a PDF file.

The 24 hr trend has a button to switch directly to the 2 hr trend and the 2 hr trend has a button to switch directly to the 24 hr trend.


Process Speed Level and Flow (24 Hours)
Previous
Menu
May 25, 2006 - May 26, 2006
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
8:27:08 AM
12:27:08
4:27:08
8:27:08
12:27:08
4:27:08
8:27:08 AM
1111
Lift Station level
1551
360
Screw Screen Level
190
Primary Filter Level
Y Scale
Move Up
Move Down
Trend Controls
Home
Move Left
Move Right
End
Next Pen Scale
Pause Trend
Print Trend
GOTO 2H
May 25, 2006 - May 26, 2006
100
80
60
40
20
0
8:27:08 AM
12:27:08
4:27:08
8:27:08
12:27:08
4:27:08
8:27:08 AM
0
P-102 Speed
80
0
P-104 Speed
10
Primary Filter Belt Speed

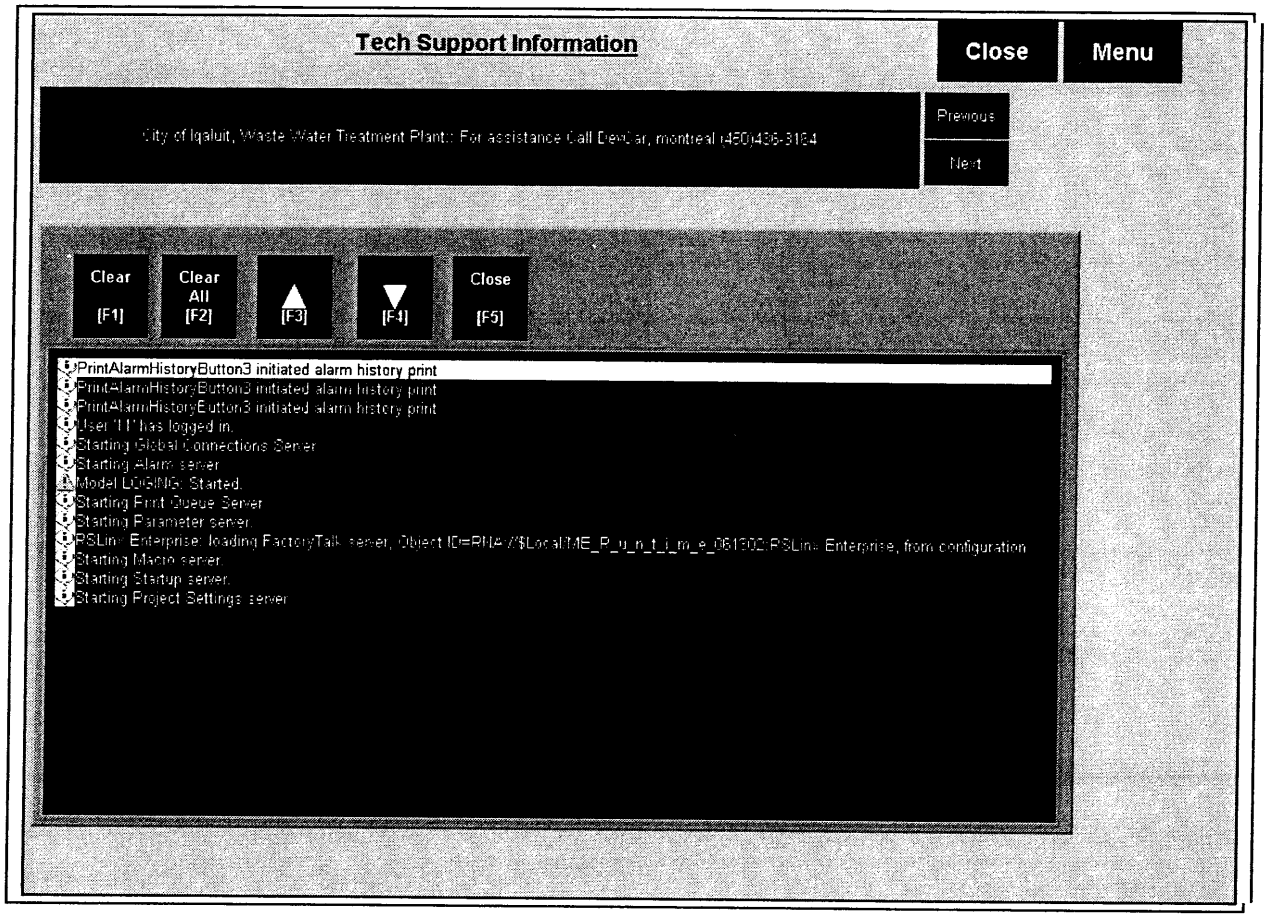

Process Speed Level and Flow (2 Hours)
Previous
Menu
May 26, 2006
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
8:26:36 AM
6:46:36
7:06:36
7:26:36
7:46:36
8:06:36
8:26:36 AM
1080
Lift Station level
1539
449
Screw Screen Level
105
Primary Filter Level
Y Scale
Move Up
Move Down
Trend Controls
Home
Move Left
Move Right
End
Next Pen Scale
Pause Trend
Print Trend
GOTO 24H
May 26, 2006
100
80
60
40
20
0
6:26:36 AM
6:46:36
7:06:36
7:26:36
7:46:36
8:06:36
8:26:36 AM
0
P-102 Speed
80
0
P-104 Speed
10
Primary Filter Belt Speed

The Building Trend has a single trend group. It records Outside Air Temperature, Exhaust Air Temperature, Supply Air Temperature, Glycol temperature and the Modulating Valve Position for AHU-3.



### 6.4.1.7 Diagnostics

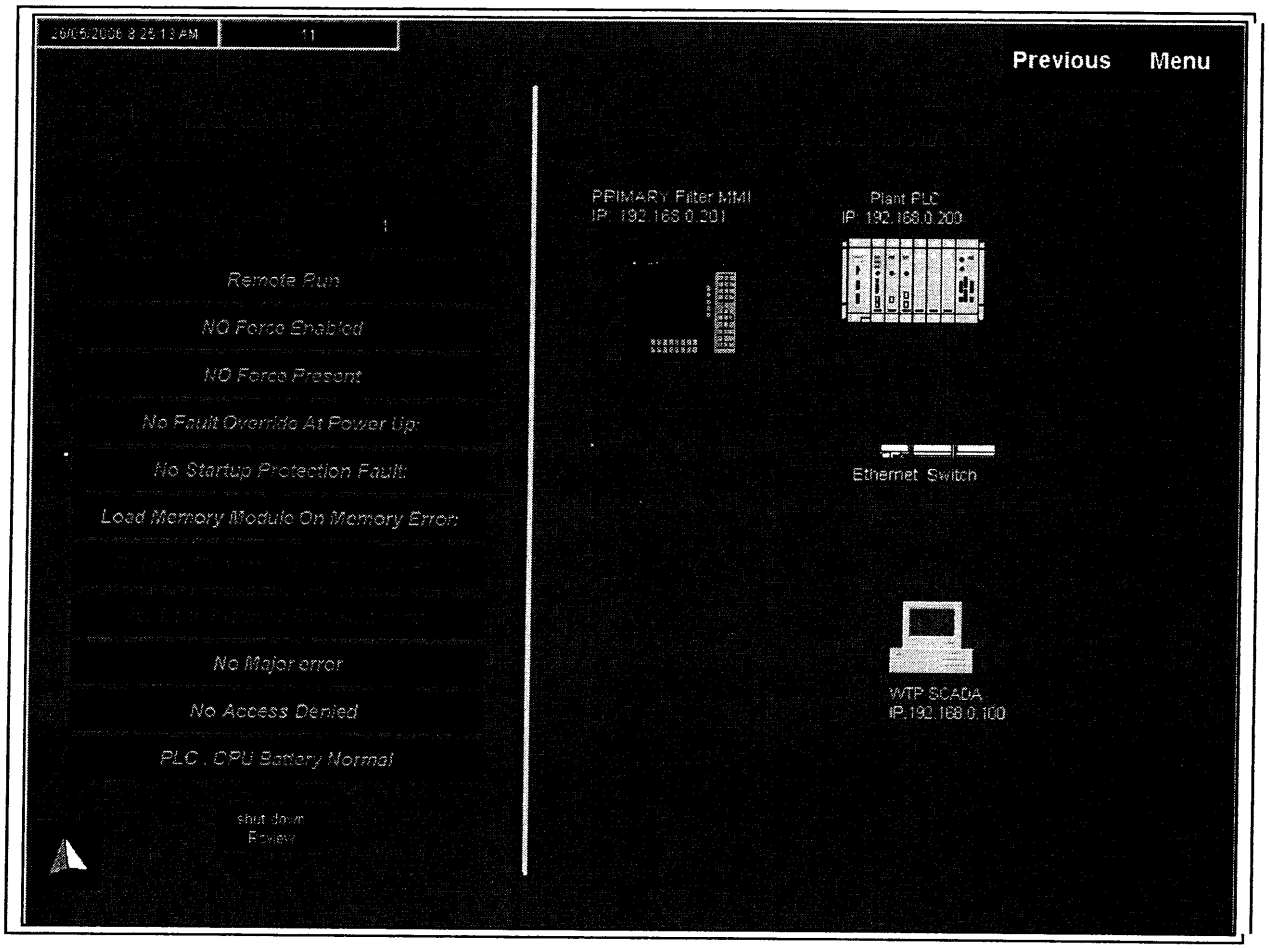
A Diagnostics page has been supplied and is available from the Navigation Menu. It contains contact information for the system programmer. This page logs activities on the system, and is mainly useful to the programmer for diagnosing system problems.



### 6.4.1.8 Communications & Diagnostics

A Communications & Diagnostics page has been supplied and is available from the Navigation Menu. This page contains diagnostic information from the PLC system, and is mainly useful to the programmer for diagnosing system problems.

At the bottom left of the screen is a button that can be used to shut down RSView.



### 6.4.2 Alarm Dialler

An alarm dialler has been provided to call out an operator in case of major alarms in the plant. It is located in the PLC Cabinet in the New Electrical Room.

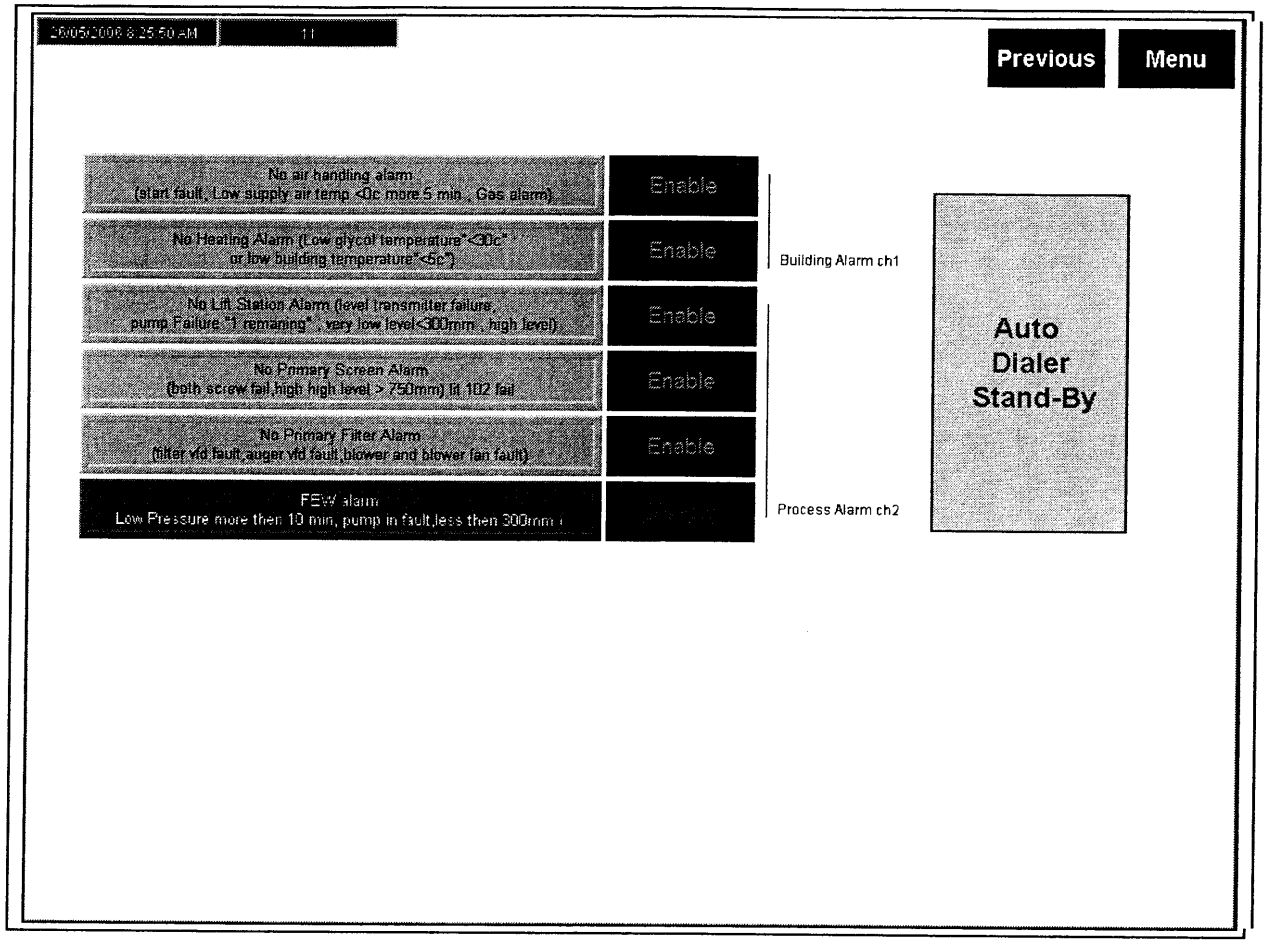
It calls out six distinct alarms, that monitor different areas of the plant. They are described in more detail in Section 6 of the Process and Mechanical O&M Manual.

Each of these six alarms can be separately over-ridden to avoid nuisance alarms in the case of known equipment failure or other unusual situations. However, the over-ride applies to all alarms in the group and should be used very carefully.

The Dialler Screen is accessed from the Navigation Menu. It has a bar for each of the six alarm groups, with and Enable/Disable button beside each. Unlike other two-state buttons, these buttons describe the present state, not the action taken when the button is depressed.

To over-ride an alarm, click on the associated "Enable" button. The alarm will be disabled, the descriptive box will turn red and the button text will change to "Disable", also in red.

The six alarms are grouped in two groups – Building and Process. Each of these groups is called out and identified separately.




**END OF CHAPTER 6**

# Chapter 7

# MAINTENANCE

## 7.1 General Maintenance

### 7.1.1 Uninterruptible Power Supply (UPS)

The PLC system and modem are to be powered by a suitable sized UPS as per the specifications. The UPS contains sealed lead acid batteries. These batteries will require annual inspection, and replacement every 3 to 5 years. Failure to do so will result in diminished or non performance of these power supplies and a resulting loss of control over the process in the event of a power failure. Refer to the UPS system manufacturer's data for testing and battery replacement information.

### 7.1.2 Operation and Maintenance Data

All programming software is to be provided complete with all operation and maintenance manuals as required in specification Section 17101.

All PLC hardware is to be provided complete with all operating and maintenance manuals as required in specification Section 17101.

Provide complete operating and maintenance manuals for the UPS system.

Provide complete operating and maintenance manuals for the modem system.

**END OF CHAPTER 7**

# Chapter 8

# TESTING AND CERTIFICATION DATA

## 8.1 YOKOGAWA FLOW METER FLOWTEST REPORT "AXFA14"

## 8.2 MILLTRONICS PARAMETER FILE "LIT-101 AS-BUILT"

## 8.3 MILLTRONICS PARAMETER FILE "LIT-102 AS-BUILT"

## 8.4 RAW SEWAGE PUMP PARAMETER FILE "AS-BUILT"

**END OF CHAPTER 8**

**Printed :** 08/08/2006 11:09:06 AM
**Comment :** wwtp iqaluit p102-p103-p104 june 27 2006
**Serialnumber :** n/a
**Device :** n/a
**Saved :** 29/06/2006 10:06:13 AM
**Firmware :** 4.44
**Application :** Local/Remote (ASFIFF03_3_3_gen.vcn, ASFIFF03 3.3)
**Parameter file :** C:\@devcar\yfb seware plant 2005\software\p102-103-104 june27-2(

| Index | Text | Value | Unit | Min | Max | ID |
|---|---|---|---|---|---|---|
| P 2.1.1 | Min Frequency | 0.00 | Hz | n/a | n/a | 101 |
| P 2.1.2 | Max Frequency | 60.00 | Hz | n/a | n/a | 102 |
| P 2.1.3 | Accel Time 1 | 15.0 | s | n/a | n/a | 103 |
| P 2.1.4 | Decel Time 1 | 15.0 | s | n/a | n/a | 104 |
| P 2.1.5 | Current Limit | 18.0 | A | n/a | n/a | 107 |
| P 2.1.6 | Motor Nom Voltg | 600 | V | n/a | n/a | 110 |
| P 2.1.7 | Motor Nom Freq | 60.00 | Hz | n/a | n/a | 111 |
| P 2.1.8 | Motor Nom Speed | 1760 | rpm | n/a | n/a | 112 |
| P 2.1.9 | Motor Nom Currnt | 15.0 | A | n/a | n/a | 113 |
| P 2.1.10 | Motor Cos Phi | 0.80 | | n/a | n/a | 120 |
| P 2.1.11 | I/O A Reference | 0 / AI1 | | n/a | n/a | 117 |
| P 2.1.12 | I/O B Reference | 1 / AI2 | | n/a | n/a | 131 |
| P 2.1.13 | Keypad Ctrl Ref | 2 / Keypad Ref. | | n/a | n/a | 121 |
| P 2.1.14 | Fieldbus Ctr Ref | 3 / Fieldbus | | n/a | n/a | 122 |
| P 2.1.15 | Jog Speed Ref | 0.00 | Hz | n/a | n/a | 124 |
| P 2.2.1 | Start/Stop Logic | 0 / Forw - Rev | | n/a | n/a | 300 |
| P 2.2.2 | DIN3 Function | 1 / ExtFaulClose | | n/a | n/a | 301 |
| P 2.2.3 | AI1 Signal Sel | AnIN:A.1 | | n/a | n/a | 377 |
| P 2.2.4 | AI1 Signal Range | 0 / 0-10 V | | n/a | n/a | 320 |
| P 2.2.5 | AI1 Custom Min | 0.00 | % | n/a | n/a | 321 |
| P 2.2.6 | AI1 Custom Max | 100.00 | % | n/a | n/a | 322 |
| P 2.2.7 | AI1 Signal Inv | 0 / No Inversion | | n/a | n/a | 323 |
| P 2.2.8 | AI1 Filter Time | 0.10 | s | n/a | n/a | 324 |
| P 2.2.9 | AI2 Signal Sel | AnIN:A.2 | | n/a | n/a | 388 |
| P 2.2.10 | AI2 Signal Range | 1 / 4-20 mA | | n/a | n/a | 325 |
| P 2.2.11 | AI2 Custom Min | 0.00 | % | n/a | n/a | 326 |
| P 2.2.12 | AI2 Custom Max | 100.00 | % | n/a | n/a | 327 |
| P 2.2.13 | AI2 Signal Inv | 0 / No Inversion | | n/a | n/a | 328 |
| P 2.2.14 | AI2 Filter Time | 0.10 | s | n/a | n/a | 329 |
| P 2.2.15 | Start/Stop Log B | 0 / Forw - Rev | | n/a | n/a | 363 |
| P 2.2.16 | A Ref Scale Min | 0.00 | Hz | n/a | n/a | 303 |
| P 2.2.17 | A Ref Scale Max | 0.00 | Hz | n/a | n/a | 304 |
| P 2.2.18 | B Ref Scale Min | 0.00 | Hz | n/a | n/a | 364 |
| P 2.2.19 | B Ref Scale Max | 0.00 | Hz | n/a | n/a | 365 |
| P 2.2.20 | Free Analog Sign | 0 / Not Used | | n/a | n/a | 361 |
| P 2.2.21 | Free Analog Func | 0 / No Function | | n/a | n/a | 362 |
| P 2.2.22 | MotPot Ramp Time | 10.0 | Hz/s | n/a | n/a | 331 |
| P 2.2.23 | MotPotMemFreqRef | 1 / Res:Stop+P.D | | n/a | n/a | 367 |
| P 2.2.24 | A-B StrtPulseMem | 0 / No | | n/a | n/a | 498 |
| P 2.3.1 | Iout 1 signal | AnOUT:A.1 | | n/a | n/a | 464 |
| P 2.3.2 | Iout Content | 1 / O/P Freq | | n/a | n/a | 307 |
| P 2.3.3 | Iout Filter Time | 1.00 | s | n/a | n/a | 308 |
| P 2.3.4 | Iout Invert | 0 / No Inversion | | n/a | n/a | 309 |
| P 2.3.5 | Iout Minimum | 1 / 4 mA | | n/a | n/a | 310 |
| P 2.3.6 | Iout Scale | 100 | % | n/a | n/a | 311 |
| P 2.3.7 | DO1 Content | 1 / Ready | | n/a | n/a | 312 |
| P 2.3.8 | RO1 Content | 2 / Run | | n/a | n/a | 313 |
| P 2.3.9 | RO2 Content | 4 / FaultInvert | | n/a | n/a | 314 |
| P 2.3.10 | Freq Supv Lim 1 | 0 / No | | n/a | n/a | 315 |
| P 2.3.11 | Freq Supv Val 1 | 0.00 | Hz | n/a | n/a | 316 |
| P 2.3.12 | Freq Supv Lim 2 | 0 / No | | n/a | n/a | 346 |
| P 2.3.13 | Freq Supv Val2 | 0.00 | Hz | n/a | n/a | 347 |
| P 2.3.14 | Torque Supv Lim | 2 / High Limit | | n/a | n/a | 348 |
| P 2.3.15 | Torque Supv Val | 200.0 | % | n/a | n/a | 349 |
| P 2.3.16 | Ref Superv Lim | 0 / No | | n/a | n/a | 350 |
| P 2.3.17 | Ref Superv Value | 0.0 | % | n/a | n/a | 351 |
| P 2.3.18 | Ext Brake OffDel | 0.5 | s | n/a | n/a | 352 |
| P 2.3.19 | Ext Brake OnDel | 1.5 | s | n/a | n/a | 353 |
| P 2.3.20 | Temp Limit Supv | 2 / High Limit | | n/a | n/a | 354 |

| Index | Text | Value | Unit | Min | Max | ID |
|---|---|---|---|---|---|---|
| P 2.3.21 | Temp Supv Value | 75 | °C | n/a | n/a | 355 |
| P 2.3.22 | Iout 2 Signal | AnOUT:0.2 | | n/a | n/a | 471 |
| P 2.3.23 | Iout 2 Content | 4 / O/P Current | | n/a | n/a | 472 |
| P 2.3.24 | Iout 2 Filter T | 1.00 | s | n/a | n/a | 473 |
| P 2.3.25 | Iout 2 Invert | 0 / No Inversion | | n/a | n/a | 474 |
| P 2.3.26 | Iout 2 Minimum | 0 / 0 mA | | n/a | n/a | 475 |
| P 2.3.27 | Iout 2 Scale | 100 | % | n/a | n/a | 476 |
| P 2.4.1 | Ramp 1 Shape | 0.1 | s | n/a | n/a | 500 |
| P 2.4.2 | Ramp 2 Shape | 0.0 | s | n/a | n/a | 501 |
| P 2.4.3 | Accel Time 2 | 10.0 | s | n/a | n/a | 502 |
| P 2.4.4 | Decel Time 2 | 10.0 | s | n/a | n/a | 503 |
| P 2.4.5 | Brake Chopper | 0 / Not Used | | n/a | n/a | 504 |
| P 2.4.6 | Start Function | 0 / Ramping | | n/a | n/a | 505 |
| P 2.4.7 | Stop Function | 0 / Coasting | | n/a | n/a | 506 |
| P 2.4.8 | DC-Brake Current | 18.0 | A | n/a | n/a | 507 |
| P 2.4.9 | Stop DC-BrakeTm | 0.00 | s | n/a | n/a | 508 |
| P 2.4.10 | Stop DC-BrakeFr | 1.50 | Hz | n/a | n/a | 515 |
| P 2.4.11 | Start DC-BrakeTm | 0.00 | s | n/a | n/a | 516 |
| P 2.4.12 | Flux Brake | 0 / Off | | n/a | n/a | 520 |
| P 2.4.13 | FluxBrakeCurrent | 18.0 | A | n/a | n/a | 519 |
| P 2.5.1 | Range 1 Low Lim | 0.00 | Hz | n/a | n/a | 509 |
| P 2.5.2 | Range 1 High Lim | 0.00 | Hz | n/a | n/a | 510 |
| P 2.5.3 | Range 2 Low Lim | 0.00 | Hz | n/a | n/a | 511 |
| P 2.5.4 | Range 2 High Lim | 0.00 | Hz | n/a | n/a | 512 |
| P 2.5.5 | Range 3 Low Lim | 0.00 | Hz | n/a | n/a | 513 |
| P 2.5.6 | Range 3 High Lim | 0.00 | Hz | n/a | n/a | 514 |
| P 2.5.7 | PH Acc/Dec Ramp | 1.0 | x | n/a | n/a | 518 |
| P 2.6.1 | Motor Ctrl Mode | 0 / Freq Control | | n/a | n/a | 600 |
| P 2.6.2 | U/f Optimization | 0 / None | | n/a | n/a | 109 |
| P 2.6.3 | U/f Ratio Select | 0 / Linear | | n/a | n/a | 108 |
| P 2.6.4 | Field WeakngPnt | 60.00 | Hz | n/a | n/a | 602 |
| P 2.6.5 | Voltage at FWP | 100.00 | % | n/a | n/a | 603 |
| P 2.6.6 | U/f Mid Freq | 50.00 | Hz | n/a | n/a | 604 |
| P 2.6.7 | U/f Mid Voltg | 100.00 | % | n/a | n/a | 605 |
| P 2.6.8 | Zero Freq Voltg | 1.50 | % | n/a | n/a | 606 |
| P 2.6.9 | Switching Freq | 1.5 | kHz | n/a | n/a | 601 |
| P 2.6.10 | Overvolt Contr | 1 / On:NoRamping | | n/a | n/a | 607 |
| P 2.6.11 | Undervolt Contr | 1 / Yes | | n/a | n/a | 608 |
| P 2.6.12 | LoadDrooping | 0.00 | % | n/a | n/a | 620 |
| P 2.6.13 | Identification | 0 / No Action | | n/a | n/a | 631 |
| P 2.6.14.1 | MagnCurrent | 0.0 | A | n/a | n/a | 612 |
| P 2.6.14.2 | Speed Control Kp | 30 | | n/a | n/a | 613 |
| P 2.6.14.3 | Speed Control Ti | 30.0 | ms | n/a | n/a | 614 |
| P 2.6.14.4 | Reserved | 0 | x | n/a | n/a | |
| P 2.6.14.5 | Accel.Compens. | 0.00 | s | n/a | n/a | 626 |
| P 2.6.14.6 | Slip Adjust | 100 | % | n/a | n/a | 619 |
| P 2.6.14.7 | Start Magn Curr | 18.0 | A | n/a | n/a | 627 |
| P 2.6.14.8 | Start Magn Time | 0.00 | s | n/a | n/a | 628 |
| P 2.6.14.9 | Start 0SpeedTime | 100 | ms | n/a | n/a | 615 |
| P 2.6.14.10 | Stop 0 SpeedTime | 100 | ms | n/a | n/a | 616 |
| P 2.6.14.11 | StartUp Torque | 0 / Not Used | | n/a | n/a | 621 |
| P 2.6.14.12 | StartupTorq FWD | 0.0 | % | n/a | n/a | 633 |
| P 2.6.14.13 | StartupTorq REV | 0.0 | % | n/a | n/a | 634 |
| P 2.6.14.14 | Reserved | 0 | x | n/a | n/a | |
| P 2.6.14.15 | Encoder1FiltTime | 0 | ms | n/a | n/a | 618 |
| P 2.6.14.16 | Reserved | 0 | x | n/a | n/a | |
| P 2.6.14.17 | CurrentControlKp | 40.00 | % | n/a | n/a | 617 |
| P 2.6.14.18 | Reserved | 0 | x | n/a | n/a | |
| P 2.6.15.1 | 0 Speed Current | 120.0 | % | n/a | n/a | 625 |
| P 2.6.15.2 | M5 Min Curr Ref | 80.0 | % | n/a | n/a | 622 |
| P 2.6.15.3 | Flux Reference | 80.0 | % | n/a | n/a | 623 |
| P 2.6.15.4 | M5 Freq 3 | 20.0 | % | n/a | n/a | 635 |
| P 2.6.15.5 | U/f Boost | 4.00 | % | n/a | n/a | 632 |
| P 2.6.16.1 | Speed Step | 0.0 | % | n/a | n/a | 1252 |
| P 2.6.16.2 | Reserved | 10.0 | % | n/a | n/a | 1355 |
| P 2.6.16.3 | Reserved | 20.0 | % | n/a | n/a | 1356 |
| P 2.6.16.4 | Reserved | 30.0 | % | n/a | n/a | 1357 |
| P 2.6.16.5 | Reserved | 40.0 | % | n/a | n/a | 1358 |
| P 2.6.16.6 | Reserved | 50.0 | % | n/a | n/a | 1359 |
| P 2.6.16.7 | Reserved | 60.0 | % | n/a | n/a | 1360 |

| Index | Text | Value | Unit | Min | Max | ID |
|---|---|---|---|---|---|---|
| P 2.6.16.8 | Reserved | 70.0 | % | n/a | n/a | 1361 |
| P 2.6.16.9 | Reserved | 80.0 | % | n/a | n/a | 1362 |
| P 2.6.16.10 | Reserved | 90.0 | % | n/a | n/a | 1363 |
| P 2.6.16.11 | Reserved | 100.0 | % | n/a | n/a | 1364 |
| P 2.6.16.12 | Reserved | 110.0 | % | n/a | n/a | 1365 |
| P 2.6.16.13 | Reserved | 120.0 | % | n/a | n/a | 1366 |
| P 2.6.16.14 | Reserved | 130.0 | % | n/a | n/a | 1367 |
| P 2.6.16.15 | Reserved | 140.0 | % | n/a | n/a | 1368 |
| P 2.6.16.16 | Reserved | 150.0 | % | n/a | n/a | 1369 |
| P 2.6.16.17 | Reserved | 200 | | n/a | n/a | 660 |
| P 2.6.16.18 | Reserved | 201 | | n/a | n/a | 661 |
| P 2.6.16.19 | Reserved | 90 | | n/a | n/a | 662 |
| P 2.6.16.20 | Reserved | 140 | | n/a | n/a | 663 |
| P 2.6.16.21 | Reserved | 0 | | n/a | n/a | 664 |
| P 2.6.16.22 | Reserved | 0 | | n/a | n/a | 665 |
| P 2.6.16.23 | Reserved | 100 | | n/a | n/a | 667 |
| P 2.6.16.24 | Reserved | 0 | | n/a | n/a | 668 |
| P 2.6.16.25 | Reserved | 0 | | n/a | n/a | 669 |
| P 2.6.16.26 | Reserved | 0 | | n/a | n/a | 670 |
| P 2.7.1 | 4mA Input Fault | 0 / No Action | | n/a | n/a | 700 |
| P 2.7.2 | 4mA Fault Freq. | 0.00 | Hz | n/a | n/a | 728 |
| P 2.7.3 | External Fault | 1 / Warning | | n/a | n/a | 701 |
| P 2.7.4 | Input Ph. Superv | 1 / Warning | | n/a | n/a | 730 |
| P 2.7.5 | UVolt Fault Resp | 0 / Fault Stored | | n/a | n/a | 727 |
| P 2.7.6 | OutputPh. Superv | 2 / Fault | | n/a | n/a | 702 |
| P 2.7.7 | Earth Fault | 2 / Fault | | n/a | n/a | 703 |
| P 2.7.8 | Motor Therm Prot | 2 / Fault | | n/a | n/a | 704 |
| P 2.7.9 | MotAmbTempFactor | 0.0 | % | n/a | n/a | 705 |
| P 2.7.10 | MTP f0 Current | 40.0 | % | n/a | n/a | 706 |
| P 2.7.11 | MTP Motor T | 35 | min | n/a | n/a | 707 |
| P 2.7.12 | Motor Duty Cycle | 100 | % | n/a | n/a | 708 |
| P 2.7.13 | Stall Protection | 0 / No Action | | n/a | n/a | 709 |
| P 2.7.14 | Stall Current | 22.0 | A | n/a | n/a | 710 |
| P 2.7.15 | Stall Time Lim | 15.00 | s | n/a | n/a | 711 |
| P 2.7.16 | Stall Freq Lim | 25.00 | Hz | n/a | n/a | 712 |
| P 2.7.17 | Underload Protec | 2 / Fault | | n/a | n/a | 713 |
| P 2.7.18 | UP fnom Torque | 10.0 | % | n/a | n/a | 714 |
| P 2.7.19 | UP f0 Torque | 5.0 | % | n/a | n/a | 715 |
| P 2.7.20 | UP Time Limit | 2.00 | s | n/a | n/a | 716 |
| P 2.7.21 | ThermistorF.Resp | 1 / Warning | | n/a | n/a | 732 |
| P 2.7.22 | FBComm.FaultResp | 1 / Warning | | n/a | n/a | 733 |
| P 2.7.23 | SlotComFaultResp | 1 / Warning | | n/a | n/a | 734 |
| P 2.8.1 | Wait Time | 0.50 | s | n/a | n/a | 717 |
| P 2.8.2 | Trial Time | 30.00 | s | n/a | n/a | 718 |
| P 2.8.3 | Start Function | 0 / Ramping | | n/a | n/a | 719 |
| P 2.8.4 | Undervolt. Tries | 0 | x | n/a | n/a | 720 |
| P 2.8.5 | Overvolt. Tries | 0 | x | n/a | n/a | 721 |
| P 2.8.6 | Overcurr. Tries | 0 | x | n/a | n/a | 722 |
| P 2.8.7 | 4mA Fault Tries | 1 | x | n/a | n/a | 723 |
| P 2.8.8 | MotTempF Tries | 1 | x | n/a | n/a | 726 |
| P 2.8.9 | Ext.Fault Tries | 1 | x | n/a | n/a | 725 |
| P 2.8.10 | Underload tries | 1 | | n/a | n/a | 738 |
| P 3.1 | Control Place | 1 / I/O Terminal | | n/a | n/a | 125 |
| P 3.3 | Keypad Direction | 0 / Forward | | n/a | n/a | 123 |
| P 3.4 | StopButtonActive | 0 / No | | n/a | n/a | 114 |
| P 6.3.4 | Autom. BackUp | 0 / Yes | | n/a | n/a | 820 |
| P 6.5.2 | Parameter Lock | 0 / ChangeEnable | | n/a | n/a | 819 |
| P 6.5.3 | Startup wizard | 0 / No | | n/a | n/a | 823 |
| P 6.5.4 | Multimon. items | 0 / ChangeEnable | | n/a | n/a | 822 |
| P 6.6.1 | Default page | 0. | | n/a | n/a | |
| P 6.6.2 | Default page/OM | 1 | | n/a | n/a | |
| P 6.6.3 | Timeout time | 60 | s | n/a | n/a | 804 |
| P 6.6.4 | Contrast | 18 | | n/a | n/a | 805 |
| P 6.6.5 | Backlight time | 10 | min | n/a | n/a | 818 |
| P 6.7.1 | InternBrakeRes | 0 / Not conn. | | n/a | n/a | 821 |
| P 6.7.2 | Fan control | 0 / Continuous | | n/a | n/a | 825 |
| P 6.7.3 | HMI ACK timeout | 200 | ms | n/a | n/a | 823 |
| P 6.7.4 | HMI retry | 5 | | n/a | n/a | 824 |
| P 7.1.1.1 | AI1 mode | 3 / 0...10V | | n/a | n/a | |
| P 7.1.1.2 | AI2 mode | 2 / 4...20mA | | n/a | n/a | |

| Index | Text | Value | Unit | Min | Max | ID |
|---|---|---|---|---|---|---|
| P 7.1.1.3 | AO1 mode | 2 / 4...20mA | | n/a | n/a | |

Waste water project Iqaluit

Derivation starter and motors

Earth Tech
Project # 75360

date _____

Derivation NO: AHU-3-EF
Pannel: MCC-2
Tag # AHU-3-EF

/ checked out OK
N/A Not Applicable
() Futher Action

| | | phase: | A | B | C |
|---|---|---|---|---|---|
| cable ident # | PC-AHU-3-EF | cable resistance at 1000v M-ohms | ∞ | ∞ | ∞ |
| cable type | 6c # 12 teck | | | | |
| breaker or fuse capacity amps | 15A 4.15 | thermal unit#-LOW | B 4.15 | | |
| | | O.L. currente - LOW | 1.15 | 1.84 | 1.97 |
| Starter data: | | O.L. current-High | 1.86 | 1.86 | 1.86 |
| DWG #E2050729 | 0-001-01 | thermal unit # - High | B 9.1 | | |
| | | sequence test | | | |
| | | Low | | | |
| | | High | | | |
| | | Stop | | | |
| | | Job | | | |
| | | | | | |

| motor description | | All reading to be thrue rms | | | |
|---|---|---|---|---|---|
| UL - Listed | Rating - 40 C | Volts | 575V | 575V | 575V |
| No-BV64203389 | AMB - cont | number of phase | | | |
| Ser #F0509090 7 | | nominal current at voltage LOW | 2,5A | 2,5A | 2,5A |
| Cat. No. - 75C PISE | | megger test 1000V | | | |
| HP - 5 - 1,3 | | supply volts no load | | | |
| T. code - T2C | | motor current as tested Low | | | |
| R.P.M. - 1750 / 870 | | Nominal current-High | 5,6A | 5,6A | 5,6A |
| Hz - 60 ; Ser. F - 1,00 | | motor current as | | | |
| Frame - 184T | | - tested High | | | |

Remarks:

Waste water project Iqaluit

Derivation starter and motors

Earth Tech
Project # 75360

date _____

Derivation NO: AHU-3-SF
Pannel: MCC-2
Tag # AHU-3-SF

/ checked out OK
N/A Not Applicable
() Futher Action

| | | phase: | A | B | C |
|---|---|---|---|---|---|
| cable ident # | PC-AHU-3-SF | cable resistance at 1000v M-ohms | ∞ | ∞ | ∞ |
| cable type | 6c #12 teck | | | | |
| breaker or fuse capacity amps | 30A 4.15 | thermal unit#-LOW | 4.15 | 4.15 | 4.15 |
| | | O.L. currente-LOW | 1.88 | 1.83 | 1.95 |
| Starter data: | | O.L. current-High | 4.50 | 4.50 | 4.50 |
| DWG #E2050729 | 0-001-01 | thermal unit #-High | 9.1 | 9.1 | 9.1 |
| | | sequence test | | | |
| | | Low | | | |
| | | High | | | |
| | | stop | | | |
| | | Job | | | |
| | | | | | |

| motor description | | All reading to be thrue rms | | | |
|---|---|---|---|---|---|
| UL-listed | Rating-40C | Volts | 575V | 575V | 575V |
| No-BV642032 | AMB-cont | number of phase | | | |
| Ser#F0509090794 | | nominal current at voltage LOW | 2,5A | 2,5A | 2,5A |
| Cat.No-75C PISE | | megger test 1000V | | | |
| HP-5-1,3 | | supply volts no load | | | |
| T. code-T2C | | motor current as tested Low | | | |
| R.P.M.-1750/870 | | Nominal current-High | 5,6A | 5,6A | 5,6A |
| Hz-60 ; Ser.F-1,00 | | Motor current as - tested High | | | |
| Frame-184T | | | | | |

Remarks:

Waste water project Iqaluit

Derivation starter and motors

Earth Tech
Project # 75360

date NOV 18. 2005

Derivation NO: SSCR-105
Pannel: MCC-2
Tag # SSCR-105

/ checked out OK
N/A Not Applicable
() Futher Action

| | | phase: | A | B | C |
|---|---|---|---|---|---|
| cable ident # | PC-SSCR-105 | cable resistance at 1000v M-ohms To ground | ∞ | ∞ | ∞ |
| cable type | 3 # 10 teck | PHASE TO PHase | ∞ | ∞ | ∞ |
| breaker or fuse capacity amps | 7A | | | | |
| | | | | | |
| Starter data: | | | | | |
| Reversing starter | | O.L. current | 2.60A | 2.60A | 2.60A |
| | | thermal unit # | B3,70 | B3,70 | B3,70 |
| | | sequence test | | | |
| | | Forward V | | | |
| | | Reverse V | | | |
| | | stop V | | | |
| | | Job V | | | |
| | | | | | |

| motor description | | All reading to be thrue rms | | | |
|---|---|---|---|---|---|
| S/N-80.15.25264.9/2 | P.F- 0,78 | Volts | 575V | 575V | 575V |
| Type-EAF-77-DFT9 | LA Mtg-B5 TBO | number of phase 3 | | | |
| V- 330/575 | Wiring DT-13 | nominal current at voltage | 2,4A | 2,4A | 2,4A |
| A- 4,18 / 2,4 | 40°C Amb; Rise-105°C | megger test 1000V | ∞ | ∞ | ∞ |
| H.P. - 2.00 | Class II Division II E & G | supply volts no load Ø-N | 349V | 354V | 363V |
| PRM- 1720 | | motor current as tested | 1,37A | 1,32A | 1,4A |
| Duty-cont | Class I Division II C & D | | | | |
| 60Hz | | | | | |
| INS CT-F | T.E.F.C. 3 Ph | | | | |

Remarks:

Waste water project Iqaluit

Derivation starter and motors

Earth Tech
Project # 75360

date NOV 18. 2005

Derivation NO: SSCR-106
Pannel: MCC-2
Tag # SSCR-106

/ checked out OK
N/A Not Applicable
() Futher Action

| | | phase: | A | B | C |
|---|---|---|---|---|---|
| cable ident # | PC-SSCR-106 | cable resistance at 1000v M-ohms To ground | ∞ | ∞ | ∞ |
| cable type | 3 # 10 teck | PHASE TO PHase | ∞ | ∞ | ∞ |
| breaker or fuse capacity amps | 7A | | | | |
| | | | | | |
| Starter data: | | O.L. current | 2.60A | 2.60A | 2.60A |
| Reversing starter | | thermal unit # | B3,70 | B3,70 | B3,70 |
| | | sequence test | | | |
| | | Forward V | | | |
| | | Reverse V | | | |
| | | stop V | | | |
| | | Jog V | | | |
| | | | | | |

| motor description | | All reading to be thrue rms | | | |
|---|---|---|---|---|---|
| S/N-80.15.25264.9/2 | P.F-0,78 | Volts | 575V | 575V | 575V |
| Type-FAF-77-DFT9DLA | Mtg-B5 TBO | number of phase 3 | | | |
| V-330/575 | Wiring DT-13 | nominal current at voltage | 2,4A | 2,4A | 2,4A |
| A-4,18/2,4 | 40°C Amb; Rise-105°C | megger test 1000V | ∞ | ∞ | ∞ |
| H.P.-2.00 | Class II-Division II | supply volts no load Ø-N | 349V | 354V | 363V |
| PRM-1720 | F & G | motor current as tested | 1,5A | 1,3A | 1,45A |
| Duty-cont | Class I Division II | | | | |
| 60Hz | C & D | | | | |
| INS CI-F | T.E.F.C. 3 Ph | | | | |

Remarks:

Waste water project Iqaluit

Derivation starter and motors

Earth Tech
Project # 75360

date _____

Derivation NO: P-102
Pannel: MMC-2
Tag # P-102

/ checked out OK
N/A Not Applicable
() Futher Action

| | | phase: | A | B | C |
|---|---|---|---|---|---|
| cable ident # | PC-P-102 | cable resistance at 1000v M-ohms | ∞ | ∞ | ∞ |
| cable type | 3 # 10 teck VSD | | | | |
| breaker or fuse capacity amps | 30A | | | | |
| | | | | | |
| Starter data: | | | | | |
| | | thermal unit # | | | |
| | | sequence test | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| motor description | | All reading to be thrue rms | | | |
|---|---|---|---|---|---|
| Ser. No. 3153.181 - | SD560258 | Volts | 600V | 600V | 600V |
| 3~ 60 Hz | | number of phase 3 | | | |
| 11,2 kW - 15 HP | | nominal current at voltage | 15A | 15A | 15A |
| 1760 RPM S1 | | megger test 1000V | | | |
| Max 40°C | | supply volts no load | | | |
| COS φ - 0.80 | | motor current as tested | | | |
| | | | | | |
| FLYGT | | | | | |
| Class I DIV II - | Groups A,B,C,D | | | | |

Remarks:

Waste water project Iqaluit

Derivation starter and motors

Earth Tech
Project # 75360

date _____

Derivation NO: P-103
Pannel: MMC-2
Tag # P-103

/ checked out OK
N/A Not Applicable
() Futher Action

| | | phase: | A | B | C |
|---|---|---|---|---|---|
| cable ident # | PC-P-103 | cable resistance at 1000v M-ohms | ∞ | ∞ | ∞ |
| cable type | 3 # 10 teck VSD | | | | |
| breaker or fuse capacity amps | 30A | | | | |
| | | | | | |
| Starter data: | | | | | |
| | | thermal unit # | | | |
| | | sequence test | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| motor description | | All reading to be thrue rms | | | |
|---|---|---|---|---|---|
| Ser No 3153.181 - | SD560259 | Volts | 600V | 600V | 600V |
| 3~ 60 Hz | | number of phase 3 | | | |
| 11,2 kW - 15 HP | | nominal current at voltage | 15A | 15A | 15A |
| 1760 RPM S1 | | megger test 1000V | | | |
| Max 40°C | | supply volts no load | | | |
| COS φ - 0,80 | | motor current as tested | | | |
| | | | | | |
| FLYGT | | | | | |
| Class I DIV II - | Groups A,B,C,D | | | | |

Remarks:

Waste water project Iqaluit

Derivation starter and motors

Earth Tech
Project # 75360

date _____

Derivation NO: P-104
Pannel: MMC-2
Tag # P-10

/ checked out OK
N/A Not Applicable
() Futher Action

| | | phase: | A | B | C |
|---|---|---|---|---|---|
| cable ident # | PC-P-104 | cable resistance at 1000v M-ohms | ∞ | ∞ | ∞ |
| cable type | 3 # 10 teck VSD | | | | |
| breaker or fuse capacity amps | 30A | | | | |
| | | | | | |
| Starter data: | | | | | |
| | | thermal unit # | | | |
| | | sequence test | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| motor description | | All reading to be thrue rms | | | |
|---|---|---|---|---|---|
| Ser No 3153.181 - | SD560260 | Volts | 600V | 600V | 600V |
| 3~ 60 Hz | | number of phase 3 | | | |
| 11,2kW - 15HP | | nominal current at voltage | 15A | 15A | 15A |
| 1760 RPM S1 | | megger test 1000V | | | |
| Max 40°C | | supply volts no load | | | |
| COS φ - 0,80 | | motor current as tested | | | |
| | | | | | |
| FLYGT | | | | | |
| Class I DIV II - | Groups A,B,C,D | | | | |

Remarks:

Waste water project Iqaluit

Derivation starter and motors

Earth Tech
Project # 75360

date _____

Derivation NO: circulator P-04
Pannel: MCC-2
Tag # circulator P-04

/ checked out OK
N/A Not Applicable
() Futher Action

| | | phase: | A | B | C |
|---|---|---|---|---|---|
| cable ident # | PC-GP-04 | cable resistance at 1000v M-ohms | ∞ | ∞ | ∞ |
| cable type | 3 #10 teck | | | | |
| breaker or fuse capacity amps | 7A | | | | |
| | | | | | |
| Starter data: | | O.L current | | | |
| | | thermal unit # | | | |
| | | sequence test | | | |
| | | Start | | | |
| | | Stop | | | |
| | | Job | | | |
| | | | | | |
| | | | | | |

| motor description | | All reading to be thrue rms | | | |
|---|---|---|---|---|---|
| Grundfos | 60 Hz | Volts | 575V | 575V | 575V |
| UPS 50-160 F | $I_1$-1,2A; $P_1$-1000W | number of phase 3 | | | |
| P/N - 96042862 | $I_2$-1,6A; $P_2$-1300W | nominal current at voltage | 1,6A | 1,6A | 1,6A |
| Model - B | Class H | megger test 1000V | ∞ | ∞ | ∞ |
| PC-0437 | LRA - 8,8D (A) | supply volts no load | | | |
| Listed - 1Z28 | | motor current as tested | | | |
| Min. liquid temp -10°C | | | | | |
| Max liquid temp 120°C | | | | | |
| Peak liquid temp 140°C | | | | | |

Remarks:

Waste water project Iqaluit

Derivation starter and motors

Earth Tech
Project # 75360

date _____

Derivation NO: FEW-01
Pannel: MCC-2
Tag # FEW-01

/ checked out OK
N/A Not Applicable
() Futher Action

| | | phase: | A | B | C |
|---|---|---|---|---|---|
| cable ident # | PC-FEW-01 | cable resistance at 1000v M-ohms | ∞ | ∞ | ∞ |
| cable type | 3 #10 tesc | | | | |
| breaker or fuse capacity amps | 15A | | | | |
| | | | | | |
| Starter data: | | O.L. current | 6,17A | 6,17A | 6,17A |
| Standard | | thermal unit # | B 9,10 | B9,10 | B9,10 |
| DWG # E2050 7290-001-02 | | sequence test | | | |
| | | Start | | | |
| | | Stop | | | |
| | | Job | | | |
| | | | | | |
| | | | | | |

| motor description | | All reading to be thrue rms | | | |
|---|---|---|---|---|---|
| Weg W21 cc029A | Sever duti | Volts | 575V | 575V | 575V |
| Ph-3; Frame-184TC-09 MA105BR59902 | | number of phase 3 | | | |
| HP-5,0 (3,7 kW) | RPM-3480 | nominal current at voltage | 4,72A | 4,72A | 4,72A |
| ENCL-TEFC | Type-ET | megger test 1000V | ∞ | ∞ | ∞ |
| IP55, PF 0,90 | Nema nom EFF 85,5 | supply volts no load | | | |
| Hz-60; SF-1,25; Code J | Ins CL-F at 80K | motor current as tested | | | |
| Nema nom EFF-87,5 | 3/4 Load EFF-86,5 | | | | |
| VJP-Part # CT005502P; SFA-5,9A | | | | | |
| Mod-1MTEIFINXH-005020; Duty-cont | | | | | |

| Remarks: | | | |
|---|---|---|---|
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| | | | |

Waste water project Iqaluit

Derivation starter and motors

Earth Tech
Project # 75360

date _____

Derivation NO: FEW-02
Pannel: MCC-2
Tag # FEW-02

/ checked out OK
N/A Not Applicable
() Futher Action

| | | phase: | A | B | C |
|---|---|---|---|---|---|
| cable ident # | PC-FEW-02 | cable resistance at 1000v M-ohms | ∞ | ∞ | ∞ |
| cable type | 3 #10 tesc | | | | |
| breaker or fuse capacity amps | 15A | | | | |
| | | | | | |
| Starter data: | | O.L. current | 6,17A | 6,17A | 6,17A |
| Standard | | thermal unit # | B 9,10 | B9,10 | B9,10 |
| DWG # E2050 7290-001-02 | | sequence test | | | |
| | | Start | | | |
| | | Stop | | | |
| | | Job | | | |
| | | | | | |
| | | | | | |

| motor description | | All reading to be thrue rms | | | |
|---|---|---|---|---|---|
| Weg W21 cc029A | Sever duti | Volts | 575V | 575V | 575V |
| Ph-3; Frame-184TC-09 | MA105BR59904 | number of phase 3 | | | |
| HP-5,0 (3,7 kW) | RPM-3480 | nominal current at voltage | 4,72A | 4,72A | 4,72A |
| ENCL-TEFC | Type-ET | megger test 1000V | ∞ | ∞ | ∞ |
| IP55, PF 0,90 | Nema nom EFF 85,5 | supply volts no load | | | |
| Hz-60; SF-1,25; Code J | Ins CL-F at 80K | motor current as tested | | | |
| Nema nom EFF-87,5 | 3/4 Load EFF-86,5 | | | | |
| VJP-Part # CT005502P; SFA-5,9A | | | | | |
| Mod-1MTEIFINXH-005020; Duty-cont | | | | | |

| Remarks: | | | |
|---|---|---|---|
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| | | | |
| | | | |
| | | | |
| | | | |

Waste water project Iqaluit

Derivation starter and motors

Earth Tech
Project # 75360

date _____

Derivation NO: FEW-03
Pannel: MCC-2
Tag # FEW-03

/ checked out OK
N/A Not Applicable
() Futher Action

| | | | phase: | A | B | C |
|---|---|---|---|---|---|---|
| cable ident # | | PC-FEW-03 | cable resistance at 1000v M-ohms | ∞ | ∞ | ∞ |
| cable type | | 3 #10 tesc | | | | |
| breaker or fuse capacity amps | | 15A | | | | |
| | | | | | | |
| Starter data: | | | O.L. current | 6,17A | 6,17A | 6,17A |
| Standard | | | thermal unit # | B 9,10 | B9,10 | B9,10 |
| DWG # E2050 7290-001-02 | | | sequence test | | | |
| | | | Start | | | |
| | | | Stop | | | |
| | | | Job | | | |
| | | | | | | |
| | | | | | | |

| motor description | | | All reading to be thrue rms | | | |
|---|---|---|---|---|---|---|
| Weg W21 cc029A | sever duti | | Volts | 575V | 575V | 575V |
| Ph-3; Frame - 184TC | 09 MA105BR5990G | | number of phase 3 | | | |
| HP-5,0 (3,7 kW) | RPM-3480 | | nominal current at voltage | 4,72A | 4,72A | 4,72A |
| ENCL-TEFC | Type-ET | | megger test 1000V | ∞ | ∞ | ∞ |
| IP55, PF 0,90 | Nema nom EFF 85,5 | | supply volts no load | | | |
| Hz-60; SF-1,25; Code J | Ins CL-F at 80k | | motor current as tested | | | |
| Nema nom EFF-87,5 | 3/4 Load EFF-86,5 | | | | | |
| VJP-Part # CT00550 2P; SFA-5,9A | | | | | | |
| Mod-1UTEIFINXH-005020; Duty-cont | | | | | | |

| Remarks: | | | |
|---|---|---|---|
| | | | |
| | | | |
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| | | | |
| | | | |

# Yokogawa Corporation of America
# Admag AXF Flowtest Report

12/20/2005

| Serial Number | Meter Size (mm) | Order Number | Item Number | Release Number |
|---|---|---|---|---|
| AAXFZC085_30986 | 150 | KDM2030 | 1 | 1 |

| Run Type | Meter Type | Frequency | Test Time (Sec) | Velocity (m/s) | Test Weight (lbs) | Specific Gravity | Water Temp (F) | Meter Factor | Low Freq Error % | High Freq Error % |
|---|---|---|---|---|---|---|---|---|---|---|
| Run | | | | | | | | | | |
| | AXFA14 | LOW | 133 | 1.47 | 7582.515 | 0.9969 | 75.02 | 0.9503264 | 0.00 | 0.00 |
| | AXFA14 | HIGH | 133 | 1.47 | 7582.515 | 0.9969 | 75.02 | 0.9016549 | 0.00 | 0.00 |
| | AXFA14 | LOW | 99 | 1.96 | 7541.001 | 0.9969 | 75.02 | 0.950181 | -0.02 | -0.02 |
| | AXFA14 | HIGH | 99 | 1.96 | 7541.001 | 0.9969 | 75.02 | 0.9015164 | -0.02 | -0.02 |
| | AXFA14 | LOW | 199 | 0.98 | 7622.634 | 0.9969 | 75.02 | 0.951762 | 0.15 | 0.15 |
| | AXFA14 | HIGH | 199 | 0.98 | 7622.634 | 0.9969 | 75.02 | 0.9030216 | 0.15 | 0.15 |
| | AXFA14 | LOW | 508 | 0.39 | 7689.545 | 0.9969 | 75.02 | 0.9514257 | 0.12 | 0.12 |
| | AXFA14 | HIGH | 508 | 0.39 | 7689.545 | 0.9969 | 75.02 | 0.9027045 | 0.12 | 0.12 |
| Calculate meter/k factor | | | | | | | | | | |
| | AXFA14 | LOW | 0 | 0.00 | 0.000 | 0.0000 | 0 | 0.9503 | 0.00 | 0.00 |
| | AXFA14 | HIGH | 0 | 0.00 | 0.000 | 0.0000 | 0 | 0.9017 | 0.00 | 0.00 |

**Flow Test Facility Maximum Uncertainty = +-0.1%**

## Calibration Equipment Used

| | Digital Multimeter | Freq. Counter | Density Detector | Density Converter |
|---|---|---|---|---|
| Model No | 34401A | TC110 | VD6D-S3*B | DM8C-A1*A |
| Serial No | 3146A52371 | 27CA14845 | 8551DA025 | 8556DA036 |

MILLTRONICS

**Company:**
**Plant:**
**Instrument:** MultiRanger 100
**Tag:** LIT 101

# Parameters - File

LIFT STATION

| Param | Description | Point | Index | Value |
|---|---|---|---|---|
| P001 | Operation | 1 | 1 | 1 (level) |
| P002 | Material | 1 | 1 | 1 (liquid or horiz. solid surface) |
| P003 | Maximum Process Speed | 1 | 1 | 3 (10 m/min (fast)) |
| P004 | Transducer | 1 | 1 | 102 (XPS-10) |
| P005 | Units | 1 | 1 | 1 (metres (m) (preset)) |
| P006 | Empty Distance | 1 | 1 | 4.454 m |
| P007 | Span | 1 | 1 | 3.680 m |
| P060 | Decimal Position | 1 | 1 | 2 (2 digits after the decimal point) |
| P062 | Offset Reading | 1 | 1 | 0.000 m |
| P064 | Reading Override Enable | 1 | 1 | 0 (Off: No override) |
| P065 | Reading Override Value | 1 | 1 | 4.43 m |
| P066 | Override Time Delay | 1 | 1 | 5.0 |
| P069 | Password | 1 | 1 | ---- |
| P070 | Failsafe Timer | 1 | 1 | 1.00 min |
| P071 | Failsafe Material Level | 1 | 1 | 0.00 m |
| P072 | Failsafe Level Advance | 1 | 1 | 1 (restricted) |
| P110 | Level Source | 1 | 1 | 1 (Point#1 = Transducer 1) |
| P110 | Level Source | 2 | 1 | 1 (Point#1 = Transducer 1) |
| P110 | Level Source | 3 | 1 | 1 (Point#1 = Transducer 1) |
| P110 | Level Source | 4 | 1 | 1 (Point#1 = Transducer 1) |
| P110 | Level Source | 5 | 1 | 1 (Point#1 = Transducer 1) |
| P110 | Level Source | 6 | 1 | 1 (Point#1 = Transducer 1) |
| P111 | Relay Control Function | 1 | 1 | 0 |
| P111 | Relay Control Function | 2 | 1 | 0 |
| P111 | Relay Control Function | 3 | 1 | 0 |
| P111 | Relay Control Function | 4 | 1 | 0 |
| P111 | Relay Control Function | 5 | 1 | 0 |
| P111 | Relay Control Function | 6 | 1 | 0 |
| P112 | Relay 'ON' Setpoint | 1 | 1 | 2.576 m |
| P112 | Relay 'ON' Setpoint | 2 | 1 | 2.944 m |
| P112 | Relay 'ON' Setpoint | 3 | 1 | 3.312 m |
| P112 | Relay 'ON' Setpoint | 4 | 1 | 0.368 m |
| P112 | Relay 'ON' Setpoint | 5 | 1 | ---- |
| P112 | Relay 'ON' Setpoint | 6 | 1 | ---- |
| P113 | Relay 'OFF' Setpoint | 1 | 1 | 0.736 m |
| P113 | Relay 'OFF' Setpoint | 2 | 1 | 0.736 m |
| P113 | Relay 'OFF' Setpoint | 3 | 1 | 3.128 m |
| P113 | Relay 'OFF' Setpoint | 4 | 1 | 0.552 m |
| P113 | Relay 'OFF' Setpoint | 5 | 1 | ---- |
| P113 | Relay 'OFF' Setpoint | 6 | 1 | ---- |
| P118 | Relay Output Logic | 1 | 1 | 2 (positive logic *) |
| P118 | Relay Output Logic | 2 | 1 | 2 (positive logic *) |
| P118 | Relay Output Logic | 3 | 1 | 2 (positive logic *) |
| P118 | Relay Output Logic | 4 | 1 | 2 (positive logic *) |
| P118 | Relay Output Logic | 5 | 1 | 2 (positive logic *) |
| P118 | Relay Output Logic | 6 | 1 | 2 (positive logic *) |
| P119 | Relay Logic Test | 1 | 1 | 0 |
| P119 | Relay Logic Test | 2 | 1 | 0 |
| P119 | Relay Logic Test | 3 | 1 | 0 |
| P119 | Relay Logic Test | 4 | 1 | 0 |

Current Date: 08/08/06 File Name F:\@devcar\yfb seware plant 2005\software\dolphin software (lit xxx)cfg\lit101config file dc
Current Time 10:14:18 File Date: 25/02/06 15:13:40



2.2.1

MILLTRONICS

**Company:**
**Plant:**
**Instrument:** MultiRanger 100
**Tag:**

# Parameters - File

| Param | Description | Point | Index | Value |
|---|---|---|---|---|
| P119 | Relay Logic Test | 5 | 1 | 0 |
| P119 | Relay Logic Test | 6 | 1 | 0 |
| P129 | Relay Failsafe | 1 | 1 | OFF |
| P129 | Relay Failsafe | 2 | 1 | OFF |
| P129 | Relay Failsafe | 3 | 1 | OFF |
| P129 | Relay Failsafe | 4 | 1 | OFF |
| P129 | Relay Failsafe | 5 | 1 | OFF |
| P129 | Relay Failsafe | 6 | 1 | OFF |
| P137 | | 1 | 1 | 1 |
| P137 | | 2 | 1 | 1 |
| P137 | | 3 | 1 | 1 |
| P137 | | 4 | 1 | 1 |
| P137 | | 5 | 1 | 1 |
| P137 | | 6 | 1 | 1 |
| P200 | mA Range | 1 | 1 | 2 (4 to 20 mA (preset)) |
| P200 | mA Range | 2 | 1 | 2 (4 to 20 mA (preset)) |
| P201 | mA Function | 1 | 1 | 1 (level) |
| P201 | mA Function | 2 | 1 | 0 (off) |
| P202 | mA Allocation | 1 | 1 | 1 (point 1) |
| P202 | mA Allocation | 2 | 1 | 1 (point 1) |
| P203 | mA Value/Transducer | 1 | 1 | 11.17 mA |
| P210 | 0/4 mA Setpoint | 1 | 1 | 0.000 m |
| P210 | 0/4 mA Setpoint | 2 | 1 | 0.000 m |
| P211 | 20 mA Setpoint | 1 | 1 | 3.680 m |
| P211 | 20 mA Setpoint | 2 | 1 | 3.680 m |
| P212 | mA Min. Limit | 1 | 1 | 3.800 mA |
| P212 | mA Min. Limit | 2 | 1 | 3.800 mA |
| P213 | mA Max. Limit | 1 | 1 | 20.20 mA |
| P213 | mA Max. Limit | 2 | 1 | 20.20 mA |
| P214 | 4 mA Trim | 1 | 1 | 4.00 |
| P214 | 4 mA Trim | 2 | 1 | 4.00 |
| P215 | 20 mA Trim | 1 | 1 | 20.00 |
| P215 | 20 mA Trim | 2 | 1 | 20.00 |
| P270 | DI Function | 1 | 1 | 2 (normally open (preset)) |
| P270 | DI Function | 2 | 1 | 2 (normally open (preset)) |
| P275 | DI Scaled Input Value | 1 | 1 | 0.000 |
| P275 | DI Scaled Input Value | 2 | 1 | 0.000 |
| P300 | Temperature, Xdcr. Max. | 1 | 1 | 24C C |
| P301 | Temperature, Xdcr. Min. | 1 | 1 | 5C C |
| P302 | Temperature, Sensor Max. | 1 | 1 | -50C C |
| P303 | Temperature, Sensor Min. | 1 | 1 | 150C C |
| P304 | Reading Max. | 1 | 1 | 3.692 m |
| P305 | Reading Min. | 1 | 1 | -0.04 m |
| P309 | Pump Run Time | 1 | 1 | 0.0 min |
| P309 | Pump Run Time | 2 | 1 | 0.0 min |
| P309 | Pump Run Time | 3 | 1 | 0.0 min |
| P309 | Pump Run Time | 4 | 1 | 0.0 min |
| P309 | Pump Run Time | 5 | 1 | 0.0 min |
| P309 | Pump Run Time | 6 | 1 | 0.0 min |
| P310 | Pump Hours | 1 | 1 | 0.000 hr |

MILLTRONICS

**Company:**
**Plant:**
**Instrument:** MultiRanger 100
**Tag:**

# Parameters - File

| Param | Description | Point | Index | Value |
|---|---|---|---|---|
| P310 | Pump Hours | 2 | 1 | 0.000 hr |
| P310 | Pump Hours | 3 | 1 | 0.000 hr |
| P310 | Pump Hours | 4 | 1 | 0.000 hr |
| P310 | Pump Hours | 5 | 1 | 0.000 hr |
| P310 | Pump Hours | 6 | 1 | 0.000 hr |
| P311 | Pump Starts | 1 | 1 | 0 |
| P311 | Pump Starts | 2 | 1 | 0 |
| P311 | Pump Starts | 3 | 1 | 0 |
| P311 | Pump Starts | 4 | 1 | 0 |
| P311 | Pump Starts | 5 | 1 | 0 |
| P311 | Pump Starts | 6 | 1 | 0 |
| P330 | Profile Record | 1 | 1 | ---- |
| P330 | Profile Record | 2 | 1 | ---- |
| P330 | Profile Record | 3 | 1 | ---- |
| P330 | Profile Record | 4 | 1 | ---- |
| P330 | Profile Record | 5 | 1 | ---- |
| P330 | Profile Record | 6 | 1 | ---- |
| P330 | Profile Record | 7 | 1 | ---- |
| P330 | Profile Record | 8 | 1 | ---- |
| P330 | Profile Record | 9 | 1 | ---- |
| P330 | Profile Record | 10 | 1 | ---- |
| P331 | Auto Record Enable | 1 | 1 | 0 (enable 'OFF') |
| P332 | Auto Record Transducer | 1 | 1 | 1 (transducer 1 (preset)) |
| P333 | Auto Record Interval | 1 | 1 | 120.0 min |
| P334 | Auto Record 'On' Setpoint | 1 | 1 | ---- |
| P335 | Auto Record 'Off' Setpoint | 1 | 1 | ---- |
| P336 | Auto Record Filling/Emptying | 1 | 1 | 0 (auto record on filling or emptying (preset)) |
| P337 | Auto Record LOE Time | 1 | 1 | 0.0 S |
| P340 | Date of Manufacture | 1 | 1 | 05:08:17 |
| P341 | Run Time | 1 | 1 | 49 day |
| P342 | Start Ups | 1 | 1 | 60 |
| P345 | | 1 | 1 | 05:08:15 |
| P346 | | 1 | 1 | 232 |
| P348 | Enabled Features | 1 | 1 | 0000 |
| P650 | Offset Calibration | 1 | 1 | ---- |
| P651 | Sound Velocity Calibration | 1 | 1 | ---- |
| P652 | Offset Correction | 1 | 1 | 0.000 m |
| P653 | Velocity | 1 | 1 | 342.1 m/S |
| P654 | Velocity at 20¦C | 1 | 1 | 344.1 m/S |
| P660 | Temperature Source | 1 | 1 | 1 (Auto) |
| P661 | Temp. Fixed | 1 | 1 | 20.00 C |
| P663 | Temp. Transducer Allocation | 1 | 1 | 1 (transducer #1) |
| P663 | Temp. Transducer Allocation | 1 | 1 | 1 (average of #1 & #2) |
| P664 | Temperature | 1 | 1 | 16C C |
| P700 | Max. Fill Rate | 1 | 1 | 10.00 m |
| P701 | Max. Empty Rate | 1 | 1 | 10.00 m |
| P702 | Filling Indicator | 1 | 1 | 1.000 m |
| P703 | Emptying Indicator | 1 | 1 | 1.000 m |
| P704 | Rate Filter | 1 | 1 | 2 (1 minute or 50 mm (2 in)) |
| P705 | Rate Update Time | 1 | 1 | 20.00 S |

MILLTRONICS

**Company:**
**Plant:**
**Instrument:** MultiRanger 100
**Tag:**

# Parameters - File

| Param | Description | Point | Index | Value |
|---|---|---|---|---|
| P706 | Rate Update Distance | 1 | 1 | 0.050 m |
| P707 | Rate Value | 1 | 1 | -0.32 m |
| P710 | Fuzz Filter | 1 | 1 | 10 % |
| P711 | Echo Lock | 1 | 1 | 2 (material agitator) |
| P712 | Echo Lock Sampling | 1 | 1 | 5: 2 |
| P713 | Echo Lock Window | 1 | 1 | 0.000 m |
| P726 | Level System Sync | 1 | 1 | 1 (syncronize level monitors (preset)) |
| P727 | Scan Delay | 1 | 1 | 3.0 S |
| P728 | Shot Delay | 1 | 1 | 0.5 S |
| P729 | Scan Time | 1 | 1 | 109.4 S |
| P730 | Auxiliary Reading | 1 | 1 | 664 |
| P731 | Auxiliary Reading Key | 1 | 1 | 664 |
| P732 | Display Delay | 1 | 1 | 1.500 |
| P733 | Scroll Access | 1 | 1 | 1 (smart (preset)) |
| P735 | Backlight | 1 | 1 | 1 (On (preset)) |
| P741 | | 1 | 1 | 5000 |
| P741 | | 2 | 1 | 5000 |
| P751 | P751 | 1 | 1 | 0 |
| P752 | P752 | 1 | 1 | 1 |
| P753 | P753 | 1 | 1 | 0 |
| P754 | P754 | 1 | 1 | 1 |
| P755 | P755 | 1 | 1 | 0 |
| P762 | Map Element Selection | 1 | 1 | 1 |
| P762 | Map Element Selection | 2 | 1 | 10 |
| P762 | Map Element Selection | 3 | 1 | 10 |
| P762 | Map Element Selection | 4 | 1 | 1 |
| P762 | Map Element Selection | 5 | 1 | 1 |
| P762 | Map Element Selection | 6 | 1 | 1 |
| P762 | Map Element Selection | 7 | 1 | 1 |
| P770 | Protocol | 1 | 1 | 1 (Milltronics' Dolphin) |
| P770 | Protocol | 2 | 1 | 1 (Milltronics' Dolphin) |
| P770 | Protocol | 3 | 1 | 1 (Milltronics' Dolphin) |
| P771 | Network Address | 1 | 1 | 1 |
| P771 | Network Address | 2 | 1 | 1 |
| P771 | Network Address | 3 | 1 | 1 |
| P772 | Baud Rate | 1 | 1 | 115.2 |
| P772 | Baud Rate | 2 | 1 | 19.2 |
| P773 | Parity | 1 | 1 | 0 (no parity (preset)) |
| P773 | Parity | 2 | 1 | 0 (no parity (preset)) |
| P774 | Data Bits | 1 | 1 | 8 (8 bits/char) |
| P774 | Data Bits | 2 | 1 | 8 (8 bits/char) |
| P775 | Stop Bits | 1 | 1 | 1 (1 bit (preset)) |
| P775 | Stop Bits | 2 | 1 | 1 (1 bit (preset)) |
| P778 | Modem Availability | 1 | 1 | 0 (None) |
| P778 | Modem Availability | 2 | 1 | 0 (None) |
| P778 | Modem Availability | 3 | 1 | 0 (None) |
| P779 | Modem Inactivity Timeout | 1 | 1 | 0 |
| P779 | Modem Inactivity Timeout | 2 | 1 | 0 |
| P779 | Modem Inactivity Timeout | 3 | 1 | 0 |
| P782 | Parameter Index Location | 1 | 1 | 0 (Global) |

MILLTRONICS

**Company:**
**Plant:**
**Instrument:** MultiRanger 100
**Tag:**

# Parameters - File

| Param | Description | Point | Index | Value |
|---|---|---|---|---|
| P784 | | 1 | 1 | 0 |
| P784 | | 2 | 1 | 0 |
| P784 | | 3 | 1 | 0 |
| P784 | | 4 | 1 | 0 |
| P784 | | 5 | 1 | 0 |
| P784 | | 6 | 1 | 0 |
| P784 | | 7 | 1 | 0 |
| P784 | | 8 | 1 | 0 |
| P785 | | 1 | 1 | ---- |
| P785 | | 2 | 1 | ---- |
| P785 | | 3 | 1 | ---- |
| P785 | | 4 | 1 | ---- |
| P785 | | 5 | 1 | ---- |
| P785 | | 6 | 1 | ---- |
| P785 | | 7 | 1 | ---- |
| P785 | | 8 | 1 | ---- |
| P786 | | 1 | 1 | 1 |
| P788 | | 1 | 1 | 0 |
| P789 | | 1 | 1 | 30 |
| P790 | Hardware Error | 1 | 1 | ERR1 |
| P791 | Bus Error | 1 | 1 | 8 |
| P792 | Bus Error Count | 1 | 1 | 0 |
| P794 | Smartlinx Module Type | 1 | 1 | 0 |
| P795 | Smartlinx Protocol | 1 | 1 | 255 |
| P799 | | 1 | 1 | 1 |
| P799 | | 2 | 1 | 1 |
| P800 | Near Blanking | 1 | 1 | 0.300 m |
| P801 | Range Extension | 1 | 1 | 0.736 m |
| P802 | Submergence Transducer | 1 | 1 | 0 (off (preset)) |
| P803 | Shot/Pulse Mode | 1 | 1 | 2 (short and long (preset)) |
| P804 | Confidence Threshold | 1 | 1 | 10: 5 |
| P805 | Echo Confidence | 1 | 1 | 1:19 |
| P806 | Echo Strength | 1 | 1 | 65 dB |
| P807 | Noise | 1 | 1 | 06:18 dB |
| P810 | Scope Displays | 1 | 1 | ____ |
| P815 | Echo Time (after post filter) | 1 | 1 | 16.52 mS |
| P816 | Echo Time (before post filter) | 1 | 1 | 16.52 mS |
| P817 | Profile Pointer Time | 1 | 1 | 0.000 |
| P818 | Profile Pointer Distance | 1 | 1 | 0.000 m |
| P819 | Profile Pointer Amplitude | 1 | 1 | 0 dB |
| P820 | Algorithm | 1 | 1 | BLF |
| P821 | Spike Filter | 1 | 1 | 1 mS (on (preset)) |
| P822 | Narrow Echo Filter | 1 | 1 | 0.000 mS |
| P823 | Reform Echo | 1 | 1 | 0.000 mS |
| P825 | Echo Marker Trigger | 1 | 1 | 50 % |
| P830 | TVT Type | 1 | 1 | 1 (TVT short curved) |
| P831 | TVT Shaper | 1 | 1 | 0 (off) |
| P832 | TVT Shaper Adjust | 1 | 1 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 2 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 3 | 0 dB |

MILLTRONICS

**Company:**
**Plant:**
**Instrument:** MultiRanger 100
**Tag:**

# Parameters - File

| Param | Description | Point | Index | Value |
|---|---|---|---|---|
| P832 | TVT Shaper Adjust | 1 | 4 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 5 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 6 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 7 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 8 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 9 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 10 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 11 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 12 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 13 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 14 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 15 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 16 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 17 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 18 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 19 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 20 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 21 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 22 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 23 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 24 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 25 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 26 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 27 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 28 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 29 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 30 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 31 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 32 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 33 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 34 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 35 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 36 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 37 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 38 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 39 | 0 dB |
| P832 | TVT Shaper Adjust | 1 | 40 | 0 dB |
| P833 | TVT Start Min | 1 | 1 | 50 dB |
| P834 | TVT Start Duration | 1 | 1 | 30 |
| P835 | TVT Slope Min. | 1 | 1 | 200 |
| P837 | | 1 | 1 | 0 |
| P838 | | 1 | 1 | 1.000 m |
| P839 | | 1 | 1 | 33 % |
| P840 | Short Shot Number | 1 | 1 | 1 |
| P841 | Long Shot Number | 1 | 1 | 2 |
| P842 | Short Shot Frequency | 1 | 1 | 43.69 |
| P843 | Long Shot Frequency | 1 | 1 | 43.69 |
| P844 | Short Shot Width | 1 | 1 | 0.200 mS |
| P845 | Long Shot Width | 1 | 1 | 1.000 mS |
| P850 | Short Shot Bias | 1 | 1 | 20 |

MILLTRONICS

**Company:**
**Plant:**
**Instrument:** MultiRanger 100
**Tag:**

# Parameters - File

| Param | Description | Point | Index | Value |
|---|---|---|---|---|
| P851 | Short Shot Floor | 1 | 1 | 50 dB |
| P852 | Short Shot Range | 1 | 1 | 1.000 m |
| P900 | Software Revision | 1 | 1 | 1.08 |
| P901 | | 1 | 1 | |
| P902 | | 1 | 1 | |
| P903 | | 1 | 1 | |
| P904 | | 1 | 1 | |
| P905 | Transmit Pulse | 1 | 1 | 43.69 |
| P906 | | 1 | 1 | |
| P908 | | 1 | 1 | --- |
| P909 | | 1 | 1 | |
| P910 | | 1 | 1 | 0 |
| P911 | mA O/P Value | 1 | 1 | 11.17 mA |
| P911 | mA O/P Value | 2 | 1 | 3.80 mA |
| P912 | Transducer Temperature | 1 | 1 | 16C C |
| P913 | Sensor Temperature | 1 | 1 | OPEN C |
| P920 | Reading Measurement | 1 | 1 | 1.65 m |
| P921 | Material Measurement (Level) | 1 | 1 | 1.650 m |
| P922 | Space Measurement | 1 | 1 | 2.030 m |
| P923 | Distance Measurement | 1 | 1 | 2.804 m |
| P927 | Distance Measurement | 1 | 1 | 62.95 % |
| P999 | Master Reset | 1 | 1 | ---- |

MILLTRONICS

**Company:**
**Plant:**
**Instrument:** MultiRanger 100
**Tag:** LIT 102

SSCR

# Parameters - File

| Param | Description | Point | Index | Value |
|---|---|---|---|---|
| P001 | Operation | 1 | 1 | 1 (level) |
| P003 | Maximum Process Speed | 1 | 1 | 3 (10 m/min (fast)) |
| P004 | Transducer | 1 | 1 | 102 (XPS-10) |
| P005 | Units | 1 | 1 | 3 (millimetres (mm)) |
| P006 | Empty Distance | 1 | 1 | 1120.000 mm |
| P006 | Empty Distance | 2 | 1 | 5.000 mm |
| P007 | Span | 1 | 1 | 800.000 mm |
| P007 | Span | 2 | 1 | 5.000 mm |
| P060 | Decimal Position | 1 | 1 | 0 (no digits after the decimal point) |
| P062 | Offset Reading | 1 | 1 | 0.000 mm |
| P062 | Offset Reading | 2 | 1 | 0.000 mm |
| P062 | Offset Reading | 3 | 1 | 0.000 mm |
| P065 | Reading Override Value | 1 | 1 | 5000.000 mm |
| P065 | Reading Override Value | 2 | 1 | 0.00 mm |
| P070 | Failsafe Timer | 1 | 1 | 1.00 min |
| P071 | Failsafe Material Level | 1 | 1 | HOLD mm |
| P071 | Failsafe Material Level | 2 | 1 | HOLD mm |
| P112 | Relay 'ON' Setpoint | 1 | 1 | 560.000 mm |
| P112 | Relay 'ON' Setpoint | 2 | 1 | 640.000 mm |
| P112 | Relay 'ON' Setpoint | 3 | 1 | 720.000 mm |
| P112 | Relay 'ON' Setpoint | 4 | 1 | 80.000 mm |
| P112 | Relay 'ON' Setpoint | 5 | 1 | ---- mm |
| P112 | Relay 'ON' Setpoint | 6 | 1 | ---- mm |
| P113 | Relay 'OFF' Setpoint | 1 | 1 | 160.000 mm |
| P113 | Relay 'OFF' Setpoint | 2 | 1 | 160.000 mm |
| P113 | Relay 'OFF' Setpoint | 3 | 1 | 680.000 mm |
| P113 | Relay 'OFF' Setpoint | 4 | 1 | 120.000 mm |
| P113 | Relay 'OFF' Setpoint | 5 | 1 | ---- mm |
| P113 | Relay 'OFF' Setpoint | 6 | 1 | ---- mm |
| P201 | mA Function | 1 | 1 | 1 (level) |
| P201 | mA Function | 2 | 1 | 0 (off) |
| P202 | mA Allocation | 2 | 1 | 1 (point 1) |
| P203 | mA Value/Transducer | 1 | 1 | 4.05 mA |
| P210 | 0/4 mA Setpoint | 1 | 1 | 0.000 mm |
| P210 | 0/4 mA Setpoint | 2 | 1 | 0.000 mm |
| P211 | 20 mA Setpoint | 1 | 1 | 800.000 mm |
| P211 | 20 mA Setpoint | 2 | 1 | 800.000 mm |
| P214 | 4 mA Trim | 1 | 1 | 4.00 |
| P214 | 4 mA Trim | 2 | 1 | 4.00 |
| P215 | 20 mA Trim | 1 | 1 | 20.00 |
| P215 | 20 mA Trim | 2 | 1 | 20.00 |
| P300 | Temperature, Xdcr. Max. | 1 | 1 | 24C C |
| P301 | Temperature, Xdcr. Min. | 1 | 1 | 19C C |
| P304 | Reading Max. | 1 | 1 | 790.000 mm |
| P304 | Reading Max. | 2 | 1 | 0.000 mm |
| P304 | Reading Max. | 3 | 1 | 0.000 mm |
| P305 | Reading Min. | 1 | 1 | -120.000 mm |
| P305 | Reading Min. | 2 | 1 | ---- mm |
| P305 | Reading Min. | 3 | 1 | ---- mm |
| P340 | Date of Manufacture | 1 | 1 | 05:08:17 yy:mm:dd |

Current Date: 08/08/06 File Name F:\@devcar\yfb seware plant 2005\software\dolphin software (lit xxx)cfg\lit102config file do
Current Time 10:14:58 File Date: 28/11/05 10:21:56



8.3.1

MILLTRONICS

**Company:**
**Plant:**
**Instrument:** MultiRanger 100
**Tag:**

# Parameters - File

| Param | Description | Point | Index | Value |
|---|---|---|---|---|
| P342 | Start Ups | 1 | 1 | 2 |
| P348 | Enabled Features | 1 | 1 | 0000 |
| P652 | Offset Correction | 1 | 1 | 0.000 mm |
| P653 | Velocity | 1 | 1 | 344.5 m/S |
| P700 | Max. Fill Rate | 1 | 1 | 10000.000 mm |
| P701 | Max. Empty Rate | 1 | 1 | 10000.000 mm |
| P702 | Filling Indicator | 1 | 1 | 1000.000 mm |
| P702 | Filling Indicator | 2 | 1 | 0.100 mm |
| P702 | Filling Indicator | 3 | 1 | 0.100 mm |
| P703 | Emptying Indicator | 1 | 1 | 1000.000 mm |
| P703 | Emptying Indicator | 2 | 1 | 0.100 mm |
| P703 | Emptying Indicator | 3 | 1 | 0.100 mm |
| P706 | Rate Update Distance | 1 | 1 | 50.000 mm |
| P707 | Rate Value | 1 | 1 | -3510.000 mm |
| P707 | Rate Value | 2 | 1 | ---- mm |
| P707 | Rate Value | 3 | 1 | ---- mm |
| P710 | Fuzz Filter | 1 | 1 | 10 % |
| P713 | Echo Lock Window | 1 | 1 | 0.000 mm |
| P727 | Scan Delay | 1 | 1 | 3.0 S |
| P729 | Scan Time | 1 | 1 | 2.922 S |
| P730 | Auxiliary Reading | 1 | 1 | 664 |
| P731 | Auxiliary Reading Key | 1 | 1 | 664 |
| P770 | Protocol | 2 | 1 | 1 (Milltronics' Dolphin) |
| P790 | Hardware Error | 1 | 1 | ERR1 |
| P791 | Bus Error | 1 | 1 | 8 |
| P800 | Near Blanking | 1 | 1 | 300.000 mm |
| P801 | Range Extension | 1 | 1 | 160.000 mm |
| P805 | Echo Confidence | 1 | 1 | 4:26 |
| P806 | Echo Strength | 1 | 1 | 92 dB |
| P807 | Noise | 1 | 1 | -4:06 dB |
| P815 | Echo Time (after post filter) | 1 | 1 | 6.621 mS |
| P816 | Echo Time (before post filter) | 1 | 1 | 6.616 mS |
| P818 | Profile Pointer Distance | 1 | 1 | 0.000 mm |
| P841 | Long Shot Number | 1 | 1 | 2 |
| P842 | Short Shot Frequency | 1 | 1 | 43.69 kHz |
| P843 | Long Shot Frequency | 1 | 1 | 43.69 kHz |
| P844 | Short Shot Width | 1 | 1 | 0.200 mS |
| P845 | Long Shot Width | 1 | 1 | 1.000 mS |
| P852 | Short Shot Range | 1 | 1 | 1000.000 mm |
| P900 | Software Revision | 1 | 1 | 1.08 |
| P905 | Transmit Pulse | 1 | 1 | 43.69 |
| P911 | mA O/P Value | 1 | 1 | 4.05 mA |
| P911 | mA O/P Value | 2 | 1 | 3.80 mA |
| P912 | Transducer Temperature | 1 | 1 | 21C C |
| P920 | Reading Measurement | 1 | 1 | 0.000 mm |
| P920 | Reading Measurement | 2 | 1 | ---- mm |
| P920 | Reading Measurement | 3 | 1 | ---- mm |
| P921 | Material Measurement (Level) | 1 | 1 | 3.000 mm |
| P921 | Material Measurement (Level) | 2 | 1 | ---- mm |
| P921 | Material Measurement (Level) | 3 | 1 | ---- mm |

MILLTRONICS

**Company:**
**Plant:**
**Instrument:** MultiRanger 100
**Tag:**

# Parameters - File

| Param | Description | Point | Index | Value |
|---|---|---|---|---|
| P922 | Space Measurement | 1 | 1 | 797.000 mm |
| P922 | Space Measurement | 2 | 1 | ---- mm |
| P923 | Distance Measurement | 1 | 1 | 1117.000 mm |
| P923 | Distance Measurement | 2 | 1 | ---- mm |
| P927 | Distance Measurement | 1 | 1 | 99.76 % |
| P927 | Distance Measurement | 2 | 1 | ---- % |

spare parts plc

SIFEC NORTH INC.

from: 20010victor ,Mirabel , J7J-1P4

**Tel: 450-437-4001 fax450/430-7106**

## Spare parts List

Waste water treatment plant phase 1. Iqaluit Nunavut
May 30, 2006

PLC spares parts

| On site | Product # | Description |
|---|---|---|
| ✓ 1 | SLC 5/01 SLC | **1747- L511** |
| ✓ 1 | 1745-IB16 | (16) Current Sinking DC Input Module |
| ✓ 1 | 1746-OX8 | (8) Relay Output Modules individually isolated |
| ✓ 1 | 1746-NI8 | (8) Analog Input Module -20...+20 mA (or) -10...+10V dc |
| ✓ 1 | 1746-NIO4I | (4) Analog Current Output Module |
| ✓ 1 | 1746-IA16 | (16) 120V ac Input Module |
| ✓ 1 | 1746-NT8 | (8)Thermocouple/mV Input Modules |
| ✓ 1 | 1746-OW16 | (16) Relay Output Modules |
| ✓ 1 | 1746-P2 | Power Supply |
| ✓ 1 | 1746-A13 | 13-Slot Modular Chassis |
| | | |
| | | |

Received by: _____

Date: 13/07/06

## Chapter 9
## ELECTRICAL EXPLOSION PROOF EQUIPMENT

## MANUFACTURER/DISTRIBUTOR:

LUMEN
401,J-F KENNEDY
ST-JÉRÔME, QUE.
PH:450-436-3225 FAX:450-436-2537

**9.1** **"EYS" ELBY-75A APPLETON.**

**9.2** **600 VOLTS 3 PHASE INSULATING SWITCH ECS3MS APPLETON.**

**9.3** **SINGLE GANG BOX ECS-175.**

**9.4** **120 VOLTS EXPLOSION PROOF SWITCH ECF2S13 APPLETON.**

**9.5** **120 VOLTS EXPLOSION PROOF SWITCH ECS2F3W3 APPLETON.**

**9.6** **EYS 3/4" EYF-50 APPLETON.**

**9.7** **MULTIPLE HUB EXPLOSION PROOF.**

**9.8** **MULTIPLE HUB EXPLOSION PROOF.**

**9.9** **3/4" UNION EXPLOSION PROOF.**

**9.10** **3/4" HUB OCTOGONAL BOX EXPLOSION PROOF GR75.**

**END OF CHAPTER 9**

| | | |
|---|---|---|
| FROM | **KUDLIK CONST./SIFEC NORTH**<br>P.O.BOX, 727,1519 FEDERAL ROAD<br>IQALUIT, NUNAVUT X0A 0H0<br>PH:867-979-7704 FAX:1169 | SHOP DRAWING SUBMITAL<br><br>EMAIL:_____ |
| TO | CITY OF IQUALUIT<br>C/O EARTH TECH Canada INC.<br>C/O MR.G.PROSKO,PH<br>C/ D.COOK,<br>PH:780-488-6800 FAX:2121 | DATE:_____<br>PAGE 1 OF_____ |
| PROJECT: | WASTE WATER TREATMENT PLANT IQUALUIT, | |

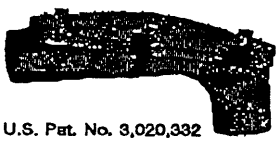
| NOTE | MANUFACTURER/DISTRIBUTOR | SPEC. | SHEET | DESCRIPTION | SECTION |
|---|---|---|---|---|---|
| | | | | | |
| | LUMEN | 16000 | | ELECTRICAL ACCESSORIES | |
| | 401,J-F KENNEDY | | | | |
| | ST-JÉRÔME,QUE. | | 1 | ELBY-75A APPLETON J2 PAGE 9 | 9 |
| | PH:450-436-3225 FAX:2537 | | 1 | 600 VOLTS 3 PHASE INSULATING SWITCH ECS3MS APPLETON N14 EXPLOSION PROFF SWITCH | 9 |
| | | | | (2 AHU-3) | |
| | | | | (3 RAW SEWAGE PUMPS) | |
| | | | | (2 SREEN) | |
| | | | 1 | SINGLE GANG BOX ECS-175 | 9 |
| | | | 1 | 120 VOLTS SWITCH EXPLOSION PROFF | 9 |
| | | | | (3 UNIT HEATER) | |
| | | | | (2 SUMP PUMP) | |
| | | | | ECS2F13 APPLETON N-6 | |
| | | | | | |
| | | | 1 | 3 WAY SWITCH EXPLOSION PROFF | 9 |
| | | | | APPLETON #ECS2F3W3 N-6 | |
| | | | | | |
| | | | 1 | EYS 3/4" EYF-75 APLLETON | 9 |
| | | | | | |
| | | | 1 | MULTIPLE HUB EXPLOSION PROFF | 9 |
| | | | | APPLETON # GRSS75 | |
| | | | | | |
| | | | 1 | MULTIPLE HUB EXPLOSION PROFF | 9 |
| | | | | APPLETON # GRSA75 | |
| | | | | | |
| | | | 1 | 3/4" UNION EXPLOSION PROFF | 9 |
| | | | | APPLETON UNF75-50NR | |
| | | | | | |
| | | | 1 | 3/4" HUB OCTOGONAL BOX EXPLOSION PROFF GR75 | 9 |
| | | | 10 | | |
| | | | NIL | PIEDS TUYAU GALVANISE 3/4" | 9 |

ELBY Series:
Class I, Groups B, •C, D
Class II, Groups E, F, G
Class III
ELBD Series
Class I, Group D
Class II, Groups E, F, G
Class III

# ELBY and ELBD 90° Pulling Elbows: Explosion-Proof, Dust-Ignition-Proof

UNILETS® for Use with Threaded Metal Conduit.

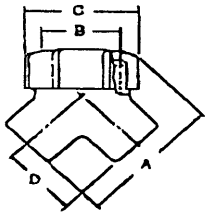
| Type and Size (Inches) | Catalogue Number Aluminum | Ferrous Alloy |
|---|---|---|
| **ELBY Capped Elbow** | | |
| 1/2 | ELBY-50A | ELBY-50 |
| 3/4 | ELBY-75A | ELBY-75 |
| 1 | ELBY-100-A | ELBY-100 |
| 1-1/4 | ELBY-125-A | ELBY-125 |
| **ELBY Pulling Elbow** | | |
| 1/2 | ELBD-50-A | ELBD-50 |
| 3/4 | ELBD-75-A | ELBD-75 |
| 1 | ELBD-100-A | ELBD-100 |
| 1-1/4 | ELBD-125-A | ELBD-125 |
| 1-1/2 | ELBD-150-A | ELBD-150 |
| 2 | ELBD-200-A | ELBD-200 |
| 2-1/2 | ELBD-250-A | ELBD-250 |
| 3 | ELBD-300-A | ELBD-300 |
| 3-1/2 | ELBD-350-A | ELBD-350 |
| 4 | ELBD-400-A | ELBD-400 |



U.S. Pat. No. 3,020,332

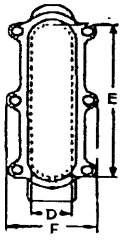
Patented Roller Feature–Listings in Bold Type

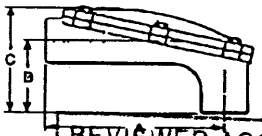
ELBY




Hubs 90° apart

ELBD




| Hub Size (Inches) | ELBY Dim. in Inches A | B | C | D | ELBD Dim. in Inches A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|
| 1/2 | 2.75 | 1.44 | 2.06 | 1.44 | 5.06 | 2.63 | 4.50 | 1.06 | 4.69 | 2.69 |
| 3/4 | 2.88 | 1.44 | 2.06 | 1.44 | 5.06 | 2.63 | 4.50 | 1.06 | 4.69 | 2.69 |
| 1 | 3.19 | 1.88 | 2.56 | 1.75 | 7.88 | 3.44 | 5.00 | 1.75 | 7.50 | 3.94 |
| 1-1/4 | 4.00 | 2.31 | 3.13 | 2.13 | 7.88 | 3.44 | 5.00 | 1.75 | 7.50 | 3.94 |
| 1-1/2 | | | | | 10.63 | 4.81 | 6.75 | 2.56 | 10.69 | 4.94 |
| 2 | | | | | 10.63 | 4.81 | 6.75 | 2.56 | 10.69 | 4.94 |
| 2-1/2 | | | | | 14.69 | 6.63 | 9.25 | 3.75 | 13.81 | 6.69 |
| 3 | | | | | 14.69 | 6.63 | 9.25 | 3.75 | 13.81 | 6.69 |
| 3-1/2 | | | | | 28.25 | 7.50 | 12.75 | 4.63 | 27.56 | 7.38 |
| 4 | | | | | 28.25 | 7.50 | 12.75 | 4.63 | 27.56 | 7.38 |
| | **ELBY Dim. in Centimetres** | | | | **ELBD Dim. in Centimetres** | | | | | |
| 1/2 | 7.0 | 3.7 | 5.2 | 3.7 | 12.9 | 6.7 | 11.4 | 2.7 | 11.9 | 6.8 |
| 3/4 | 7.3 | 3.7 | 5.2 | 3.7 | 12.9 | 6.7 | 11.4 | 2.7 | 11.9 | 6.8 |
| 1 | 8.1 | 4.8 | 6.5 | 4.5 | 20.0 | 8.7 | 12.7 | 4.5 | 19.1 | 10.0 |
| 1-1/4 | 10.2 | 5.9 | 7.9 | 5.4 | 20.0 | 8.7 | 12.7 | 4.5 | 19.1 | 10.0 |
| 1-1/2 | | | | | 27.0 | 12.2 | 17.2 | 6.5 | 27.2 | 12.5 |
| 2 | | | | | 27.0 | 12.2 | 17.2 | 6.5 | 27.2 | 12.5 |
| 2-1/2 | | | | | 37.3 | 16.8 | 23.5 | 9.5 | 35.1 | 17.0 |
| 3 | | | | | 37.3 | 16.8 | 23.5 | 9.5 | 35.1 | 17.0 |
| 3-1/2 | | | | | 71.4 | 19.1 | 32.4 | 11.8 | 70.0 | 18.7 |
| 4 | | | | | 71.4 | 19.1 | 32.4 | 11.8 | 70.0 | 18.7 |

•Shaded area indicates items suitable for Class I, Group B in addition to Class I, Groups C, D; Class II, Groups E, F, G and Class III.

REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT. ANY ACTION INDICATED IS SUBJECT TO THESE REQUIREMENTS.
☑ NO EXCEPTIONS TAKEN
☐ MAKE NOTED CORRECTIONS
☐ REVISE & RESUBMIT
☐ REJECTED
DATE May 21/09 BY DC
EARTH TECH (CANADA) INC.

750 Lawrence Street
Kitchener, Ontario N3H 2N1



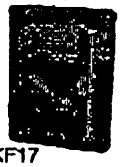
JOB; WASTE WATER TREATMENT PLANT AT IQUALUIT, NUNAVUT
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK per; C. FAUTEUX, T.P.
G, FAUTEUX, P.ENG.

1/1

9-1

Class I, Div. 1 and 2,
Groups B, C, D;
Class I Zone 1 and 2, IIB + $H_2$ T6
Class II, Div. 1 and 2,
Groups E, F, G;
Class III, Encl. 3, weatherproof
EEMAC Type 3R, 7BCD, 9EFG
CSA Approved

# ECS Control Stations and Pilot Lights: Explosion-Proof, Dust-Ignition-Proof, Factory Sealed and Non Factory Sealed

| ECS Covers with Device (Continued) | Type | Catalogue Number Front Operated | Key Operated |
|---|---|---|---|
| **Toggle Switches** 20 Amp 120/277 Vac (Factory Sealed) | 1 Pole | ECSKF1 | ECSKK1 |
| | 2 Pole | ECSKF2 | ECSKK2 |
| | 3 Way | ECSKF3W | ECSKK3W |
| | 4 Way | ECSKF4W | ECSKK4W |
| ECSKF1 ECSKK1 | | | |
| **Toggle Switches** 20 Amp 347 Vac (Non-Factory Sealed) | 1 Pole | ECSKF17 | ECSKK17 |
| | 2 Pole | ECSKF27 | ECSKK27 |
| | 3 Way | ECSKF3W7 | ECSKK3W7 |
| | 4 Way | ECSKF4W7 | ECSKK4W7 |
|  ECSKF17 ECSKK17 | | | |
| **Toggle Switches** 30 Amp 120/277 Vac (Non-Factory Sealed) | 1 Pole | ECSKF13 | ECSKK13 |
| | 2 Pole | ECSKF23 | ECSKK23 |
| | 3 Way | ECSKF3W3 | ECSKK3W3 |
| | 3 Pole | ECSKF33 | ECSKK33 |
| ECSKF13 ECSKK13 | Optional: Flush mounted single LED indicator light - add suffix -LED | | |

| | Type | Starter Rating | Catalogue Number |
|---|---|---|---|
| **Manual Motor Starters** (Non-Factory Sealed Devices) | 1 Pole, Single Phase | 1 H.P. 120/240 Vac | ECSK1MSH[1] |
| | 2 Pole, Single Phase | 1 H.P. 120/240 Vac | ECSK2MSH[1] |
| ECSK1MSH | 2 Pole, Single Phase | 30 Amp 250 Vac<br>30 Amp 600 Vac<br>2 H.P. 120 Vac<br>3 H.P. 240 Vac<br>7.5 H.P. 480 Vac<br>10 H.P. 600 Vac | ECSK2MS[2] |
| | 3 Pole, Three Phase | 30 Amp 250 Vac<br>30 Amp 600 Vac<br>3 H.P. 120 Vac<br>7.5 H.P. 240 Vac<br>10 H.P. 480 Vac<br>20 H.P. 600 Vac | ECSK3MS[2] |

[1]Heater supplied for maximum motor load.
[2]No heater available

1/1

REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT. ANY ACTION INDICATED IS SUBJECT TO THESE REQUIREMENTS.
[X] NO EXCEPTIONS TAKEN
[ ] MAKE NOTED CORRECTIONS
[ ] REVISE & RESUBMIT
[ ] REJECTED
DATE July 21/06 BY DC
EARTH TECH (CANADA) INC.

750 Lawrence Street
Cambridge, Ontario N3H 2N1

JOB; WASTE WATER TREATMENT PLANT AT IQUALUIT, NUNAVUT
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK per; C. FAUTEUX, T.P.
G, FAUTEUX, P.ENG.
P.A.PELLETIER, P.ENG.

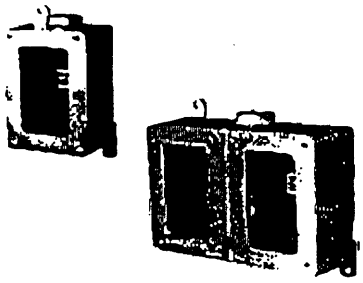
9-2

Class I, Div. 1 and 2,
Groups B, C, D;
Class I Zone 1 and 2, IIB + $H_2$ T6
Class II, Div. 1 and 2,
Groups E, F, G;
Class III, Encl. 3, weatherproof
NEMA Type 3R, 7BCD, 9EFG
CSA Approved



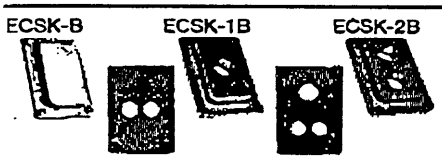
# ECS Control Stations and Pilot Lights: Explosion-Proof, Dust-Ignition-Proof, Factory Sealed and Non Factory Sealed

## ECS Covers and Back Boxes Only



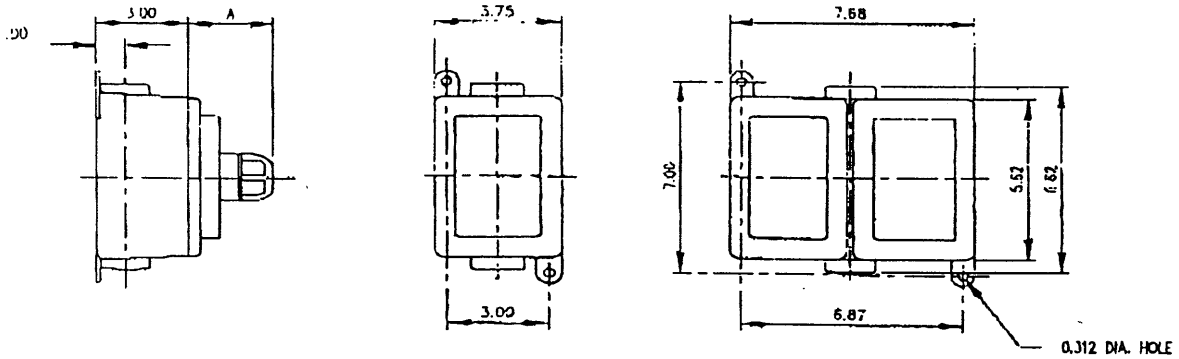
| Hub Size (in inches) | Description | Catalogue Number |
|---|---|---|
| | **ECS Series Mounting Boxes** | |
| | C.S.A. certified when complete with ECSK cover assembly. | |
| | Boxes and covers sold separately. | |
| 3/4 | Single Gang | ECS-175 |
| 1 | Single Gang | ECS-110 |
| 3/4 | Two Gang | ECS-275 |
| 1 | Two Gang | ECS-210 |

Boxes are complete with feed through hubs, mounting feet, ground screw and close-up plug for dead end use.
For 1/2" entry on ECS-172 and ECS-275 reducer required.




| Description | Catalogue Number |
|---|---|
| **ECS Replacement Covers** | |
| Blank Cover | ECSK-B |
| Single Device Cover | ECSK-1B |
| Two Device Cover | ECSK-2B |
| Dual Push button/Selector Switch Cover | ECSK-2P |
| Pilot Light and Dual Push button/Selector Switch Cover | ECSK-3P |

## Dimensions




| Device | Dim. A |
|---|---|
| P.B. Switch | 1.81 |
| SEL. Switch | 2.25 |
| Pilot Light | 2.75 |
| Mush. Hd. Switch | 2.18 |
| Snap Switch | 1.56 |
| GFI | 1.62 |
| Photo Control | 2.12 |

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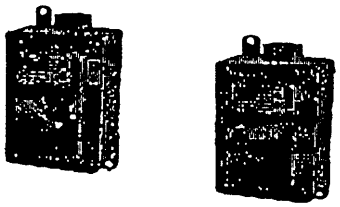
Class I, Div. 1 and 2,
Groups B, C, D;
Class I Zone 1 and 2, IIB + $H_2$ T6
Class II, Div. 1 and 2,
Groups E, F, G;
Class III, Encl. 3, weatherproof
NEMAC Type 3R, 7BCD, 9EFG
CSA Approved

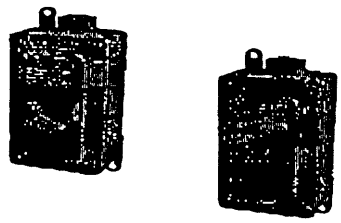


# ECS Control Stations and Pilot Lights: Explosion-Proof, Dust-Ignition-Proof, Factory Sealed and Non Factory Sealed

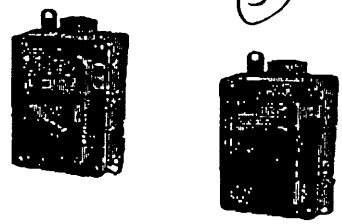
## Toggle Switches



| Hub Size (in inches) | Type | Catalogue Number Front Operated | Key Operated |
|---|---|---|---|
| **Single Gang** 20 Amp, 120 to 277 Vac (Factory Sealed Devices) | | | |
| 1/2 – 3/4 | 1 Pole | ECS3F1 | ECS3K1 |
| 1 | 1 Pole | ECS5F1 | ECS5K1 |
| 1/2 – 3/4 | 2 Pole | ECS3F2 | ECS3K2 |
| 1 | 2 Pole | ECS5F2 | ECS5K2 |
| 1/2 – 3/4 | 3 Way | ECS3F3W | ECS3K3W |
| 1 | 3 Way | ECS5F3W | ECS5K3W |
| 1/2 – 3/4 | 4 Way (Non-Factory sealed) | ECS3F4W | ECS3K4W |
| 1 | 4 Way (Non-Factory sealed) | ECS5F4W | ECS5K4W |
| **Two Gang** | | | |
| 1/2 – 3/4 | 1 Pole | ECS7F1 | ECS7K1 |
| 1 | 1 Pole | ECS9F1 | ECS9K1 |
| 1/2 – 3/4 | 2 Pole | ECS7F2 | ECS7K2 |
| 1 | 2 Pole | ECS9F2 | ECS9K2 |
| 1/2 – 3/4 | 3 Way | ECS7F3W | ECS7K3W |
| 1 | 3 Way | ECS9F3W | ECS9K3W |
| 1/2 – 3/4 | 4 Way (Non-Factory sealed) | ECS7F4W | ECS7K4W |
| 1 | 4 Way (Non-Factory sealed) | ECS9F4W | ECS9K4W |



| | | | |
|---|---|---|---|
| **Single Gang** 20 Amp, 347 Vac (Non-Factory Sealed Devices) | | | |
| 1/2 – 3/4 | 1 Pole | ECS2F17 | ECS2K17 |
| 1 | 1 Pole | ECS4F17 | ECS4K17 |
| 1/2 – 3/4 | 2 Pole | ECS2F27 | ECS2K27 |
| 1 | 2 Pole | ECS4F27 | ECS4K27 |
| 1/2 – 3/4 | 3 Way | ECS2F3W7 | ECS2K3W7 |
| 1 | 3 Way | ECS4F3W7 | ECS4K3W7 |
| 1/2 – 3/4 | 4 Way | ECS2F4W7 | ECS2K4W7 |
| 1 | 4 Way | ECS4F4W7 | ECS4K4W7 |



| | | | |
|---|---|---|---|
| **Single Gang** 30 Amp, 120 to 277 Vac (Non-Factory Sealed Devices) | | | |
| 1/2 – 3/4 | 1 Pole | ECS2F13 | ECS2K13 |
| 1 | 1 Pole | ECS4F13 | ECS4K13 |
| 1/2 – 3/4 | 2 Pole | ECS2F23 | ECS2K23 |
| 1 | 2 Pole | ECS4F23 | ECS4K23 |
| 1/2 – 3/4 | 3 Way | ECS2F3W3 | ECS2K3W3 |
| 1 | 3 Way | ECS4F3W3 | ECS4K3W3 |
| 1/2 – 3/4 | 3 Pole | ECS2F33 | ECS2K33 |
| 1 | 3 Pole | ECS4F33 | ECS4K33 |

Optional: Flush mounted single LED indicator light - add suffix -LED

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EGS Electrical Group | Appleton

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G, FAUTEUX, P.ENG.
P.A.PELLETIER, P.ENG.

# N-6

Cat. No. Index | Master Index

September 2002 | N Index

Class I, Div. 1 and 2,
ups B, C, D;
ss I Zone 1 and 2, IIB + $H_2$ T6
Class II, Div. 1 and 2,
Groups E, F, G;
Class III, Encl. 3, weatherproof
EEMAC Type 3R, 7BCD, 9EFG
CSA Approved

## ECS Control Stations and Pilot Lights: Explosion-Proof, Dust-Ignition-Proof, Factory Sealed and Non Factory Sealed

### Toggle Switches

| Hub Size (in inches) | Type | Catalogue Number Front Operated | Key Operated |
|---|---|---|---|
| **Single Gang** 20 Amp, 120 to 277 Vac (Factory Sealed Devices) | | | |
| 1/2 – 3/4 | 1 Pole | ECS3F1 | ECS3K1 |
| 1 | 1 Pole | ECS5F1 | ECS5K1 |
| 1/2 – 3/4 | 2 Pole | ECS3F2 | ECS3K2 |
| 1 | 2 Pole | ECS5F2 | ECS5K2 |
| 1/2 – 3/4 | 3 Way | ECS3F3W | ECS3K3W |
| 1 | 3 Way | ECS5F3W | ECS5K3W |
| 1/2 – 3/4 | 4 Way (Non-Factory sealed) | ECS3F4W | ECS3K4W |
| 1 | 4 Way (Non-Factory sealed) | ECS5F4W | ECS5K4W |
| **Two Gang** | | | |
| 1/2 – 3/4 | 1 Pole | ECS7F1 | ECS7K1 |
| 1 | 1 Pole | ECS9F1 | ECS9K1 |
| 1/2 – 3/4 | 2 Pole | ECS7F2 | ECS7K2 |
| 1 | 2 Pole | ECS9F2 | ECS9K2 |
| 1/2 – 3/4 | 3 Way | ECS7F3W | ECS7K3W |
| 1 | 3 Way | ECS9F3W | ECS9K3W |
| 1/2 – 3/4 | 4 Way (Non-Factory sealed) | ECS7F4W | ECS7K4W |
| 1 | 4 Way (Non-Factory sealed) | ECS9F4W | ECS9K4W |
| **Single Gang** 20 Amp, 347 Vac (Non-Factory Sealed Devices) | | | |
| 1/2 – 3/4 | 1 Pole | ECS2F17 | ECS2K17 |
| 1 | 1 Pole | ECS4F17 | ECS4K17 |
| 1/2 – 3/4 | 2 Pole | ECS2F27 | ECS2K27 |
| 1 | 2 Pole | ECS4F27 | ECS4K27 |
| 1/2 – 3/4 | 3 Way | ECS2F3W7 | ECS2K3W7 |
| 1 | 3 Way | ECS4F3W7 | ECS4K3W7 |
| 1/2 – 3/4 | 4 Way | ECS2F4W7 | ECS2K4W7 |
| 1 | 4 Way | ECS4F4W7 | ECS4K4W7 |
| **Single Gang** 30 Amp, 120 to 277 Vac (Non-Factory Sealed Devices) | | | |
| 1/2 – 3/4 | 1 Pole | ECS2F13 | ECS2K13 |
| 1 | 1 Pole | ECS4F13 | ECS4K13 |
| 1/2 – 3/4 | 2 Pole | ECS2F23 | ECS2K23 |
| 1 | 2 Pole | ECS4F23 | ECS4K23 |
| 1/2 – 3/4 | 3 Way | ECS2F3W3 | ECS2K3W3 |
| 1 | 3 Way | ECS4F3W3 | ECS4K3W3 |
| 1/2 – 3/4 | 3 Pole | ECS2F33 | ECS2K33 |
| 1 | 3 Pole | ECS4F33 | ECS4K33 |

Optional: Flush mounted single LED indicator light - add suffix **-LED**

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EGS Electrical Group | Appleton

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P.A.PELLETIER, P.ENG.

# Sealing Fittings for Close Turning Radius: EY; Explosion-Proof, Dust-Ignition-Proof, Raintight

Unilets® for Use with Threaded Metal Conduit

| Size (Inches) | Turning Radius† Inches | (cm) | Kwiko® Cement Req'd Ozs. | (Grams) | Catalogue Number Ferrous Alloy | Aluminum |
|---|---|---|---|---|---|---|
| **EY Vertical and Horizontal Conduit Seals for Close Turning Radius** | | | | | | |
| **Female** | | | | | | |
| 1/2 | 1.06 | (2.7) | 1 | (28.4) | EYF-50 | EYF-50AL |
| 3/4 | 1.19 | (3.0) | 2 | (56.7) | EYF-75 | EYF-75AL |
| 1 | 1.38 | (3.5) | 4 | (113.4) | EYF-100 | EYF-100AL |
| 1-1/4 | 1.75 | (4.5) | 7 | (198.4) | EYF-125 | EYF-125AL |
| 1-1/2 | 2.06 | (5.2) | 13 | (368.5) | EYF-150 | EYF-150AL |
| 2 | 2.31 | (5.9) | 22 | (623.7) | EYF-200 | EYF-200AL |
| 2-1/2 | 2.69 | (6.8) | 36 | (1020.6) | EYF-250 | EYF-250AL |
| 3 | 3.13 | (7.9) | 61 | (1729.3) | EYF-300 | EYF-300AL |
| 3-1/2 | 3.44 | (8.7) | 89 | (2523.1) | EYF-350 | EYF-350AL |
| 4 | 3.69 | (9.4) | 114 | (3231.8) | EYF-400 | EYF-400AL |

**Female EYF**

1/2" – 1" 1-1/4" – 3" 3-1/2" – 4"

| Size (Inches) | Turning Radius† Inches | (cm) | Kwiko® Cement Req'd Ozs. | (Grams) | Catalogue Number Ferrous Alloy | Aluminum |
|---|---|---|---|---|---|---|
| **Male/Female (Removable Male Nipple)** | | | | | | |
| 1/2 | 1.06 | (2.7) | 1 | (28.4) | EYM-50 | EYM-50AL |
| 3/4 | 1.19 | (3.0) | 2 | (56.7) | EYM-75 | EYM-75AL |
| 1 | 1.38 | (3.5) | 4 | (113.4) | EYM-100 | EYM-100AL |
| 1-1/4 | 1.75 | (4.5) | 7 | (198.4) | EYM-125 | EYM-125AL |
| 1-1/2 | 2.06 | (5.2) | 13 | (368.5) | EYM-150 | EYM-150AL |
| 2 | 2.31 | (5.9) | 22 | (623.7) | EYM-200 | EYM-200AL |
| 2-1/2 | 2.69 | (6.8) | 36 | (1020.6) | EYM-250 | EYM-250AL |
| 3 | 3.13 | (7.9) | 61 | (1729.3) | EYM-300 | EYM-300AL |
| 3-1/2 | 3.44 | (8.7) | 89 | (2523.1) | EYM-350 | EYM-350AL |
| 4 | 3.69 | (9.4) | 114 | (3231.8) | EYM-400 | EYM-400AL |

**Male EYM**

1/2" – 1" 1-1/4" – 3" 3-1/2" – 4"

†Turning radius with cover or plug removed.



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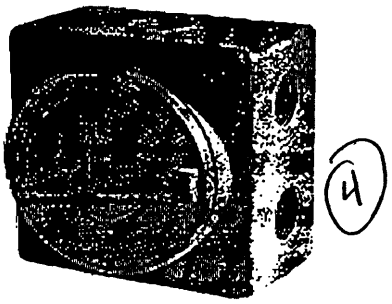
P.A.PELLETIER, P.ENG.

CSA Approved
Class I, Div. 1 and 2
Groups B, C, D;
Class I, Zone 1 and 2, IIB + $H_2$ T6,
Class II, Div. 1 and 2
Groups E, F, G;
Class III, Enclosure 3

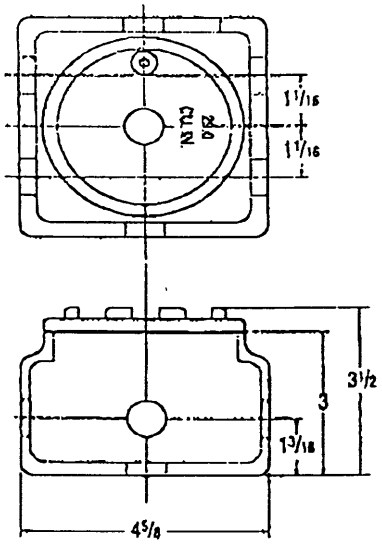
# GRSS Conduit Outlet Boxes with Multiple Hubs, Explosion-Proof, Dust-Ignition-Proof

UNILETS® for use with threaded metal conduit. Furnished with internal ground screw.

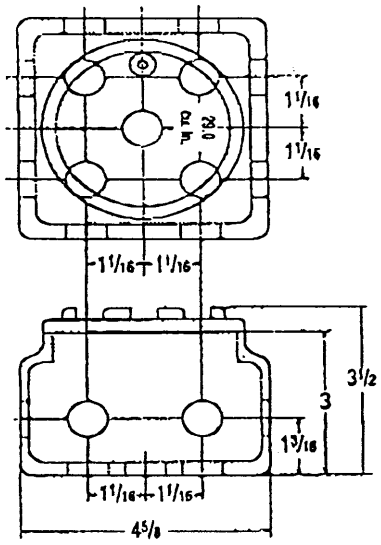


| Box Type | Conduit Size (In.) | Cover Opening (Inches) | Hubs | Plugs | Catalogue Number Aluminum |
|---|---|---|---|---|---|
| **GRSS Outlet Box with Cover** | | | | | |
| Internally threaded aluminum bodies with externally threaded aluminum form 1 covers. Has 7 hubs; 2 on each of the sides, 1 on the top, 1 on the bottom and 1 on the centre in the back. Furnished with 4 close-up plugs | | | | | |
| | 1/2 | 3.38 | 7 | 4 | GRSS50 |
| GRSS | 3/4 | 3.38 | 7 | 4 | GRSS75 |
| | 1 | 3.38 | 7 | 4 | GRSS100 |
| **GRSSA Outlet Box with Cover** | | | | | |
| Internally threaded aluminum bodies with externally threaded aluminum form 1 covers. Has 13 hubs; 2 on each side, 2 each on top and bottom and 5 in the back. Furnished with 5 close-up plugs | | | | | |
| | 1/2 | 3.38 | 13 | 5 | GRSSA50 |
| GRSS | 3/4 | 3.38 | 13 | 5 | GRSSA75 |

## Dimensions




GRSS




GRSSA

*In Group B atmospheres, all conduit runs must have a sealing fitting (not supplied) field installed adjacent to the enclosure.

750 Lawrence Street
Cambridge, Ontario N3H 2N1

EGS Appleton

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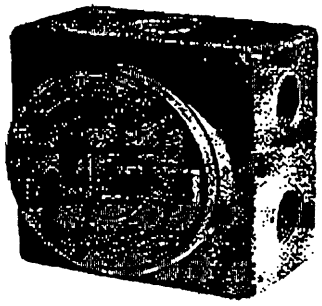
G, FAUTEUX, P.ENG.
P.A.PELLETIER, P.ENG.

CSA Approved
Class I, Div. 1 and 2
Groups B, C, D;
Class I, Zone 1 and 2, IIB + $H_2$ T6,
Class II, Div. 1 and 2
Groups E, F, G;
Class III, Enclosure 3

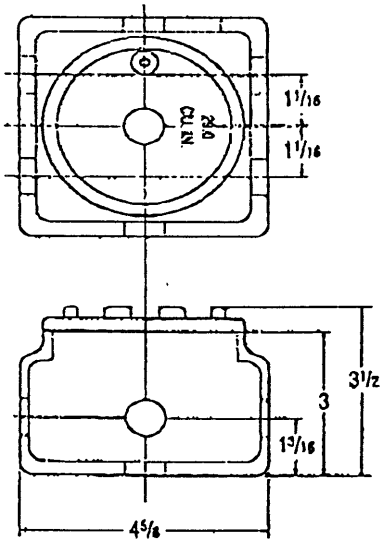
# GRSS Conduit Outlet Boxes with Multiple Hubs, Explosion-Proof, Dust-Ignition-Proof

UNILETS® for use with threaded metal conduit. Furnished with internal ground screw.

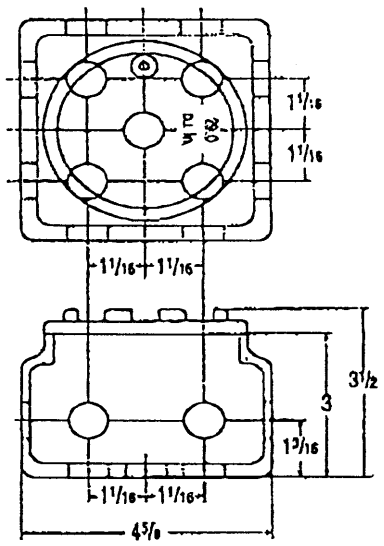


| Box Type | Conduit Size (In.) | Cover Opening (Inches) | Hubs | Plugs | Catalogue Number Aluminum |
|---|---|---|---|---|---|
| **GRSS Outlet Box with Cover** | | | | | |
| Internally threaded aluminum bodies with externally threaded aluminum form 1 covers. Has 7 hubs; 2 on each of the sides, 1 on the top, 1 on the bottom and 1 on the centre in the back. Furnished with 4 close-up plugs | | | | | |
| | 1/2 | 3.38 | 7 | 4 | GRSS50 |
| GRSS | 3/4 | 3.38 | 7 | 4 | GRSS75 |
| | 1 | 3.38 | 7 | 4 | GRSS100 |
| **GRSSA Outlet Box with Cover** | | | | | |
| Internally threaded aluminum bodies with externally threaded aluminum form 1 covers. Has 13 hubs; 2 on each side, 2 each on top and bottom and 5 in the back. Furnished with 5 close-up plugs | | | | | |
| | 1/2 | 3.38 | 13 | 5 | GRSSA50 |
| GRSS | 3/4 | 3.38 | 13 | 5 | GRSSA75 |

## Dimensions




GRSS




GRSSA

*In Group B atmospheres, all conduit runs must have a sealing fitting (not supplied) field installed adjacent to the enclosure.

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Cambridge, Ontario N3H 2N1

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CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK per; C. FAUTEUX, T.P.
G, FAUTEUX, P.ENG.
P.A.PELLETIER, P.ENG.

**Class I, Groups A, B, C, D;**
**Class II, Groups E, F, G;**
**Class III**

**Class I, Groups C, D;**
**Class II, Groups E, F, G;**
**Class III**



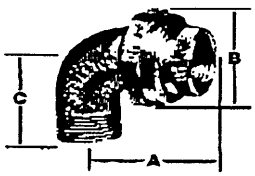
# Unions: UNY, UNF and UNL; Explosion-Proof, Dust-Ignition-Proof

Unilets® for Use with Threaded Metal Conduit

| | Size (Inches) | Dim. In Inches A | Dim. In Inches B | Dim. In Millimeters A | Dim. In Millimeters B | Catalogue Number Steel (1/2" to 1") and Malleable (1-1/4" to 6") | Catalogue Number Aluminum (1/2" to 4") |
|---|---|---|---|---|---|---|---|
| | **UNY Unions** | | | | | | |
| | For connecting conduit to enclosure | | | | | | |
| 1/2" – 1" | **Male** | | | | | | |
| | 1/2 | 1.94 | 1.47 | 49.2 | 37.3 | UNY50NR | UNY50NR-A |
| | 3/4-1/2‡ | 1.94 | 1.47 | 49.2 | 37.3 | UNY75-50NR | UNY75-50NR-A |
| | 3/4 | 1.94 | 1.75 | 49.2 | 44.5 | UNY75NR | UNY75NR-A |
| | 1 | 2.34 | 2.00 | 59.5 | 50.8 | UNY100NR | UNY100NR-A |
| | **Male/Female (Removable Male Nipple)** | | | | | | |
| 1-1/4" – 4" | 1-1/4 | 3.13 | 2.81 | 79.4 | 71.4 | UNY125NR | UNY125NR-A |
| | 1-1/2 | 3.25 | 3.06 | 82.6 | 77.8 | UNY150NR | UNY150NR-A |
| | 2 | 3.63 | 3.72 | 92.1 | 94.5 | UNY200NR | UNY200NR-A |
| | 2-1/2 | 4.81 | 4.88 | 122.2 | 123.8 | UNY250NR | UNY250NR-A |
| | 3 | 4.81 | 5.38 | 122.2 | 136.5 | UNY300NR | UNY300NR-A |
| | 3-1/2 | 4.94 | 5.88 | 125.4 | 149.2 | UNY350NR | UNY350NR-A |
| | 4 | 5.13 | 6.44 | 130.2 | 163.5 | UNY400NR | UNY400NR-A |
| | **UNF Female Unions** | | | | | | |
| | For connecting conduit to enclosure | | | | | | |
| 1/2" – 1" | 1/2 | 1.47 | 1.47 | 37.3 | 37.3 | UNF50NR | UNF50NR-A |
| | 3/4-1/2‡ | 1.47 | 1.47 | 37.3 | 37.3 | UNF75-50NR | UNF75-50NR-A |
| | 3/4 | 1.47 | 1.75 | 37.3 | 44.5 | UNF75NR | UNF75NR-A |
| | 1 | 1.72 | 2.00 | 43.7 | 50.8 | UNF100NR | UNF100NR-A |
| | 1-1/4 | 2.19 | 2.81 | 55.6 | 71.4 | UNF125NR | UNF125NR-A |
| | 1-1/2 | 2.19 | 3.06 | 55.6 | 77.8 | UNF150NR | UNF150NR-A |
| 1-1/4" – 4" | 2 | 2.31 | 3.72 | 58.7 | 94.5 | UNF200NR | UNF200NR-A |
| | 2-1/2 | 3.38 | 4.88 | 85.7 | 123.8 | UNF250R | UNF250R-A |
| | 3 | 3.38 | 5.38 | 85.7 | 136.5 | UNF300R | UNF300R-A |
| | 3-1/2 | 3.38 | 5.88 | 85.7 | 149.2 | UNF350R | UNF350R-A |
| | 4 | 3.50 | 6.44 | 88.9 | 163.5 | UNF400R | UNF400R-A |

**UNL 90° Elbow Unions**

For connecting conduit to enclosure



| | A | B | C | A | B | C | |
|---|---|---|---|---|---|---|---|
| 1/2-1/2 | 2.47 | 1.47 | 1.78 | 62.7 | 37.3 | 45.2 | UNL50NR |
| 1/2-3/4† | 2.47 | 1.75 | 1.78 | 62.7 | 44.5 | 45.2 | UNL75-50NR |
| 3/4-1/2† | 2.00 | 1.75 | 1.59 | 50.8 | 44.5 | 40.5 | UNL75NR |
| 3/4-3/4 | 2.00 | 1.47 | 1.59 | 50.8 | 37.3 | 40.5 | UNL100NR |

Shaded area indicates items suitable for Class I, Groups A and B in addition to Class I, Groups C and D; Class II Groups E, F, G and Class III.
‡Size of right end is given first. †Male end given first.



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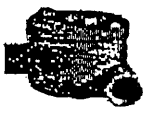
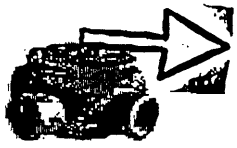
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK per; C. FAUTEUX, T.P.
G, FAUTEUX, P.ENG.
P.A.PELLETIER, P.ENG.

# J-3

CSA Approved
Class I, Div. 1 and 2
Groups B, C, D;
Class I, Zone 1 and 2, IIB + $H_2$ T6,
Class II, Div. 1 and 2
Groups E, F, G;
Class III, Enclosure 3

## GR Junction Unilets, Malleable or Copper-Free* Aluminum: Explosion-Proof, Dust-Ignition-Proof, and Weather Resistant (Raintight)

| Illustration | Malleable Iron Cat. No. | Aluminum Catalogue Number | Description | | Cover Opening | Form Number |
|---|---|---|---|---|---|---|
| | GRE50 | GRE50-A | GRE | 1/2 | 3-3/8 | 1 |
| | GRE75 | GRE75-A | | 3/4 | 3-3/8 | 1 |
| | GRE100 | GRE100-A | | 1 | 3-3/8 | 1 |
| | GRE125 | GRE125-A | | 1-1/4 | 3-15/16 | 2 |
| | GRE150 | GRE150-A | | 1-1/2 | 4-7/8 | 3 |
| | GRC50 | GRC50-A | GRC | 1/2 | 3-3/8 | 1 |
| | GRC75 | GRC75-A | | 3/4 | 3-3/8 | 1 |
| | GRC100 | GRC100-A | | 1 | 3-3/8 | 1 |
| | GRC125 | GRC125-A | | 1-1/4 | 3-15/16 | 2 |
| | GRC150 | GRC150-A | | 1-1/2 | 4-7/8 | 3 |
| | GRC200 | GRC200-A | | 2 | 4-7/8 | 3 |
| | GRL50 | GRL50-A | GRL | 1/2 | 3-3/8 | 1 |
| | GRL75 | GRL75-A | | 3/4 | 3-3/8 | 1 |
| | GRL100 | GRL100-A | | 1 | 3-3/8 | 1 |
| | GRL125 | GRL125-A | | 1-1/4 | 3-15/16 | 2 |
| | GRL150 | GRL150-A | | 1-1/2 | 4-7/8 | 3 |
| | GRL200 | GRL200-A | | 2 | 4-7/8 | 3 |
| | GRLB50 | GRLB50-A | GRLB | 1/2 | 3-3/8 | 1 |
| | GRLB75 | GRLB75-A | | 3/4 | 3-3/8 | 1 |
| | GRLB100 | GRLB100-A | | 1 | 3-3/8 | 1 |
| | GRLB125 | GRLB125-A | | 1-1/4 | 3-15/16 | 2 |
| | GRLB150 | GRLB150-A | | 1-1/2 | 4-7/8 | 3 |
| | GRLB200 | GRLB200-A | | 2 | 4-7/8 | 3 |
|  | GRN50 | GRN50-A | GRN | 1/2 | 3-3/8 | 1 |
| | GRN75 | GRN75-A | | 3/4 | 3-3/8 | 1 |
| | GRN100 | GRN100-A | | 1 | 3-3/8 | 1 |
| | GRN125 | GRN125-A | | 1-1/4 | 3-15/16 | 2 |
| | GRN150 | GRN150-A | | 1-1/2 | 4-7/8 | 3 |
| | GRT50 | GRT50-A | GRT | 1/2 | 3-3/8 | 1 |
| | GRT75 | GRT75-A | | 3/4 | 3-3/8 | 1 |
| | GRT100 | GRT100-A | | 1 | 3-3/8 | 1 |
| | GRT125 | GRT125-A | | 1-1/4 | 3-15/16 | 2 |
| | GRT150 | GRT150-A | | 1-1/2 | 4-7/8 | 3 |
| | GRT200 | GRT200-A | | 2 | 4-7/8 | 3 |
|  (24) | GRX50 | GRX50-A | GRX | 1/2 | 3-3/8 | 1 |
| | GRX75 | GRX75-A | | 3/4 | 3-3/8 | 1 |
| | GRX100 | GRX100-A | | 1 | 3-3/8 | 1 |
| | GRX125 | GRX125-A | | 1-1/4 | 3-15/16 | 2 |
| | GRX150 | GRX150-A | | 1-1/2 | 4-7/8 | 3 |
| | GRX200 | GRX200-A | | 2 | 4-7/8 | 3 |

NOTE: All GR boxes above are supplied with O-ring.

See page 5 for other covers available. If no covers are desired, specify catalogue number with suffix "LC", and deduct price of cover.
Form numbers indicate sizes of unilets which take correspondingly classified covers.



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SIFEC-KUDLIK per; C. FAUTEUX, T.P.G, FAUTEUX, P.ENG.
P.A.PELLETIER, P.ENG.

9-10

## Chapter 10 LIGHTNING

## MANUFACTURER/DISTRIBUTOR:

CDE
298,DEMARTIGNY OUEST
ST-JÉRÔME.QUE. J7Y 4C9
PH:450-438-1263

**10.1 TYPE 101 LIGHT FOR LABORATORY.**

**10.2 HID FACTORY SEALED FIXTURE EXPLOSION PROOF.**

**10.3 ELECTRICAL ROOM LIGHT FIXTURE TYPE RIU 32W.**

**10.4 CAST WALL PACK C/W POLYCARBONATE REFRACTOR.**

**10.5 LUNEX EMERGENCY LIGHT , B-SERIES.**

**10.6 STONCO WALL MOUNT FIXTURE.**

**10.7 MAXIMA EXIT LIGHT , SELF LUMINOUS.**

**END OF CHAPTER 10**

FROM **KUDLIK CONST./SIFEC NORTH**
P.O.BOX, 727,1519 FEDERAL ROAD
IQALUIT, NUNAVUT X0A 0H0
PH:867-979-7704 FAX:1169

SHOP DRAWING SUBMITAL

EMAIL:_____

TO CITY OF IQUALUIT
C/O EARTH TECH Canada INC.
C/O MR.G.PROSKO,PH
C/ D.COOK,
PH:780-488-6800 FAX:2121

DATE:_____
PAGE 1 OF_____

PROJECT: WASTE WATER TREATMENT PLANT IQUALUIT,

| NOTE | MANUFACTURER/DISTRIBUTOR | SPEC. | SHEET | DESCRIPTION | SECTION |
|---|---|---|---|---|---|
| | | | | | |
| | CDE | 16510 | 14 | TYPE 101 LIGHT FOR LABO | 10 |
| | 298,DEMARTIGNY OUEST | | | TYPE 201HID | 10 |
| | ST-JÉRÔME.QUE. J7Y 4C9 | | | TYPE 200 POLYCARBONATE REFRACTOR | 10 |
| | PH:450-438-1263 | | | | 10 |
| | | 16519 | 2 | MAXIMA EXIT | 10 |
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| Catalog Number | Type |
|---|---|
| CL 232341 GEB | 101 |
| | |

## FEATURES

- Choice of high impact, vandal-resistant acrylic, prismatic diffuser or Holophane® #7101-A injection-molded acrylic diffuser.
- End of diffuser includes decorative white injection-molded end caps.
- Pyramidal prisms minimize lamp image.
- Spring pin diffuser support prevents accidental opening and simplifies maintenance.
- Channel includes hemmed edges.
- Ballast cover secured by 1/4 turn fasteners; no tools required.
- Twist and lock anti-vibration lampholders.
- Available in tandem-wired lengths.
- High-gloss, baked white enamel finish.
- Guaranteed for one year against mechanical defects in manufacture.

## SPECIFICATIONS

BALLAST — Thermally protected, resetting, Class P, HPF, non-PCB, UL listed, CSA certified ballast is standard. Sound rated A. Standard combinations are CBM approved and conform to UL 935.

WIRING & ELECTRICAL — Fixture conforms to UL 1570 and is suitable for damp locations. AWM, TFN or THHN wire used throughout rated for required temperatures.

MATERIALS — Metal parts are die-formed from code gauge steel. Diffuser is 100% acrylic. No asbestos used in this product.

FINISH — Five-stage, iron-phosphate pretreatment ensures superior paint adhesion and rust resistance. Painted parts finished with high-gloss, baked white enamel.

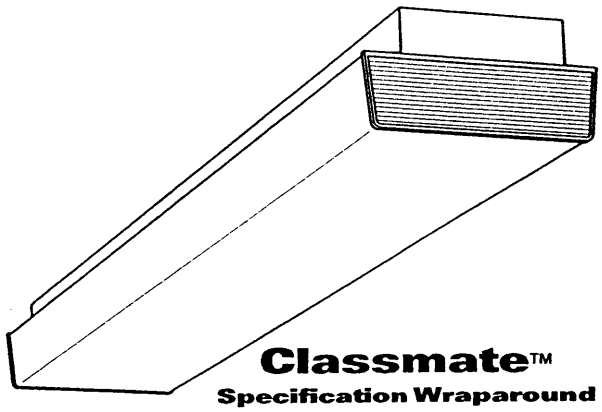
LISTING — UL listed and labeled. Listed and labeled to comply with Canadian Standards (see options). Listed and labeled to comply with Mexican Standards (see options).

Specifications subject to change without notice.

**Wraparound**

# CLM

4' and 8' Lengths
1, 2 and 3 Lamps



**Classmate™**
**Specification Wraparound**

## ENERGY

- Luminaire Efficacy Rating (LER) and Annual Energy Cost: Two-lamp LER.FW = 77. Annual Energy Cost = $3.12. Based on 32W T8 lamp, 2850 lumens and energy saving electronic ballast. Ballast factor = .88, input watts = 58.

Calculated in accordance with NEMA standard LE-5.

## PHOTOMETRICS

**CLM 1 32**

**Report LTL 6998 - Lumens per lamp = 2850**

**S/MH (along) 1.3 (across) 1.6**

**Coefficient of Utilization**

| Ceiling | 80% | | | 70% | | | 50% | | |
|---|---|---|---|---|---|---|---|---|---|
| Wall | 70% | 50% | 30% | 70% | 50% | 30% | 50% | 30% | 10% |
| 0 | 89 | 89 | 89 | 86 | 86 | 86 | 80 | 80 | 80 |
| 1 | 81 | 78 | 75 | 78 | 75 | 73 | 71 | 69 | 67 |
| 2 | 75 | 69 | 64 | 72 | 67 | 63 | 63 | 59 | 56 |
| 3 | 69 | 62 | 56 | 66 | 60 | 55 | 57 | 52 | 49 |
| 4 | 63 | 55 | 49 | 61 | 54 | 48 | 51 | 46 | 42 |
| 5 | 58 | 49 | 43 | 56 | 48 | 42 | 45 | 40 | 36 |
| 6 | 54 | 44 | 38 | 52 | 43 | 37 | 41 | 36 | 32 |
| 7 | 50 | 40 | 34 | 48 | 39 | 33 | 37 | 32 | 28 |
| 8 | 46 | 36 | 30 | 44 | 35 | 29 | 33 | 28 | 24 |
| 9 | 42 | 32 | 26 | 41 | 31 | 26 | 30 | 25 | 21 |
| 10 | 39 | 29 | 23 | 38 | 29 | 23 | 27 | 22 | 19 |

**Zonal Lumens Summary**

| Zone | Lumens | %Lamp | %Fixture |
|---|---|---|---|
| 0-30 | 494 | 17.3 | 20.7 |
| 0-40 | 846 | 29.7 | 35.4 |
| 0-60 | 1463 | 51.3 | 61.1 |
| 0-90 | 1912 | 67.1 | 79.9 |
| 90-180 | 480 | 16.9 | 20.1 |
| 0-180 | 2392 | 83.9 | 100.0 |

**CLM 2 32**

**Report LTL 7085 - Lumens per lamp = 2850**

**S/MH (along) 1.3 (across) 1.5**

**Coefficient of Utilization**

| Ceiling | 80% | | | 70% | | | 50% | | |
|---|---|---|---|---|---|---|---|---|---|
| Wall | 70% | 50% | 30% | 70% | 50% | 30% | 50% | 30% | 10% |
| 0 | 102 | 102 | 102 | 98 | 98 | 98 | 90 | 90 | 90 |
| 1 | 92 | 87 | 83 | 87 | 83 | 79 | 76 | 73 | 71 |
| 2 | 83 | 75 | 69 | 79 | 72 | 67 | 67 | 62 | 58 |
| 3 | 76 | 66 | 59 | 72 | 64 | 57 | 59 | 53 | 49 |
| 4 | 70 | 59 | 51 | 66 | 57 | 49 | 52 | 46 | 42 |
| 5 | 64 | 53 | 45 | 61 | 51 | 43 | 47 | 41 | 36 |
| 6 | 59 | 47 | 40 | 56 | 46 | 38 | 42 | 36 | 32 |
| 7 | 55 | 43 | 35 | 52 | 41 | 34 | 39 | 32 | 28 |
| 8 | 51 | 39 | 32 | 49 | 38 | 31 | 35 | 29 | 25 |
| 9 | 48 | 36 | 29 | 45 | 35 | 28 | 32 | 27 | 22 |
| 10 | 44 | 33 | 26 | 43 | 32 | 25 | 30 | 24 | 20 |

**Zonal Lumens Summary**

| Zone | Lumens | %Lamp | %Fixture |
|---|---|---|---|
| 0-30 | 1089 | 19.1 | 21.5 |
| 0-40 | 1831 | 32.1 | 36.2 |
| 0-60 | 3122 | 54.8 | 61.6 |
| 0-90 | 4148 | 72.8 | 81.9 |
| 90-180 | 915 | 16.1 | 18.1 |
| 0-180 | 5164 | 88.8 | 100.0 |

**CLM 2 32 IM**

**Report LTL 7084 - Lumens per lamp = 2850**

**S/MH (along) 1.3 (across) 1.7**

**Coefficient of Utilization**

| Ceiling | 80% | | | 70% | | | 50% | | |
|---|---|---|---|---|---|---|---|---|---|
| Wall | 70% | 50% | 30% | 70% | 50% | 30% | 50% | 30% | 10% |
| 0 | 101 | 101 | 101 | 97 | 97 | 97 | 89 | 89 | 89 |
| 1 | 92 | 88 | 84 | 88 | 84 | 81 | 78 | 75 | 73 |
| 2 | 84 | 77 | 72 | 80 | 74 | 69 | 68 | 64 | 61 |
| 3 | 77 | 68 | 62 | 73 | 66 | 60 | 61 | 56 | 52 |
| 4 | 71 | 61 | 54 | 67 | 59 | 52 | 54 | 49 | 44 |
| 5 | 65 | 54 | 47 | 62 | 52 | 46 | 49 | 43 | 39 |
| 6 | 60 | 49 | 42 | 57 | 47 | 40 | 44 | 38 | 34 |
| 7 | 56 | 44 | 37 | 53 | 43 | 36 | 40 | 34 | 30 |
| 8 | 52 | 40 | 33 | 50 | 39 | 32 | 37 | 31 | 27 |
| 9 | 48 | 37 | 30 | 46 | 36 | 29 | 34 | 28 | 24 |
| 10 | 45 | 34 | 27 | 43 | 33 | 27 | 31 | 25 | 22 |

**Zonal Lumens Summary**

| Zone | Lumens | %Lamp | %Fixture |
|---|---|---|---|
| 0-30 | 1152 | 20.2 | 23.0 |
| 0-40 | 2001 | 35.1 | 39.9 |
| 0-60 | 3396 | 59.6 | 67.8 |
| 0-90 | 4078 | 71.5 | 81.4 |
| 90-180 | 934 | 16.4 | 18.6 |
| 0-180 | 5011 | 87.9 | 100.0 |

10.1

# CLM Wraparound

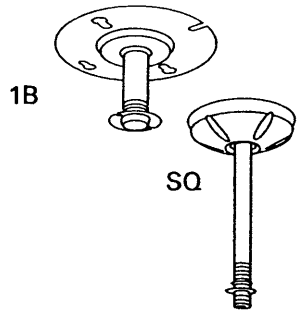
## MOUNTING DATA

For unit or row installation, surface or stem mounting.

Unit installation —Two single-stem hangers required.

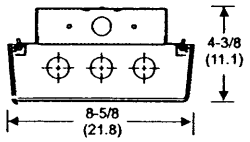
Row installation — One hanger per fixture plus one per row required.

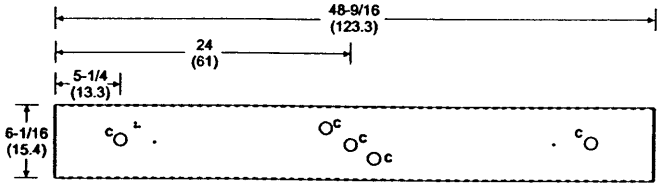
See ACCESSORIES below for hanging devices.



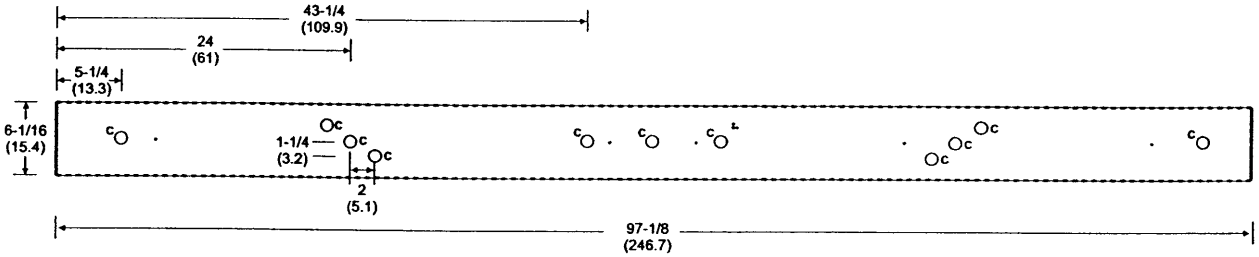

## DIMENSIONS

Inches (centimeters). Subject to change without notice.




C = 7/8 (2.2) diameter K.O.




## ORDERING INFORMATION

Example: **TCLM 2 32 277 1/4 GEB**

**CLM**

| Series | Number of lamps | Lamp type | Diffuser type* | Voltage | Options |
|---|---|---|---|---|---|
| **CLM** 8-5/8" wide | 1 (2) 3 | (32) 32W T8 (48") | (blank) High impact prismatic | 120, 277, (347) | (GEB) Electronic ballast, ≤ 20%THD |
| For tandem, double-length unit, add prefix T. Example: **TCLM. Two 4' diffusers provided on 8' units.** | Not included. | 40 40W T12 (48") | IM Injection-molded Holophane #7101 | Others available. | GEB10 Electronic ballast, ≤ 10% THD<br>1/3 One 3-lamp ballast<br>1/4 One 4-lamp ballast<br>2/3 Two 3-lamp ballasts<br>EL Self-contained emergency inverter<br>CSA Listed and labeled to comply with Canadian Standards<br>NOM Listed and labeled to comply with MexicanStandards |

### *Accessories*

Order as separate item.

**SQ__** Swivel-stem hanger (specify length in 2" increments).

**1B** Ceiling spacer adjusts from 1-1/2" to 2-1/2" from ceiling.

NOTES:

* Diffuser ships separate from fixture.

101.



©2000 Lithonia Lighting 3/00
CLM.P65

LITHONIA LIGHTING
GENERAL FLUORESCENT LIGHTING
ONE LITHONIA WAY, CONYERS, GEORGIA 30012, TELEPHONE 770-922-9000, FAX 770-929-8789
www.lithonia.com • IN CANADA: 1100 50TH AVE., LACHINE, QUEBEC H8T 2V3

#201

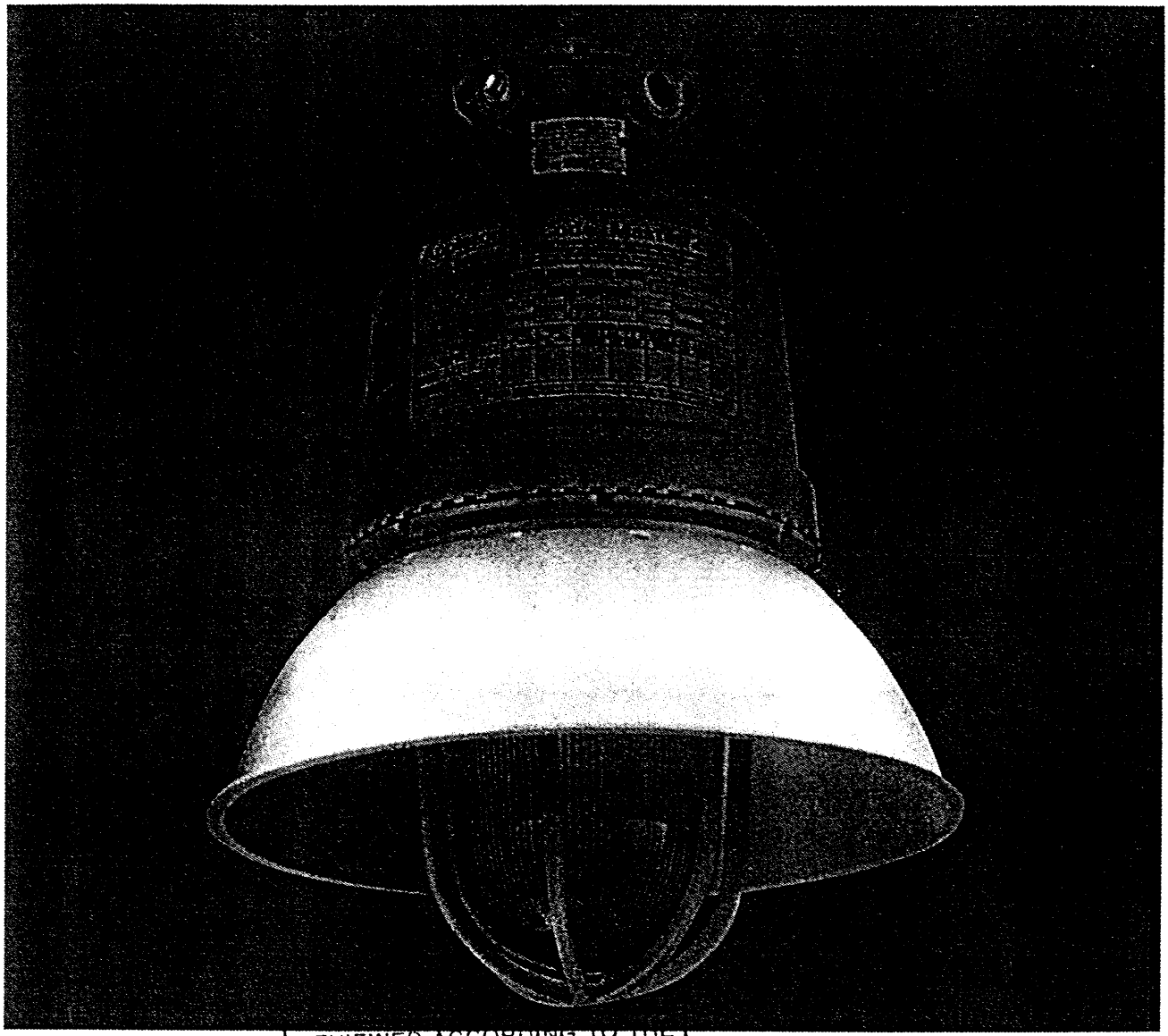




**Class I, Div. 1 and 2,
Groups B, C, D;
Class II, Div. 1,
Groups E, F, G;
Class II, Div. 2,
Groups F, G;
Class III,
CSA 4X
Suitable for Wet Locations.
Exd IIB + $H_2$**

# Code•Master 2™ HID Factory Sealed Fixtures: Explosion-Proof, Dust-Ignition-Proof

Integrally Ballasted for H.P.S., M.H. or M.V. Lamps.
For use with Threaded Metal Conduit.



**Lamp Type and Watts:**

- 70W-400W HPS
- 175W-400W MH
- 175W-400W MV

REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT. ANY ACTION INDICATED IS SUBJECT TO THESE REQUIREMENTS.

- ☐ NO EXCEPTIONS TAKEN
- ☑ MAKE NOTED CORRECTIONS
- ☐ REVISE & RESUBMIT
- ☐ REJECTED

DATE _____ BY _____
EARTH TECH (CANADA) INC.

Compliances
• CSA Listed

JOB; WASTE WATER TREATMENT PLANT AT IQUALUIT, NUNAVUT
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK per; C. FAUTEUX, T.P.
G, FAUTEUX, P.ENG.
P.A.PELLETIER, P.ENG.

10.2



Appleton Electrical Group
750 Lawrence Street
Cambridge, Ontario N3H 2N1

**lass I, Div. 1 and 2,**
**roups B, C, D;**
**Class II, Div. 1,**
**Groups E, F, G;**
**Class II, Div. 2,**
**Groups F, G;**
**Class III,**
**CSA 4X**
**Suitable for Wet Locations.**
**Exd IIB + $H_2$**

# Code•Master 2™ HID Factory Sealed Fixtures: Explosion-Proof, Dust-Ignition-Proof

Integrally Ballasted for H.P.S., M.H. or M.V. Lamps.
For use with Threaded Metal Conduit.

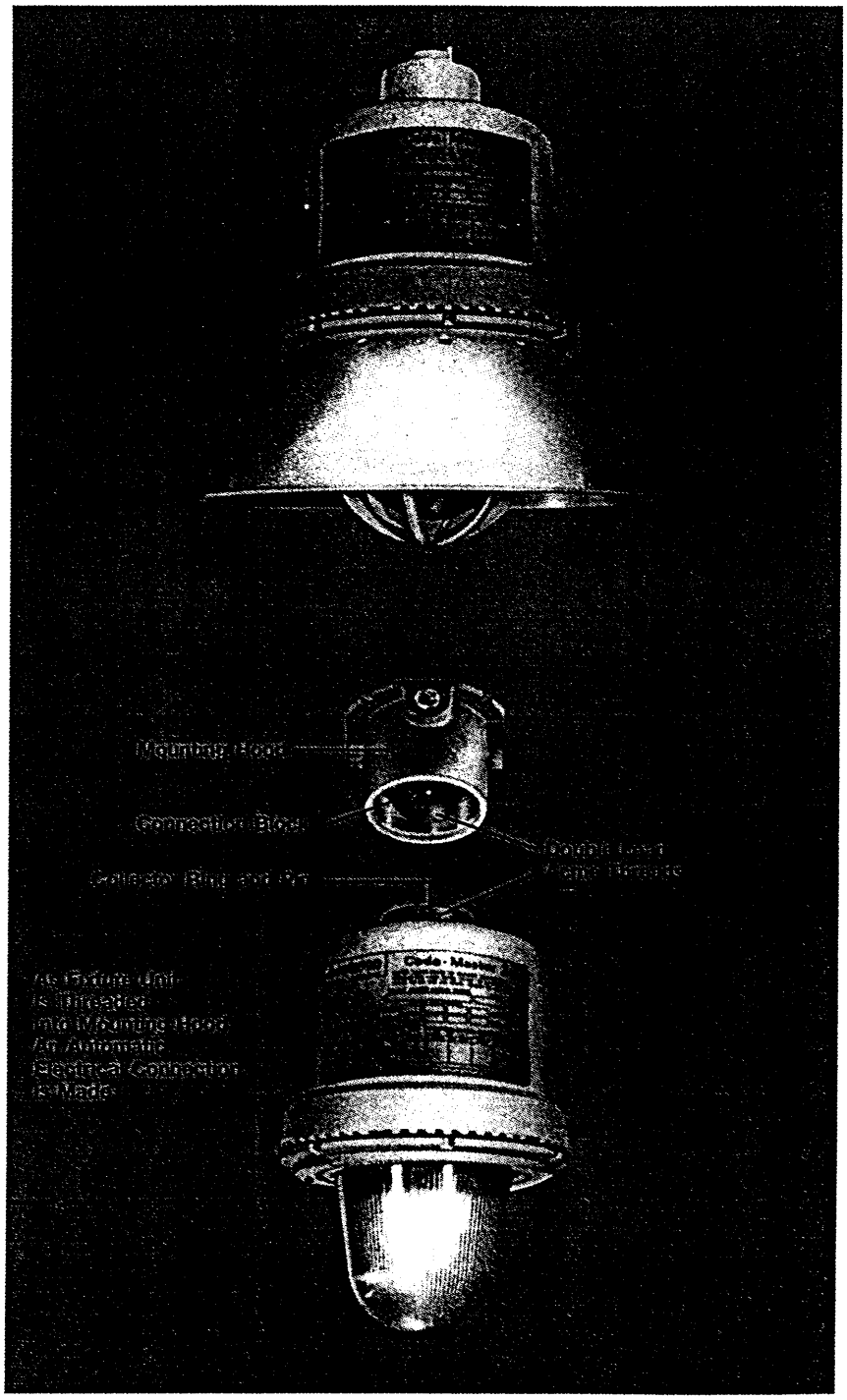
### Applications

- Ideal for use in chemical and petrochemical plants, such as manufacturers of plastics, paints and thinners, in refineries, and in other process areas where ignitable vapours, dust, moisture and corrosive elements may be present.
- Suitable for use in wet locations.

### Features

- Fixtures operate safely in high ambient temperatures. For example, in Class I areas the 150W HPS fixture operates at a maximum temperature of 120°C in a 65°C ambient (100°C temperature in a 40°C ambient). See page 12 for specific ratings.
- Arrangement of heat-producing components results in more efficient heat dissipation for cooler fixture operation.
- Patented "wireless" design. Threading of fixture unit onto mounting hood makes electrical connection. Only wiring required is attaching two wires to connection block in mounting hood.

  Connection block is easily wired: (a) loosen two screws, (b) make wire connections, (c) re-position connection block.
- Safe, easy servicing without disconnecting any wiring. "Wireless" fixture unit easily threads off mounting hood for convenient servicing or for immediate replacement with a "stand-by" unit.
- Acme double lead threads speed installation and fixture removal from mounting hood—only half as many turns are required as for single lead threads. The threads do not stick, or gall, eliminating the troublesome problems often encountered with single lead threads during fixture unit removal.
- Five threads are always fully engaged in an explosion-proof manner, even after fixture unit is backed off to break the electrical connection.
- Engineered for safety. Safe even if current is accidentally left on, because arcing, if any, is safely confined to the interior.
- All threaded joints are flame-tight.
- Integrally-ballasted HID lighting fixtures; separate ballasts not required.
- Factory sealed. External seals not required.
- Strategic location of lamp socket, in combination with the interior prism design of the glass globe, provides optimum light distribution and control.




2

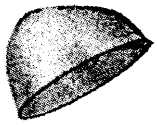
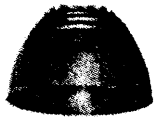
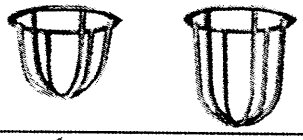
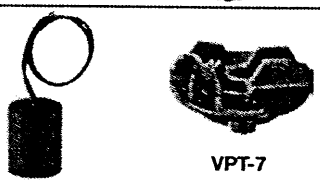
10.2

THR201

# G1-15

**Class I, Div. 1 and 2, Groups B, C, D; Class II, Div. 1, Groups E, F, G; Class II, Div. 2, Groups F, G; Class III, CSA 4X UL 1572, 844, 595 Exd IIB + $H_2$**

## Reflectors, Globes, Guards and Parts for Code•Master 2™ HID Lighting Fixtures

| | Description | Catalogue Number |
|---|---|---|
| Standard and Deep Dome  30° Angle | **Polyester Reflectors— 50 thru 400w** | |
| | Standard Dome | CMR-4ST |
| | Deep Dome | CMR-4DD |
| | 30° Angle | CMR-4AN |
|  | **Alzak Aluminum High Bay Reflectors— 50W thru 400W** | CMR-4HB |
| | **Prismatic Glass Globes— 50W thru 400W and Ring Assembly** | |
| | 50, 70, 100, 150W HPS; 175, 250W MH; 100, 175, 250W MV. | CGL-250 |
| | 250, 400W HPS; 400W MV and MH. | CGL-400 |
|  | **Aluminum Guards— 50W thru 400W** | |
| | 50, 70, 100, 150W HPS; 175, 250W MH; 100, 175, 250W MV. | CGU2 |
| | 250, 400W HPS; 400W MV and MH. | CGU4 |
|  VPT-7 | **Replacement Sockets— 50W thru 400W** | |
| | For all Code•Master 2 HID fixtures | CMS-400 |
| | **Connection Block— 50W thru 400W** | |
| | For all Code•Master 2 HID fixtures | VPT-7 |

**Quartz Emergency Lamp for Mercury Vapour, Metal Halide and High Pressure Sodium Fixtures.**
Fixtures can be supplied with a socket to accept a 150W or 250W, 120V quartz lamp. This D.C. bayonet base socket is in addition to the standard lamp socket, independant of the lighting fixture voltage.

Add suffix . . . . . -E

**HPS Instant Restart Accessories of HPS Fixtures**
Fixtures can be supplied with a special ignitor (starter board). The *hot* lamp restart option provides instant restart of HPS lamps after power outages of up to 30 seconds. This accessory does not accelerate cold lamp start-up. Factory installed only.

Add suffix . . . . . -HRE

**HPS Safety Starter/Pulse Eliminator**
Safety starter effectively shuts down ballast components upon end of lamp life. Eliminates unnecessary operation of components after lamp failure.

Add suffix . . . . . -PE

**Fusing**

(CWA) Single fuse add suffix . . . . . -F1
(CWI) Double fuse add suffix . . . . . -F2



EGS Electrical Group | Appleton
750 Lawrence Street
Cambridge, Ontario N3H 2N1

EGS Electrical Group

Appleton®

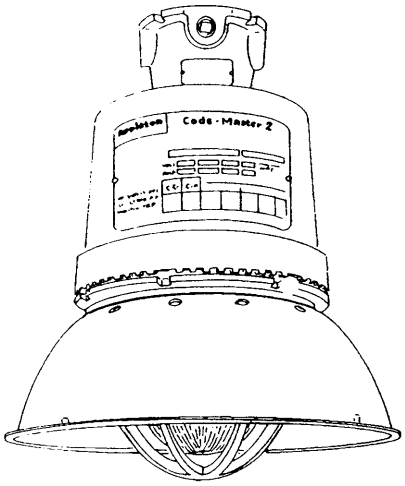
**654028-001**
**INSTRUCTION SHEET**

# INSTALLATION AND MAINTENANCE INSTRUCTIONS
# CODE•MASTER 2 LUMINAIRE

**Read carefully before attempting to install fixture.**

**Class I, Div. 1 and 2,**
**Groups C, D**
**Class II, Div. 1**
**Groups E,F, G**
**Class II, Div. 2**
**Groups F, G**
**Class III**

**UL 1598A, 844**
**Suitable for Use in Wet Locations**




U.S. Pat. 3,170,750
Pat Can 1968

## Code•Master 2™ Factory Sealed Fixtures: Explosion-Proof, Dust-Ignition-Proof; 50W-400W

High Pressure Sodium: High Power Factor (Min.P.F. 90%), Metal Halide and Mercury Vapor: Constant Wattage (Min P.F. 90%), Pulse Start Metal Halide: Super CWA (Min. P.F. 90%).

### Applications

- Ideal for use in chemical and petrochemical plants such as manufacturers of plastics, paints and thinners in refineries, and in other process areas where ignitable vapors, dust, moisture and corrosive elements may be present.
- Suitable for use in wet locations.

### Features

- Fixtures operate safely in high ambient temperatures. For example, in Class I areas the 150W HPS fixture operates at a maximum temperature of 120°C in a 65°C ambient (100°C temperature in a 40°C ambient). See page 4 for specific ratings.
- Arrangement of heat-producing components results in more efficient heat dissipation for cooler fixture operations.
- Patented "wireless" design. Threading of fixture unit onto mounting hood makes electrical connection. Only wiring required is attaching two wires to connection block in mounting hood.
- Connection block is easily wired: (a) loosen two screws. (b) make wire connections (c) re-position connection block.
- Safe, easy servicing without disconnecting any wiring. "Wireless" fixture unit easily threads off mounting hood for convenient servicing or for immediate replacement with a "stand-by" unit.
- Acme double lead threads speed installation and fixture removal from mounting hood-only half as many turns are required as for single lead threads.

10.2.

## INSTALLATION AND MAINTENANCE INSTRUCTIONS
## CODE•MASTER 2 LUMINAIRE

Read carefully before attempting to install fixture

**VERIFY** that the supply line voltage and fixture nameplate voltage are compatible. (If more than one ballast voltage is listed on nameplate, fixture contains a multi-tap ballast requiring one internal connection. (See below.)
**VERIFY** that the fixture operating temperature marked on nameplate complies with temperature restrictions of hazardous area.
**USE** supply wire rated for ambient temperature to be encountered. See nameplate.

**INSTALLATION OF MOUNTING ACCESSORIES:**

**PENDANT HOOD**

Remove connection block from hood by loosening two mounting screws. Thread hood onto conduit and tighten locking set screw. Connect the ground wire to the green screw provided in hood. Connect supply wires to connection block. Replace connection block into mounting hood and tighten securely.

**STANCHION ARM**

Remove connection block. Thread stanchion onto conduit and tighten locking set screw. Connect electrically as described under pendant hood.

**WALL BRACKET AND CEILING BOX**

Install wall bracket or ceiling box on support surface with four bolts through four external mounting holes. Remove connection block and connect electrically as described under pendant hood.

**INSTALLATION OF FIXTURE**

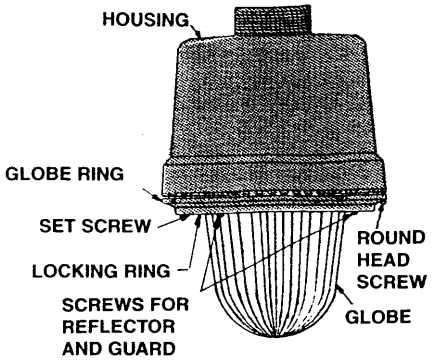
Single voltage fixtures are completely wired, needing no additional field wiring. Fixtures with multi-tap ballasts (more that one ballast voltage listed on nameplate) need to have one ballast primary lead connected to fixture lead.

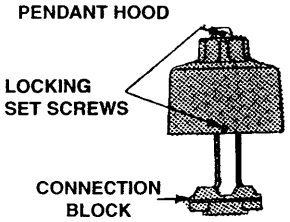
**REMOVING GLOBE-RING ASSEMBLY**

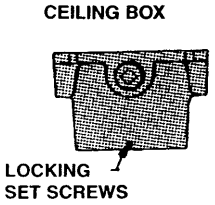
Loosen round head locking screw in globe ring until screw clears pry bars in ballast housing. Unthread globe-ring assembly (Do not hold glass globe to unthread globe-ring assembly as this might loosen globe locking ring. Should the globe locking ring be accidentally loosened it must be retightened. Loosen set screw in globe locking ring and tighten the locking ring, then retighten the set screw.) A screwdriver inserted through slot in ring and operated against pry bars in housing will assist in removing globe-ring assembly.

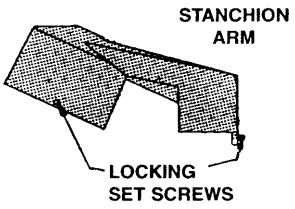
**WIRING MULTI-TAP BALLAST**

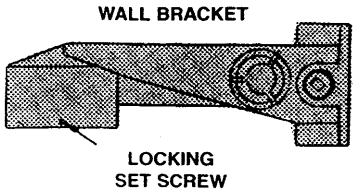
Loosen the three screws securing the socket support plate, remove plate and set aside (enough slack in the wires is provided). Locate fixture lead marked "Line" and connect to ballast voltage lead corresponding to supply voltage. All other ballast voltage leads must remain capped. Replace socket support plate and tighten the three screws.



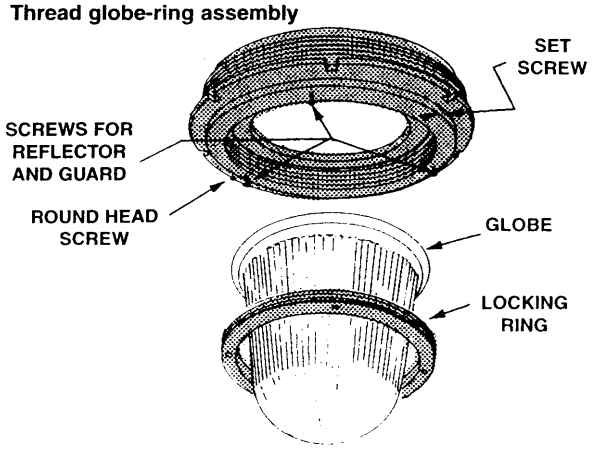



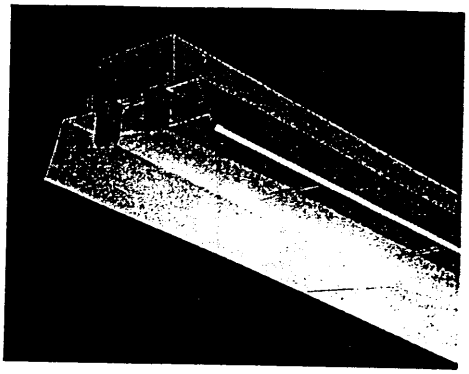

**Thread globe-ring assembly**




10.2

# RI
# RIU

AVAILABLE IN CANADA ONLY



## Intended Use

Intended for mounting heights up to 16' requiring low to medium light levels. Ideal for light-duty areas, utility, storage rooms or retail.

## Features

Solid top reflector or 5% uplight is available. Sturdy combination reflector and channel cover secured by two screws. Combination endplate/channel connector supplied with each fixture. High-gloss baked white enamel finish. Reflector is painted after fabrication. Available in tandem wired lengths. Accepts plug-ins for one or two primary circuits.

Ballast – Thermally protected, resetting, Class P, HPF, non-PCB, UL listed, CSA-certified ballast is standard. Sound rating depends on lamp/ballast combination.

Wiring & Electrical – AWM, TFN or THHN wire used throughout, rated for required temperatures.

Mounting – For unit or row installations, surface or suspended mounting.

Listings – CSA Certified. Suitable for damp locations. **These models not available in U.S.**

## Ordering Information

Example: **RI 2 96T8 120 GEB**

**Series**
- **RI** Solid reflector
- **RIU** 5% uplight

For tandem double-length unit, add prefix T. Example: TRIU

**Number of lamps**
- **1, 2**

Not included.

**Lamp type**
- **17** 17W T8 (24")
- **20** 20W T12 (24")[1]
- **32** 32W T8 (48")
- **40** 40W T12 (48")
- **48** 38W Slimline (48")
- **96** 75W Slimline (96")
- **96T8** 59WT8 Slimline (96")

**Voltage**
- **120**
- **277**
- **347**
- **MVOLT***

Others available.

* 120-277V. Must specify GEB10IS.

**Options/Accessories**
- **1/4** One 4-lamp ballast
- **GEB** Electronic ballast, ≤20% THD
- **GEB10IS** T8 electronic ballast, ≤10% THD, instant start
- **GEB10RS** T8 electronic ballast, ≤10% THD, rapid start

See page 99 for others.

## Availability and Dimensions

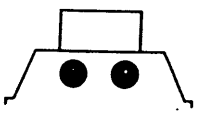
| Series | Lamps per cross section | Lamps per fixture | Lamp type | Width[2] in. (cm) | Depth[2] in. (cm) | Length[2] in. (cm) |
|---|---|---|---|---|---|---|
| RI, RIU | 1 | 1 | 17, 20[1] | 9 (22.9) | 4¼ (10.8) | 24 (61.0) |
| | 2 | 2 | | | | |
| RI, RIU | 1 | 1 | 32, 40, 48 | 9 (22.9) | 4¼ (10.8) | 48 (121.8) |
| | 2 | 2 | | | | |
| TRI, TRIU | 1 | 2 | 32, 40, 48 | 9 (22.9) | 4¼ (10.8) | 96 (243.6) |
| | 2 | 4 | | | | |
| RI, RIU | 1 | 1 | 96, 96T8 | 9 (22.9) | 4¼ (10.8) | 96 (243.6) |
| | 2 | 2 | | | | |

NOTES:
1. Specify ballast option HPF or LPF for 20W.
2. For detailed mounting information consult the product specification sheets.

1/1

Drawings for dimensional detail only.
May not represent actual mechanical configuration.
Dimensions are shown in inches (centimeters).

10.3



REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT. ANY ACTION INDICATED IS SUBJECT TO THESE REQUIREMENTS.

- [x] NO EXCEPTIONS TAKEN
- [ ] MAKE NOTED CORRECTIONS
- [ ] REVISE & RESUBMIT
- [ ] REJECTED

DATE May 21/05 BY

JOB; WASTE WATER TREATMENT PLANT AT IQUALUIT, NUNAVUT
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK per; C. FAUTEUX, T.P.
G, FAUTEUX, P.ENG.
P.A.PELLETIER, P.ENG.

# Cast Wall-Paks, Polycarbonate Refractor

Building Mounted

TWP

REVIEWED ACCORDING TO THE REQUIREMENTS OF THE CONTRACT CONDITIONS OF THE CONTRACT. ANY ACTION INDICATED IS SUBJECT TO THESE REQUIREMENTS
NO EXCEPTIONS TAKEN
MAKE NOTED CORRECTIONS
REVISE & RESUBMIT

## Intended Use

/ entrances, loading docks, walkways and vehicle ramps.

## Features

Housing – Rear housing is rugged, die-cast aluminum. Corrosion-resistant, captive external hardware includes slotted hex-head and tamperproof fasteners. Finish is dark bronze (DDB) corrosion-resistant polyester powder.

Optics – Reflector is aluminum, finished in white enamel. Front housing and refractor are one-piece, injection-molded, UV-stabilized polycarbonate. Standard finish an opaque portion of front cover and back housing is dark bronze polyester. Refractor is sealed and gasketed to inhibit the entrance of outside contaminants.

Electrical – HPS, 70-150M: High-reactance, high-power factor (XHP). 175MH and MV: Constant-wattage autotransformer. Ballast is copper wound and 100% factory tested. UL listed. Electrical components mounted on back housing.

Installation – Top ¾" threaded wiring access. Back access through ¾" opening. For feed-thru wiring, use condulet tee (not included). Mount on any flat, non-combustible vertical surface.

Socket – Glazed porcelain (mogul base), horizontally oriented socket with copper alloy, nickel-plated screw shell and center contact. Medium-base for 150W and below: UL listed 660W, 600V, 4KV pulse rated. Mogul-base for 175W: UL listed 1500W, 600V, 4KV pulse rated.

Listings – UL Listed (standard). CSA or NOM Certified (see Options). UL listed for wet locations. IP65 rated in accordance with IEC standard 529.

JOB: WASTE WATER TREATMENT PLANT IQUALUIT, CONTRACTOR PRE-APPROVAL; SIFEC-KUDLIK per: C.FAUTEUX, T,P. G.FAUTEUX, P,ENG. P.A. PELLETIER, P,ENG

## Ordering Information

Example: **TWP 175M TB LPI**

| Designation | | Voltage |
|---|---|---|
| High Pressure Sodium | | 120 |
| TWP | 35S[1,2] | 208[4] |
| TWP | 50S[1] | 240[4] |
| TWP | 70S | 277 |
| TWP | 100S | 347 |
| TWP | 150S[3] | 480[4] |
| Metal Halide | | TB[5] |
| TWP | 70M | |
| TWP | 100M | |
| TWP | 150M | |
| TWP | 175M | |
| Mercury Vapor | | |
| TWP | 100H | |
| TWP | 175H | |
| Low Pressure Sodium | | |
| TWP | 35L[1] | |
| Incandescent | | |
| TWP | 200I | |

| Installed | |
|---|---|
| SF | Single fuse (120V, 277V, 347V)[1] |
| DF | Double fuse (208V, 240V, 480V)[1] |
| EC | Emergency circuit[6,7] |
| QRS | Quartz restrike system[6,7] |
| CR | Enhanced corrosion resistance |
| CRT | Non-stick protective coating[8] |
| PE | Photoelectric cell, button type[1] |
| LPI | Lamp included as standard |
| L/LP | Less lamp |
| FS | Full shield |

| Options/Accessories | |
|---|---|
| WG | Wireguard |
| SCWA | Super CWA pulse start ballast (150M only) |
| RHP | Reactor high power factor Ballast (HPS only) |
| RNP | Reactor normal power factor ballast (HPS only) |
| XHP | Reactance high power factor ballast (HPS only) |
| CSA | CSA Certified |
| NOM | NOM Certified (consult factory) |
| Architectural Colors (optional) | |
| DNA | Natural aluminum |
| DBL | Black |
| DMB | Medium bronze |
| DWH | White |
| DSS | Sandstone |

1/1

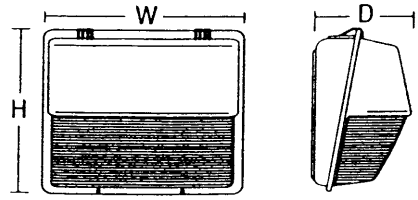
Lamp/Fixture/Ballast Data[9]

| Wattage | Lamp Ballast | Base Type | Type |
|---|---|---|---|
| High Pressure Sodium (med/clear) | | | |
| 35 | RHP | E17 | medium |
| 50 | RHP | E17 | medium |
| 70 | XHP | E17 | medium |
| 100 | XHP | E17 | medium |
| 150 | XHP | E17 | medium |
| Metal Halide (med(70/100/150)/mogul(175)/clear) | | | |
| 50 | HX-HPF | E17 | medium |
| 70 | HX-HPF | E17 | medium |
| 100 | HX-HPF | E17 | medium |
| 150 | HX-HPF | E17 | medium |
| 175 | CWA | BT28 | mogul |
| Mercury Vapor (mog/coated) | | | |
| 100 | CWA | E17 | medium |
| 175 | CWA | BT/ED28 | mogul |
| Low Pressure Sodium (D.C. bay/clear) | | | |
| 35 | HPF-LAG | T17 | medium |

| Accessories | (Order separately) |
|---|---|
| RK1 PEB1 | Photoelectric control kit, 120V |
| RK1 PEB2 | Photoelectric control kit, 208V, 240V, and 277V. |
| RK1 PEB1 CSA | Photoelectric control kit, 120V |
| RK1 PEB3 CSA | Photoelectric control kit, 347V |
| RK1 TWPFA FS | Field installable shield for cutoff |

Dimensions are shown in **inches (centimeters)** unless otherwise noted.

| | *TWP* |
|---|---|
| Height | 15⅞ (39.2) |
| Width | 16⅛ (41) |
| Depth | 7¾ (19.7) |
| Weight | 16 lbs (7 kg) |




NOTES:
1 Not available with 480V or TB.
2 120V only.
3 Operates 55V lamp. Consult factory in Canada; not available with 35S, 50S and 50M.
4 Optional multi-tap ballast (120V, 208V, 240V, 277V). In Canada 120V, 277V, 347V; ships as 120V/347V.
5 Lamp not included.
6 Quartz lamp wattage not to exceed ballast wattage rating.
7 Black finish on housing only.
8 Other ballast types available.

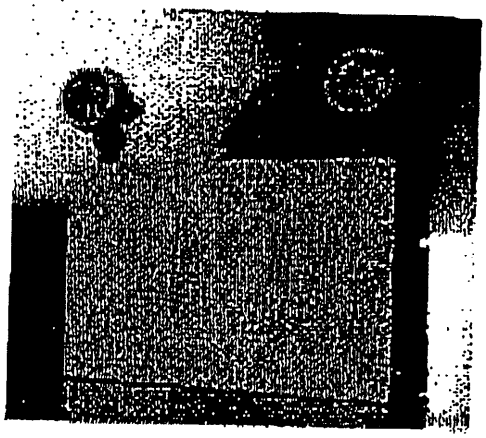
10.4

www.lithonia.com

Luxnet SEWAGE WATER IQUALUIT

# B-Series

- PulseGuard pulse switching charger, offers up to 70% better efficiency.
- 6 volt 85 to 180 watt capacities.
- 12 volt 100 to 360 watt capacities.
- 24 volt 144 to 720 watt capacities.
- Steel housing.
- 2 year complete warranty.



The B-Series emergency lighting series is a family of specification grade 6, 12 and 24 volt battery units designed with the PulseGuard pulse switching charger. The PulseGuard offers superior performance and energy efficiency versus conventional constant voltage chargers. Traditional top mounted PAR18 heads are standard, PAR36 heads are optional.

## Features:

- 20 Gauge steel cabinet.
- Magnum terminal connectors allows for larger gauge wires to be connected for remote loads.
- White finish.
- High impact thermoplastic heads.
- 9 watt R1-PAR18 heads standard, R2-PAR36 large heads optional.
- Universal mounting pattern and key hole slots on back and conduit K/O on side of the unit.

## Electrical:

- Input, 120/347VAC 60Hz.
- Fused output circuit.

## Circuitry:

- PulseGuard pulse switching charger, is up to 70% more efficient than older constant voltage chargers.
- Fully automatic current limited charger.
- Solid state line-latched low voltage disconnect protection.
- Temperature compensated.
- Brownout protection.
- Short circuit protection.
- Dual diagnostic LED display indicates AC-ON and High Charge.
- Push button test switch.

## Battery:

- Maintenance-free 10 year life expectancy - 6, 12 or 24 volt sealed valve regulated gas recombination lead technology.

## Warranty:

- 2 year net warranty on the complete unit - lamps excluded.

JOB; WASTE WATER TREATMENT
PLANT AT IQUALUIT, NUNAVUT
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK per; C. FAUTEUX, T.P.
G, FAUTEUX, P.ENG.
P.A.PELLETIER, P.ENG.

REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT. ANY ACTION INDICATED IS SUBJECT TO THESE REQUIREMENTS.

[✓] EXCEPTIONS TAKEN

[ ] MAKE NOTED CORRECTIONS

[ ] REVISE & RESUBMIT

[ ] REJECTED

July 21/04 BY DL

TECH (CANADA) INC.

– ONE FOR ELECTRICAL ROOM

Phone: 1 877 358 9638 or 905 948 9500 Fax: 905 948 8673
Beghelll Group

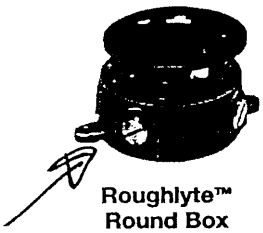


10.5

15300 sect 2.4 1/2 (9)

# ROUGHLYTE™ Series Accessories





Roughlyte™ Round Box

Roughlyte™ Round Plug

## 4" ROUND BOXES & PLUGS

Die-cast aluminum for use with conduit, Stonco ceiling, surface and wall fixtures and flood lights.

Four side and one back hole tapped 3/4" or 1/2", as shown. Heavy-duty gasket (except on VXL1), screws, four aluminum five-threaded plugs. No cover.

| Catalog No. | Tap Size | Description | Catalog No. | NPT Size | Description |
|---|---|---|---|---|---|
| **VXL1** | 1/2" | Mounting Box | **V12** | 1/2" | Plug |
| **VXL13** | 3/4" | Mounting Box | **V13** | 3/4" | Plug |

**VGC100 Clear Glass Globe**

**VGP100 Clear Prismatic Globe**

**VGR100 Ruby Glass Globe**

**VPRC10 Prismatic Lexan Globe**

## COLORED & SPECIALTY GLOBES

Full molded threads. Fit all Stonco housings.
Globes for vertical mounting only.

| Catalog No. | Description | | Catalog No. | Description | |
|---|---|---|---|---|---|
| **3-1/2" GLOBE DIA. GLASS** | | | **4-3/8" GLOBE DIA. GLASS** | | |
| **VGC100** | Clear* | | **VGC200** | Clear* | |
| **VGCH100** | Clear, heat tempered | | **VGCH200** | Clear, heat tempered | |
| **VGP100** | Clear, prismatic | | **VGP200** | Clear, prismatic | |
| **VGA100** | Amber | 60W Max. | **VGA200** | Amber | 75W Max. |
| **VGB100** | Blue | | **VGB200** | Blue | |
| **VGG100** | Green | | **VGG200** | Green | |
| **VGR100** | Ruby | | **VGR200** | Ruby | |
| **3-1/2" GLOBE DIA. LEXAN** | | | **4-3/8" GLOBE DIA. LEXAN** | | |
| **VPRC5** | Clear, prismatic (60W Max.) | | **VPRC10** | Clear, prismatic (75W Max.) | |

*Standard with all incandescent glass fixtures.
**NOTE:** Use of colored globes will down-rate wattage.

⇒ VGB100 RED

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☑ NO EXCEPTIONS TAKEN
☐ MAKE NOTED CORRECTIONS
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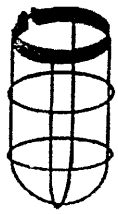
BY
SMITH TECH (CANADA) INC.



**V127 Plated Wire Guard**

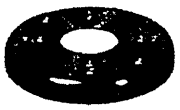
**V131 Cast Aluminum Guard**

## GUARDS

Wire guards are clamp-on type. Cast aluminum guards are twist on/off bayonet type, includes allen head security screws. Shipped with threaded ring adapter for use with standard threaded bases or the new RoughLyte™ bases.

| WIRE GUARD | | CAST GUARD | |
|---|---|---|---|
| Catalog No. | Fits Globe Diameter | Catalog No. | Fits Globe Diameter |
| **V127** | 3-1/2" | **V131** | 3-1/2" |
| **V128** | 4-3/8" | **V132** | 4-3/8" |

**VCN Adapter**



**VCA1 Recessed Box Adapter**
For use with VW and HID Series only.

## ADAPTER PLATES

Permits easy box mounting over various size boxes and plumb alignment.
Heavy-gauge aluminum. Complete with gasket, screws.

| Catalog No. | Use With | For Mounting On |
|---|---|---|
| **VCP** | VK Series | 4" octagon boxes |
| **VCP** | VW Series | 3-1/2" round boxes |
| **VCN** | VK & VW Series | 4" octagon boxes |
| **VCA1** | VW Series and HID Series | Recessed boxes |

10.6.

**NOTE:** Roughlyte™ fixtures are NOT for use in hazardous locations.

Crescent Stonco

Available from www.GoodMart.com

2/2

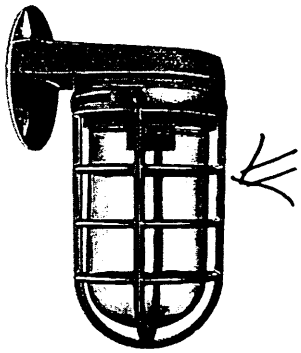
TYPE NO. _____

CATALOG NO. _____

Stonco



# ROUGHLYTE™ Series
# Wall Mount



## ORDERING INFORMATION

**Catalog Number:** Example: VW1GC

| VW | | |
|---|---|---|
| FIXTURE | WATTAGE | DESCRIPTION |
| VW-Wall Mount | 1-100W<br>2-200W | GC-Glass Globe and Cast Guard<br>K-Glass Globe<br>**No Suffix for unit only** |

## ACCESSORIES

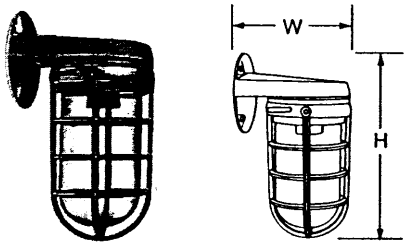
Accessories - See page 5-A

## TECHNICAL INFORMATION

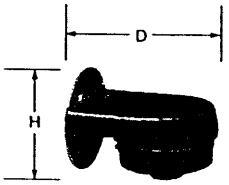
All incandescent Roughlyte ceiling and wall fixtures are not supplied with a lamp. This fixture requires a medium base incandescent A lamp. The lamp can be clear or coated.

**DIMENSIONS**

| Catalog No. | Height (H) | Dia. (D) |
|---|---|---|
| **VW1** | 4-1/4" | 5-3/8" |
| **VW2** | 4-1/4" | 5-7/8" |
| **VW1K** | 9-1/4" | 5-3/8" |
| **VW2K** | 11" | 5-7/8" |
| **VW1GC** | 9-3/4" | 5-1/2" |
| **VW2GC** | 11-1/2" | 6" |




VW1GC
Wall Unit with
Cast Guard and Glass Globe




VW1
Wall Adapter

## PRODUCT SPECIFICATIONS

- VW Roughlyte™ fixtures are for use on ceilings and canopies. VW guard against moisture and debris in exterior applications (for globe down mounting only). **Not recommended for use in hazardous locations.**
- Fits all 4" round and octagon boxes.
- Order VCA1 mounting plate for all 3-1/2" 4" recessed octagon box mounting.
- Order VCP mounting plate for all 3-1/2" 4" recessed octagon and round boxes for plumb alignment.
- Heat and shock resistant glass or polycarbonate globe.
- Sockets are pre-wired with extra long 1/2" stripped leads.
- For 3/4" conduit, use VW series with VXL13 universal box.
- Patented.

JOB; WASTE WATER TREATMENT PLANT AT IQUALUIT, NUNAVUT
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK, PER; C.FAUTEUX, T.P
G.FAUTEUX, P.ENG.
P.A.PELLETIER,P.ENG.

Roughlyte is a registered trademark of Stonco and is not for use in hazardous areas.

10.6

UL Wet Location Listed.
UL File Number: E57163

Available from www.GoodMart.com

Crescent Stonco

Industrial Application

JOB: SEWAGE WATER IQUALUIT | TYPE: TSL P20Y1RBW

# Maxima Exit

## PRODUCT OVERVIEW

The MAXIMA series of self-luminous exits are designed for easy installation. The use of internally sealed tritium gas as the illumination source reduces general maintenance issues and operational costs. The MAXIMA series does not require electrical power, wiring or batteries. The MAXIMA series is available in single or double face versions. Housings are available constructed from durable corrosion resistant thermoplastic or industrial grade aluminum, please specify when ordering. The MAXIMA series is offered in 10, 15 or 20 year versions. Signs can be specified as ceiling or wall mount.

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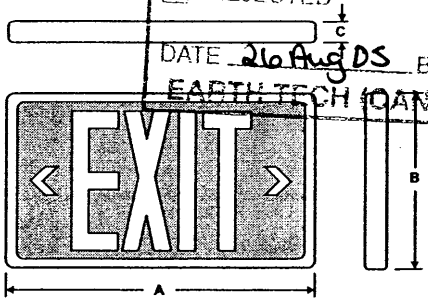
✓
REJECTED
DATE 26 Aug 05 BY DC
EARTH TECH (CANADA) INC.

## EXTERNAL SPECIFICATIONS

The MAXIMA series housing is available constructed from durable, corrosion resistant ABS thermoplastic or optional industrial grade aluminum. The MAXIMA faceplate is supplied standard with a red stencil and black frame finish (other colours are optional). Wall or ceiling mount configurations are available. Single or double face versions must be specified. Removable field adjustable chevron arrows are standard on each fixture.

## DIMENSIONS (in.)




| Housing | A" | B" | C" |
|---|---|---|---|
| | 12 1/4" | 8 1/4" | 1 1/4" |

## INTERNAL SPECIFICATIONS

SELF-LUMINOUS: standard self-luminous versions are internally illuminated by maintenance free sealed tritium filled tubes. Tritium source illumination provides constant emergency illumination as specified for either ten (10), fifteen (15) or twenty (20) years.

## INTERNAL SPECIFICATIONS

The MAXIMA series exit is suitable for surface ceiling and wall mounting. Suitable for wet location installations on normally inflammable surfaces.

## ORDERING INFORMATION

| Series | Housing Type | Duration | Faces | Stencil Colour | Frame Colour | Mounting | Options |
|---|---|---|---|---|---|---|---|
| TSL | PL (Plastic) | 10Y (Ten years) | 1 (Single face) | R (Red) | B (Black - standard) | C (Ceiling mount) | SW (Special wording - specify) |
| | AL (Aluminum) | 15Y (Fifteen years) | 2 (Double face) | G (Green) | W (White) | W (Wall mount) | WG (Wireguard) |
| | | 20Y (Twenty years) | | B (Black) | G (Grey) | | |

TSL P20Y1RBW

10.7.

MPLE: TSL-PL-20Y-1-R-W-C.
CRIPTION: TSL self-luminous exit, plastic frame, 20 year lifespan, single face, red stencil, white frame, ceiling.

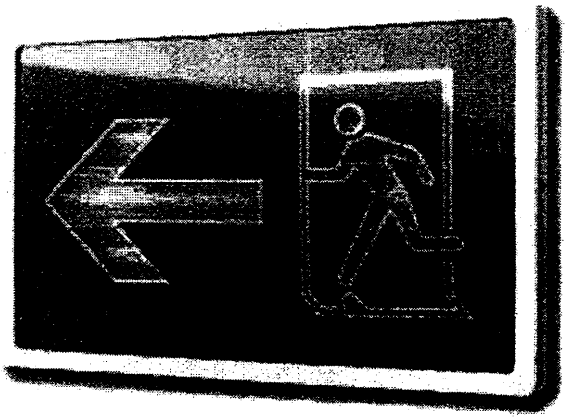
Beghelli

# Technical Data

Canadian Nuclear Safety Commission Approved

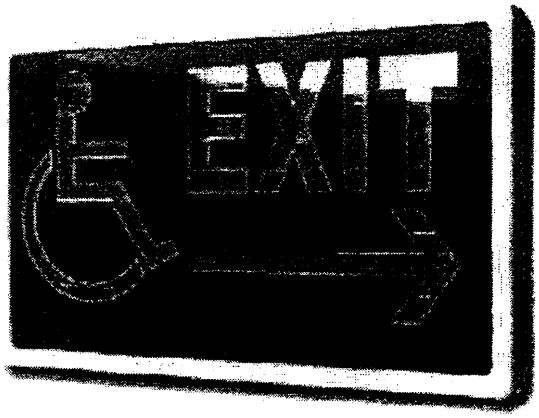
## PRACTICAL DESIGN

The MAXIMA series has been designed to perform in just about any environment. Requiring no external power source, installation is effortless and efficient. The practical design of the MAXIMA series allows installation and maintenance to be at a minimum. Since an external power source is not required, the installation of the MAXIMA series is not restricted by location or the lack of an easily accessible power source.



## EFFICIENT PERFORMANCE

The MAXIMA series is a completely self-powered, illuminated exit sign requiring no external power source of any kind. The MAXIMA series self-luminous sign is extemely reliable during its predicted life. The MAXIMA series exit sign is always "ON" requiring no wiring or electrical installation, and as a practical and environmental matter, consumes no power of any kind. The MAXIMA series life expectancy is 10 - 20 years, as specified.




## MECHANICAL SPECIFICATIONS

The MAXIMA series is manufactured under stringent quality control procedures and is licensed by the Canadian Nuclear Safety Commission and the U.S. Nuclear Regulatory Commission. Illumination is achieved by using a permanent internal light source. Tritium emits relatively low energy beta particles that bombard the phosphorus coated glass tubes, this action generates light. Light emitting phosphors are designed and selected according to their colour and light production efficiency. The MAXIMA series features several glass envelopes (tubes) that are encased behind plastic housing light diffusers. To reduce chances of breakage, the MAXIMA series features tritium tube shockproof mountings made of PVC.

10.7,

## WARRANTY

The MAXIMA exit series comes from the factory with a 5 year product warranty. Illumination is guaranteed to meet the specifications of the product as ordered (10 year, 15 year or 20 year).

Beghelli

## Chapter 11
## MOTOR CONTROL CENTERS

## MANUFACTURER/DISTRIBUTOR:

CDE
298,DEMARTIGNY OUEST
ST-JÉRÔME.QUE. J7Y 4C9
PH:450-438-1263

**11.1 LIGHT CONTACTOR, TYPE S.**

**11.2 TRANSFORMER 45 KVA.**

**11.3 ELECTRICAL ROOM PANEL "42 CIRCUITS 347/600V 3PH 250A"**

**11.4 ELECTRICAL ROOM PANEL "42 CIRCUITS 120/208V 3PH 225A"**

**11.5 (CD) ALTIVAR 78 "VARIABLE SPEED DRIVE"**

**11.6 SQUARE D ORIGINAL DRAWINGS CONTROL.**

**11.6.1** TABLE OF CONTENTS ELEMENTARY DIAGRAM .

**11.7 M.C.C INSTRUCTION BULLETIN "125 PAGES"**

**END OF CHAPTER 11**

FROM **KUDLIK CONST./SIFEC NORTH**
P.O.BOX, 727,1519 FEDERAL ROAD

IQALUIT, NUNAVUT X0A 0H0
PH:867-979-7704 FAX:1169

SHOP DRAWING SUBMITAL

EMAIL:_____

TO CITY OF IQUALUIT

C/O EARTH TECH Canada INC.
C/O MR.G.PROSKO,PH
C/ D.COOK,
PH:780-488-6800 FAX:2121

DATE:_____

PAGE 1 OF_____

PROJECT: WASTE WATER TREATMENT PLANT IQUALUIT,

| NOTE | MANUFACTURER/DISTRIBUTOR | SPEC. | SHEET | DESCRIPTION | SECTION |
|---|---|---|---|---|---|
| | | | | | |
| | CDE | 16461 | 1 | TRANSFORMER | 11 |
| | 298,DEMARTIGNY OUEST | | | | |
| | ST-JÉRÔME.QUE. J7Y 4C9 | 16471 | 2 | DATA FOR PANEL 6B & 2B | 11 |
| | PH:450-438-1263 | | | | |
| | | 16477 | 1 | CONTACTEURS D'ALIMENTATION POUR ÉCLAIRAGE | 11 |
| | | | | | |
| | | 16811 | 1 | ALTIVAR 78 | 11 |
| | | | | | |
| | | 16820 | 128 | PANELBOARD MANUAL | 11 |
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☒ NO EXCEPTIONS TAKEN
☐ MAKE NOTED CORRECTIONS
☐ REVISE & RESUBMIT
☐ REJECTED
DATE: May 12/05 DC



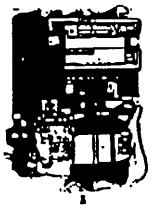
SQUARE D
Schneider Electric

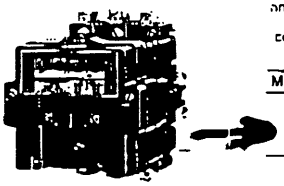
# Commande d'éclairage – Type S

16477

## Contacteurs d'alimentation pour éclairage
## Sélection et prix







Type S

Dossier E78427
CCN NNNT

Dossier LR60905
Classe 3231 01

**Particularités**
- Maintien électrique et mécanique
- Courant nominal d'éclairage de 30 à 800 ampères
- Versions à 2 à 5 pôles (5 pôles jusqu'à 200 ampères)
- Valeurs nominales de charge mixte (éclairage et moteur)
- Commandes câblées en usine et points de raccordement clairement indiqués

50-60 Hz

Tensions nominales maximales ▸ Page 1/61

| Valeur nominale en ampères du contact | Nbre de pôles | NÉMA Type 1 Coffret d'usage général | | NEMA Type 1 Montage encastré coffret d'usage général avec ajustement pour gypse | | NEMA Type 3R Coffret à l'épreuve de l'eau | | NEMA Types 4 et 4X Coffret étanche à l'eau, antipoussière, en verre polyester résistant à la corrosion | | NEMA Type 4 et 4X Coffret étanche à l'eau, antipoussière | | NEMA Type 12 Coffret à l'épreuve des poussières et des égouttures pour usage industriel | | NADAI, INC. Type suivant | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Type | Prix† | Type | Prix† | Coffr. à Type | Épr. de l'eau Prix† | Type | Prix† | Type | Prix† | Type | Prix† | Type | Prix† |
| **Maintien électrique▾** | | | | | | | | | | | | | | | |
| 30 | 2 | SMG1▪ | $ 528. | SMF1▪ | $ 736. | SMH1▪ | $ 720. | SMW21▪ | $ 1104. | SMW1▪ | $ 1104. | SMA1▪ | $ 720. | SMO1▪▪ | $ 496. |
| | 3 | SMG2▪ | 576. | SMF2▪ | 784. | SMH2▪ | 768. | SMW22▲ | 1152. | SMW2▪ | 1152. | SMA2▪ | 768. | SMO2▪▪ | 544. |
| | 4 | SMG3▪ | 704. | SMF3▪ | 912. | SMH3▪ | 896. | SMW23▲ | 1280. | SMW3▪ | 1280. | SMA3▪ | 896. | SMO3▪▪ | 672. |
| | 5 | SMG4▪ | 928. | SMF4▪ | 1136. | SMH4▪ | 1120. | SMW24▲ | 1504. | SMW4▪ | 1504. | SMA4▪ | 1120. | SMO4▪▪ | 896. |
| 60 | 2 | SPG1▪ | 1088. | SPF1▪ | 1360. | SPH1▪ | 1440. | SPW21▪ | 2240. | SPW1▪ | 2240. | SPA1▪ | 1440. | SPO1▪▪ | 928. |
| | 3 | SPG2▪ | 1152. | SPF2▪ | 1424. | SPH2▪ | 1504. | SPW22▪ | 2304. | SPW2▪ | 2304. | SPA2▪ | 1504. | SPO2▪▪ | 992. |
| | 4 | SPG3▪ | 1440. | SPF3▪ | 1712. | SPH3▪ | 1792. | SPW23▪ | 3040. | SPW3▪ | 3040. | SPA3▪ | 1792. | SPO3▪▪ | 1280. |
| | 5 | SPG4▪ | 2080. | SPF4▪ | 2352. | SPH4▪ | 2432. | SPW24▪ | 3680. | SPW4▪ | 3680. | SPA4▪ | 2432. | SPO4▪▪ | 1920. |
| 100 | 2 | SOG1▪ | 1792. | SOF1▪ | 2256. | SOH1▪ | 2208. | SOW21▪ | 4280. | SQW1▪ | 3424. | SQA1▪ | 2208. | SQO1▪▪ | 1472. |
| | 3 | SOG2▪ | 1920. | SOF2▪ | 2384. | SOH2▪ | 2336. | SOW22▪ | 4440. | SQW2▪ | 3562. | SQA2▪ | 2336. | SQO2▪▪ | 1600. |
| | 4 | SOG3▪ | 2368. | .... | .... | SOH3▪ | 2784. | .... | .... | SQW3▪ | 4448. | SQA3▪ | 2784. | SQO3▪▪ | 2048. |
| | 5 | SOG4▪ | 3392. | .... | .... | SOH4▪ | 3808. | .... | .... | SQW4▪ | 5472. | SQA4▪ | 3808. | SQO4▪▪ | 3072. |
| 200 | 2 | SVG1▪ | 4224. | .... | .... | SVH1▪ | 5800. | .... | .... | SVW1▪ | 7008. | SVA1▪ | 5800. | SVO1▪ | 3552. |
| | 3 | SVG2▪ | 4512. | .... | .... | SVH2▪ | 5888. | .... | .... | SVW2▪ | 7296. | SVA2▪ | 5888. | SVO2▪ | 3840. |
| | 4 | SVG3▪ | 6016. | .... | .... | .... | .... | .... | .... | SVW3▪ | 9952. | SVA3▪ | 7872. | SVO3▪ | 5344. |
| | 5 | SVG4▪ | 8000. | .... | .... | .... | .... | .... | .... | SVW4▪ | 11856. | SVA4▪ | 9876. | SVO4▪ | 7350. |
| 300 | 2 | SXG1▪ | 8928. | .... | .... | .... | .... | .... | .... | SXW1▪ | 12448. | SXA1▪ | 12448. | SXO1▪ | 7896. |
| | 3 | SXG2▪ | 9600. | .... | .... | .... | .... | .... | .... | SXW2▪ | 13120. | SXA2▪ | 13120. | SXO2▪ | 8568. |
| 400▪ | 2 | SYG1▪ | 21376. | .... | .... | .... | .... | .... | .... | SYW1▪ | 31376. | SYA1▪ | 27696. | SYO1▪ | 18304. |
| | 3 | SYG2▪ | 28438. | .... | .... | .... | .... | .... | .... | SYW2▪ | 34436. | SYA2▪ | 30752. | SYO2▪ | 21360. |
| 600▪ | 2 | SZG1▪ | 28700. | .... | .... | .... | .... | .... | .... | SZW1▪ | 38700. | SZA1▪ | 33020. | SZO1▪ | 23460. |
| | 3 | SZG2▪ | 32240. | .... | .... | .... | .... | .... | .... | SZW2▪ | 40250. | SZA2▪ | 34588. | SZO2▪ | 26990. |
| 800▪ | 2 | SJG1▪ | 33416. | .... | .... | .... | .... | .... | .... | SJW1▪ | 41416. | SJA1▪ | 38160. | SJO1▪ | 27882. |
| | 3 | SJG2▪ | 37148. | .... | .... | .... | .... | .... | .... | SJW2▪ | 45148. | SJA2▪ | 41456. | SJO2▪ | 31708. |
| **Maintien mécanique▾** | | | | | | | | | | | | | | | |
| 30 | 2 | SMG10▪ | 704. | SMF10▪ | 912. | .... | .... | SMW31▪ | 1280. | SMW10▪ | 1280. | SMA10▪ | 896. | SMO10▪▪ | 672. |
| | 3 | SMG11▪ | 752. | SMF11▪ | 960. | .... | .... | SMW32▪ | 1328. | SMW11▪ | 1328. | SMA11▪ | 944. | SMO11▪▪ | 720. |
| | 4 | SMG12▪ | 800. | SMF12▪ | 1008. | .... | .... | SMW33▪ | 1376. | SMW12▪ | 1376. | SMA12▪ | 992. | SMO12▪▪ | 768. |
| | 5 | SMG13▪ | 1148. | SMF13▪ | 1232. | .... | .... | SMW34▪ | 1600. | SMW13▪ | 1600. | SMA13▪ | 1216. | SMO13▪▪ | 992. |
| 60 | 2 | SPG10▪ | 1664. | SPF10▪ | 1968. | .... | .... | SPW31▪ | 2816. | SPW10▪ | 2816. | SPA10▪ | 2016. | SPO10▪▪ | 1536. |
| | 3 | SPG11▪ | 1728. | SPF11▪ | 2032. | .... | .... | SPW32▪ | 2880. | SPW11▪ | 2880. | SPA11▪ | 2080. | SPO11▪▪ | 1600. |
| | 4 | SPG12▪ | 2048. | SPF12▪ | 2352. | .... | .... | SPW33▪ | 3648. | SPW12▪ | 3648. | SPA12▪ | 2400. | SPO12▪▪ | 1920. |
| | 5 | SPG13▪ | 2688. | SPF13▪ | 2992. | .... | .... | SPW34▪ | 4288. | SPW13▪ | 4288. | SPA13▪ | 3040. | SPO13▪▪ | 2560. |
| 100 | 2 | SOG10▪ | 2336. | SOF10▪ | 2512. | .... | .... | SQW31▪ | 4960. | SQW10▪ | 3968. | SQA10▪ | 2752. | SQO10▪▪ | 2048. |
| | 3 | SOG11▪ | 2464. | SOF11▪ | 2640. | .... | .... | SQW32▪ | 5120. | SQW11▪ | 4096. | SQA11▪ | 2880. | SQO11▪▪ | 2176. |
| | 4 | SOG12▪ | 2944. | .... | .... | .... | .... | .... | .... | SQW12▪ | 5024. | SQA12▪ | 3360. | SQO12▪▪ | 2656. |
| | 5 | SOG13▪ | 3974. | .... | .... | .... | .... | .... | .... | SQW13▪ | 6048. | SQA13▪ | 4384. | SQO13▪▪ | 3680. |
| 200 | 2 | SVG10▪ | 5984. | .... | .... | .... | .... | .... | .... | SVW10▪ | 8768. | SVA10▪ | 7360. | SVO10▪ | 5056. |
| | 3 | SVG11▪ | 6752. | .... | .... | .... | .... | .... | .... | SVW11▪ | 9536. | SVA11▪ | 8128. | SVO11▪ | 5472. |
| | 4 | SVG12▪ | 8256. | .... | .... | .... | .... | .... | .... | SVW12▪ | 12192. | SVA12▪ | 10112. | SVO12▪ | 6976. |
| 300 | 2 | SXG13▪ | 10464. | .... | .... | .... | .... | .... | .... | SXW13▪ | 13984. | SXA13▪ | 13984. | SXO13▪ | 8480. |
| | 3 | SXG14▪ | 11488. | .... | .... | .... | .... | .... | .... | SXW14▪ | 15008. | SXA14▪ | 15008. | SXO14▪ | 8768. |
| 400 | 2 | SYG16▪ | 25376. | .... | .... | .... | .... | .... | .... | SYW16▪ | 33376. | SYA16▪ | 29696. | SYO16▪ | 20304. |
| | 3 | SYG17▪ | 28432. | .... | .... | .... | .... | .... | .... | SYW17▪ | 36432. | SYA17▪ | 32752. | SYO17▪ | 23360. |
| 600 | 2 | SZG18▪ | 30896. | .... | .... | .... | .... | .... | .... | SZW18▪ | 38696. | SZA18▪ | 35016. | SZO18▪ | 25448. |
| | 3 | SZG19▪ | 34240. | .... | .... | .... | .... | .... | .... | SZW19▪ | 42240. | SZA19▪ | 38560. | SZO19▪ | 28984. |
| 800 | 2 | SJG10▪ | 36020. | .... | .... | .... | .... | .... | .... | SJW10▪ | 44184. | SJA10▪ | 40340. | SJO10▪ | 30600. |
| | 3 | SJG11▪ | 40050. | .... | .... | .... | .... | .... | .... | SJW11▪ | 48052. | SJA11▪ | 44376. | SJO11▪ | 34612. |

† Les coffrets NEMA de Type 12 peuvent être modifiés sur place pour les applications extérieures ou on peut commander des coffrets NEMA Type 3R séparés. Voir la section sur la Classe 9991.
• Des coffrets distincts sont offerts pour ces dispositifs. Il peut être possible d'améliorer le rendement en commandant un contacteur de type ouvert et un boîtier de Classe 9991 séparé.
▲ Les coffrets NEMA du type 4 et 4x sont en acier inoxydable brossé pour les contacteurs d'une capacité de 30 à 300 ampères. Les calibres 400, 600 et 800 sont en tôle d'acier peint. Pour un fini électropoli, spécifiez la forme G18 et ajoutez 15 % au prix du dispositif de base NEMA type 4 et 4 x.
‡ Les prix n'incluent pas le contact du circuit de retenue.
▪ La forme F4T est normalement offerts; spécifier la tension de ligne en commandant. La tension de commande est de 120/60.
▪ Le code de tension doit être spécifié pour commander ce produit. Voir les codes de tension standard énumérés ci-dessous et insérer comme indiqué dans la case «Pour commander».
▾ Tous les contacteurs d'éclairage sont fournis de série avec commande séparée.

### Codes de tension de la bobine

| Tension 60 Hz | Tension 50 Hz | Code | Supplém. de prix |
|---|---|---|---|
| 24▲ | ... | V01 | S.F. |
| 120 | 110 | V02 | S.F. |
| 208 | ... | V08 | S.F. |
| 240 | 220 | V03 | S.F. |
| 277 | ... | V04 | S.F. |
| 347 | ... | V42 | S.F. |
| 480 | 440 | V06 | S.F. |
| Spécifier | Spécifier | V99 | $40. |

▲ Les bobines de 24 volt ne sont pas disponibles pour les dispositifs du 200 à 800 A

### Pôles de puissance pour le type S seulement

Une trousse à un ou deux pôles peut être ajoutée à tout contacteur d'éclairage à 2 ou 3 pôles, 30 ou 60 ampères du type S pour en faire un dispositif à 4 ou 5 pôles. Les contacteurs à 4 et 5 pôles assemblés en usine utilisent le dispositif de base à 3 pôles en y ajoutant une trousse à un ou deux pôles. Un seul pôle de puissance peut être ajouté par contacteur. Il y a suffisamment d'espace dans tous les styles de coffret pour l'ajout d'une trousse de pôle de puissance.

| Courant nominal (A) | Description | Classe 9999 Type | Prix |
|---|---|---|---|
| 30 | Un N.O. | SB6 | $176. |
| | Un N.F. | SB7 | 176. |
| | Un N.O. et un N.F. | SB8 | 410. |
| | Deux N.O. | SB9 | 410. |
| | Deux N.F. | SB10 | 410. |
| 60 | Un N.O. | SB21 | 320. |
| | Un N.F. | SB22▪ | 320. |
| | Un N.O. et un N.F. | SB23▪ | 736. |
| | Deux N.O. | SB24▪ | 736. |
| | Deux N.F. | SB25▪ | 736. |

▪ Lorsqu'un pôle de puissance est ajouté à un contacteur de 60 ampères, une bobine à 4 pôles est aussi requise. Utiliser le tableau des bobines à la page 1-118 pour commander. Les pôles de puissance de 60 ampères peuvent être utilisés aussi bien avec des fils de cuivre que d'aluminium.

### Pour commander

| Préciser : | Exemple : | | | |
|---|---|---|---|---|
| • Numéro de classe<br>• Numéro de type<br>• Code de tension de la bobine<br>• Forme(s) | Classe | Type | Code tension de la bobine | Forme(s) |
| | 8903 | SMG2 | V04 | C |

JOB; WASTE WATER TREATMENT PLANT AT IQUALUIT, NUNAVUT
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK per; C. FAUTEUX, T.P.
G, FAUTEUX, P.ENG.
P.A.PELLETIER, P.ENG.

SM G2

11.1

11.1

16461

## DRY - TYPE TRANSFORMER / TRANSFORMATEUR TYPE SEC

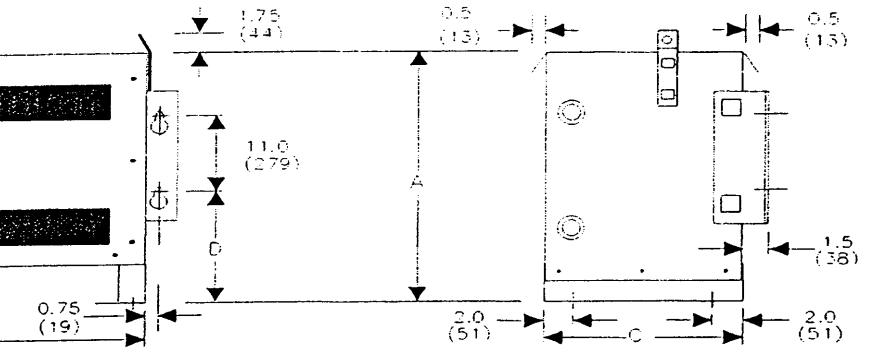
OPTION
# SPMGCT

REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GEN[redacted] CONDITIONS OF THE CONTRACT. ANY ACTION INDICATED IS SUBJECT TO THESE REQUIREMENTS.

- [x] NO EXCEPTIONS TAKEN
- [ ] MAKE NOTED CORRECTIONS
- [ ] REVISE & RESUBMIT
- [ ] REJECTED

DATE July 12/05 BY DC

EARTH TECH (CANADA) INC.

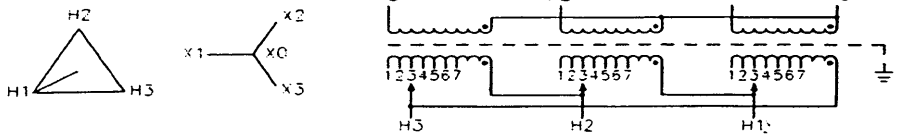



DRIPPROOF COVER / TOIT À L'ÉPREUVE DES ÉGOUTTEMENTS

### DIMENSIONS

| | Inches / Pouces | MM |
|---|---|---|
| A | 28 | (711) |
| B | 29 | (737) |
| C | 14 | (356) |
| D | 8.5 | (216) |
| E | -- | (--) |

### WIRING DIAGRAM / SCHÉMA D'ENROULEMENT




CAT. C45T79HNLPX KVA : 45 Phase : 3

Temp. Rise / Élév. de Temp. : 150 °C
Insul. System / Système d'isol. : 220 °C
[ ] CU [x] AL

Frequency / Fréquence : 60 Hz
Taps / Prises : 4 - 2.5 % 2A, 2B Iz : 6.2 (%)

Enclosure / Boîtier : 1
Sound Level / Niveau de Bruit : 45 dBA

| Primary / Primaire | | Secondary / Secondaire | |
|---|---|---|---|
| DELTA | | WYE / ÉTOILE | |
| Voltage / Tension | Connectors / Connecteur | Voltage / Tension | Connectors / Connecteur |
| 600 | #14 to/à #2 | 208Y/120 | 1 of/de 250 MCM |

| Efficiency / Efficacité (170 °C) | | | | Regulation / Régulation (%) (170 °C) | | |
|---|---|---|---|---|---|---|
| 100% | 75% | 50% | 25% | 1.0 P.F. | 0.9 P.F. | 0.8 P.F. |
| 95.35 | 96.17 | 96.83 | 96.79 | 4 .40 | 5 .85 | 6 .14 |

| Losses / Pertes (Watts) | | | Excitation Current / Courant d'excitation : 2.9 (%) |
|---|---|---|---|
| No Load / À Vide | Load / En Charge | Total / Totales | Weight / Poids : 388/176 Lbs / Kg |
| 251 | 1939 | 2190 | Mounting / Montage : [x] Wall / Mur [x] Floor / Plancher |

Specials Features / Caractéristiques spéciales :
K Factor of 13 / Facteur K de 13

Quantity: 1

Project Name / Nom du Projet :
K Factor of 13 / Facteur K de 13

Location / endroit :
Iqualuit Waste Water

Contractor / Contracteur :
Guy Fauteux

Distributor-Order Number / Distributeur-No de Commande :
CDE St-Jerome, 84030

Field Office / Succursale :
20507290

Notes :
K Factor of 13 / Facteur K de 13

JOB; WASTE WATER TREATMENT PLANT AT IQUALUIT, NUNAVUT
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK per; C. FAUTEUX, T.P.
G, FAUTEUX, P.ENG.
P.A.PELLETIER, P.ENG.

Built To / Construit Selon : CSA C22.2 No 47 [ ] CSA C9 [ ]

Drawing No / Dessin No :

[ ] Approval / Approbation [ ] Information

| Drawn By / Dessiné Par : | C.D. | Date 2003/09/18 | Ref. No 405 |
|---|---|---|---|
| Approved / Approuvé : | | Date | V0008 |

Subject to change without notice / Sujet à changement sans préavis



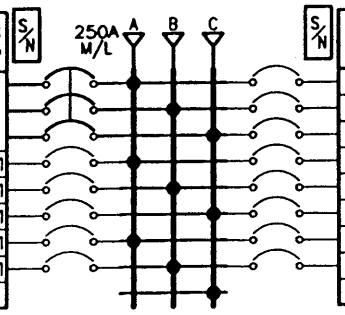
1/1

11.2

| REV | DESCRIPTION | BY | DATE | - | ---- | -- | --/--/-- |
|---|---|---|---|---|---|---|---|
| - | ---- | -- | --/--/-- | - | ---- | -- | --/--/-- |

16471

| | ACCESSORIES | TYPE | RATING AMP/P | S/N |
|---|---|---|---|---|
| 1 | | EDB | 50/3 | |
| 3 | | | | |
| 5 | | | | |
| 7 | | EDB | 15/1 | |
| 9 | | EDB | 15/1 | |
| 11 | | EDB | 15/1 | |
| 13 | | EDB | 15/1 | |
| 15 | | EDB | 15/1 | |
| 17 | BLANK | | | |




| S/N | RATING AMP/P | TYPE | ACCESSORIES | CKT NO |
|---|---|---|---|---|
| | 15/1 | EDB | | 2 |
| | 15/1 | EDB | | 4 |
| | 15/1 | EDB | | 6 |
| | 15/1 | EDB | | 8 |
| | 15/1 | EDB | | 10 |
| | 15/1 | EDB | | 12 |
| | 15/1 | EDB | | 14 |
| | 15/1 | EDB | | 16 |
| | | | BLANK | 18 |

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REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT. ANY ACTION INDICATED IS SUBJECT TO THESE REQUIREMENTS.

- ☐ NO EXCEPTIONS TAKEN
- ☑ MAKE NOTED CORRECTIONS
- ☐ REVISE & RESUBMIT
- ☐ REJECTED

DATE July 12/05 BY PC

EARTH TECH (CANADA) INC.

JOB: WASTE WATER TREATMENT PLANT IQUALUIT,
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK per: C.FAUTEUX, T,P.
G.FAUTEUX, P,ENG.
P.A. PELLETIER, P,ENG

this panel to be 42 circuit as indicated on 16471 project drawings/16477 1/1

## PHYSICAL DATA

- o ENCLOSURE: TYPE 1
  SURFACE WITH DOOR FRONT
  FRONT CAT#: NC32S
  BOX CAT#: MH32
  DIMENSIONS:
  32"H X 20"W X 5.75"D
  WIRE BENDING SPACE:
  TOP 12.7"
  BOTTOM 5.0"
  SIDE 4.1"
- o BUSSING: ALUMINUM BUS
  STANDARD PLATING
- o SPECIAL:
  SHIP COMPLETELY ASSEMBLED
  STANDARD SOLID NEUTRAL
  GROUND BAR
  ADDITIONAL GROUND BAR
  WHT FACE/BLCK LET NAMEPLATE

## ELECTRICAL DATA

- o SYSTEM: 347/600 3PH 4W 50/60 HZ
  14,000 AMPS SYMS. SCCR
- o MAIN: MAIN LUGS: 250A
  TOP FEED
  14K AIC
  INCOMING CONDUCTOR(S):
  (1)#6-350 kcmil (PER NEC)
- o BRANCH MOUNTING TYPE: BOLT-ON

---------- BRANCH SUMMATION ----------

1-50A/3P EDB

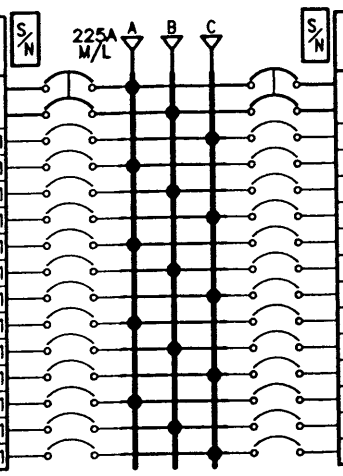
13-15A/1P EDB

11.3

| | | | |
|---|---|---|---|
| JOB NAME: | IQUALUIT SEWAGE WATER STATION | EQUIPMENT DESIGNATION: | Panel 6B |
| JOB LOCATION: | MIRABEL QC | EQUIPMENT TYPE: | NF |
| DRAWN BY: | (Q2C) | DRAWING TYPE: | ONE LINE DIAGRAM |
| ENGR: | --- | | SQUARE D Schneider Electric |
| DATE: | JUNE 10 2005 | | |
| DRAWING STATUS: | QUOTE NOT FOR CONSTRUCTION | DWG# 020507290 | PG 1 OF 1 REV 00 |

| REV | DESCRIPTION | BY | DATE | - | ---- | -- | --/--/-- |
|---|---|---|---|---|---|---|---|
| - | ---- | -- | --/--/-- | - | ---- | -- | --/--/-- |

| | ACCESSORIES | TYPE | RATING AMP/P | S/N |
|---|---|---|---|---|
| 1 | | QOB | 30/2 | |
| 3 | | QOB | 15/1 | |
| 5 | | QOB | 15/1 | |
| 7 | | QOB | 15/1 | |
| 9 | | QOB | 15/1 | |
| 11 | | QOB | 15/1 | |
| 13 | | QOB | 15/1 | |
| 15 | | QOB | 15/1 | |
| 17 | | QOB | 15/1 | |
| 19 | | QOB | 15/1 | |
| 21 | | QOB | 15/1 | |
| 23 | | QOB | 15/1 | |
| 25 | | QOB | 15/1 | |
| 27 | | QOB | 15/1 | |
| 29 | | QOB | 15/1 | |




| S/N | RATING AMP/P | TYPE | ACCESSORIES | CKT NO |
|---|---|---|---|---|
| | 30/2 | QOB | | 2 |
| | | | | 4 |
| | 15/1 | QOB | | 6 |
| | 15/1 | QOB | | 8 |
| | 15/1 | QOB | | 10 |
| | 15/1 | QOB | | 12 |
| | 15/1 | QOB | | 14 |
| | 15/1 | QOB | | 16 |
| | 15/1 | QOB | | 18 |
| | 15/1 | QOB | | 20 |
| | 15/1 | QOB | | 22 |
| | 15/1 | QOB | | 24 |
| | 15/1 | QOB | | 26 |
| | 15/1 | QOB | | 28 |
| | 15/1 | QOB | | 30 |

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REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT. ANY ACTION INDICATED IS SUBJECT TO THESE REQUIREMENTS.

- ☐ NO EXCEPTIONS TAKEN
- ☑ MAKE NOTED CORRECTIONS
- ☐ REVISE & RESUBMIT
- ☐ REJECTED

DATE July 12/06 BY DC

EARTH TECH (CANADA) INC.

16 471
16 477

This panel to be 42 circuits as indicated on project drawings

## PHYSICAL DATA

- o ENCLOSURE: TYPE 1
  SURFACE WITH DOOR FRONT
  FRONT CAT#: MHC32S
  BOX CAT#: MH32
  DIMENSIONS:
  32"H X 20"W X 5.75"D
  WIRE BENDING SPACE:
  TOP 11.5"
  BOTTOM 5.0"
  SIDE 6.1"
  PBA 501A
- o BUSSING: ALUMINUM BUS
  STANDARD PLATING
- o SPECIAL:
  SHIP COMPLETELY ASSEMBLED
  STANDARD SOLID NEUTRAL
  GROUND BAR
  WHT FACE/BLCK LET NAMEPLATE

## ELECTRICAL DATA

- o SYSTEM: 208Y/120 VAC 3PH 4W 60 HZ
  10,000 AMPS SYMS. SCCR
- o MAIN: MAIN LUGS: 225A

  TOP FEED
  10K AIC
  INCOMING CONDUCTOR(S):
  (1)#6-300 kcmil Al/Cu (PER NEC)

1/1

- o BRANCH MOUNTING TYPE: BOLT-ON

BRANCH SUMMATION

2-30A/2P QOB

26-15A/1P QOB

11.4

| | | | |
|---|---|---|---|
| JOB NAME: | IQUALUIT SEWAGE WATER STATION | EQUIPMENT DESIGNATION: | Panel 2B |
| JOB LOCATION: | MIRABEL QC | EQUIPMENT TYPE: | NQOD |
| DRAWN BY: | (Q2C) | DRAWING TYPE: | ONE LINE DIAGRAM |
| ENGR: | --- | | SQUARE D Schneider Electric |
| DATE: | JUNE 10 2005 | DWG # 020507290 | PG 1 OF 1 REV 00 |

NOT FOR CONSTRUCTION

16811

# Altivar 78

User's Manual

Variable Speed Drive

ALL MANUAL ON CD ENCLOSED

CITY OF IQUALUIT
C/O WASTE WATER TREAT.PLANT
C/O POTABLE WATER PLANT
P.O.BOX 460, IQUALUIT,
NUNAVUT, XOA OHO

11,5

a brand of Schneider Electric

Telemecanique

16820

SQUARE D COMPANY
Schneider Electric

| | | | |
|---|---|---|---|
| Job Name: | IQUALUIT SEWAGE WATER STATION | Square D Quotation #: | 20507290 |
| Job Location: | MIRABEL QC | Quotation Revision #: | |
| | | Sales Contact: | ins nsta |
| | | Sales Contact Location: | 807 |
| Purchaser: | CENTRE DE DISTRIBUTION | Customer: | GUY FAUTEAUX & FILS INC |
| Purchaser PO #: | S84030402 | Customer PO #: | |
| User: | | Architect: | |
| User Location: | | Cons. Engineer: | |
| Drawing Status: | RECORD | | |

# TABLE OF CONTENTS

SQUARE D FACTORY ORDER NUMBER: 20507290-001

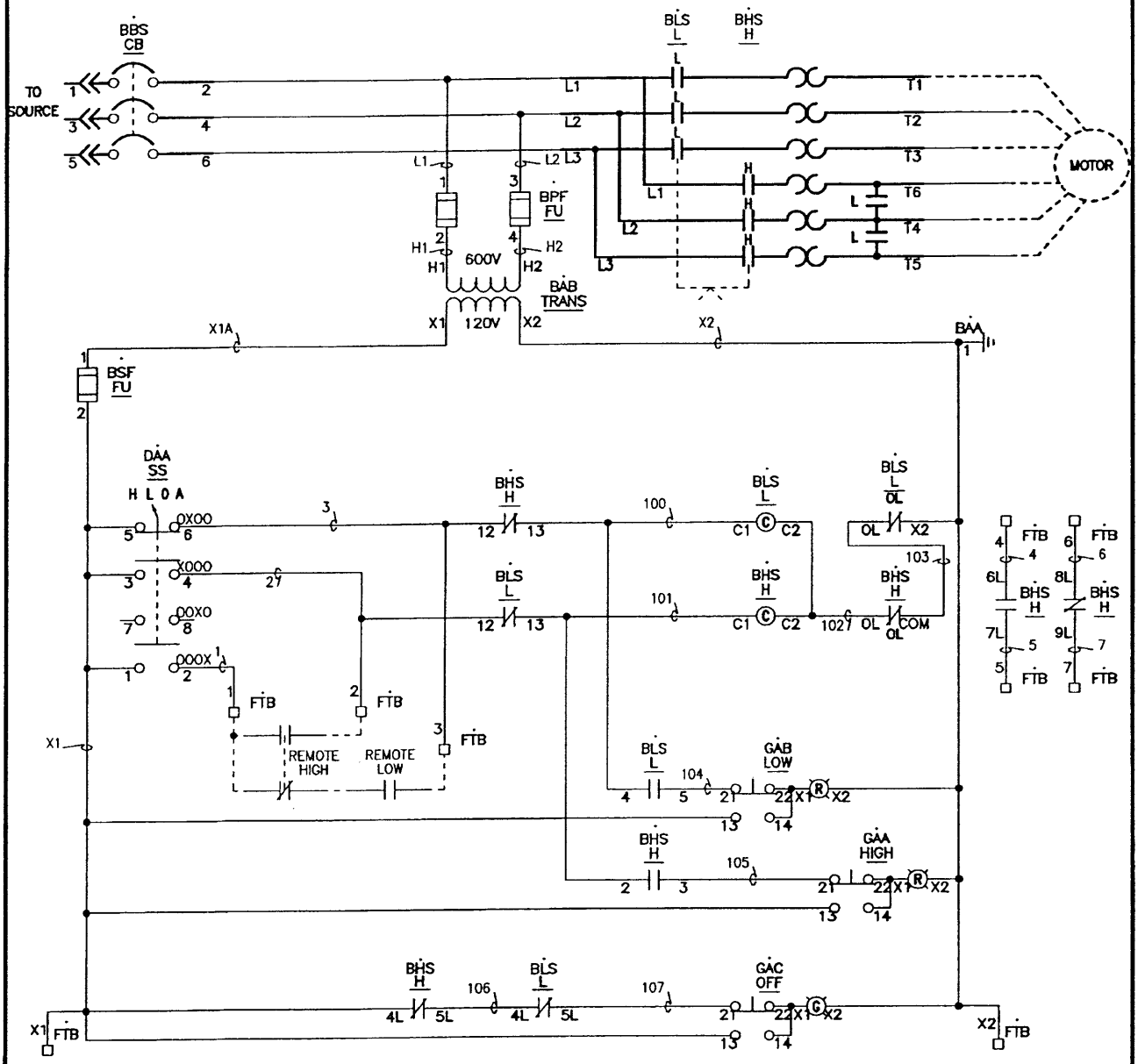

| Equipment Designation | Equipment Type | Drawing Type | Drawing Number | Page | Revision Level |
|---|---|---|---|---|---|
| MCC-2 | MODEL 6 MCC | ELEVATION | F20507290-001-01 | 1 | A |
| | | ELEMENTARY DIAGRAM | E20507290-001-01 | 1 | A |
| | | | E20507290-001-02 | 1 | A |
| | | | E20507290-001-03 | 1 | A |
| | | | E20507290-001-04 | 1 | A |
| | | | E20507290-001-05 | 1 | A |
| | | COMPONENT INFORMATION | I20507290-001-01 | 1 | A |


These products are manufactured in a facility which is quality systems registered by Underwriters Laboratories to ISO 9001



11.6.1

| REV | DESCRIPTION | BY | DATE | | | | |
|---|---|---|---|---|---|---|---|
| A | REV. AS PER APPROVAL | SU | 07/19/05 | - | ---- | -- | --/--/-- |

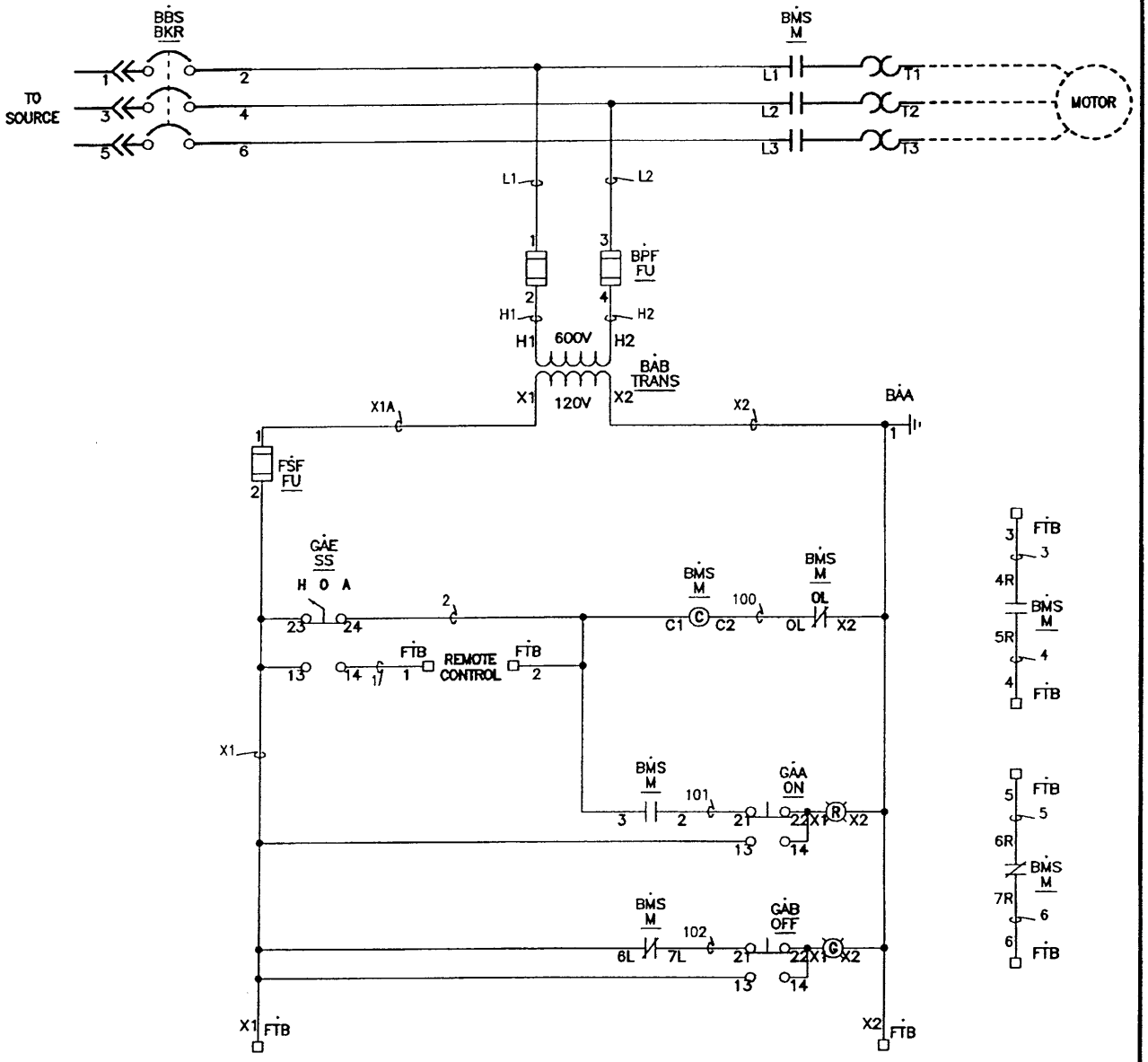



THERMAL UNITS INCLUDED
HEATSHRINK WIRE MARKERS

| | | | |
|---|---|---|---|
| JOB NAME: | IQUALUIT SEWAGE WATER STATION | EQUIPMENT DESIGNATION: | MCC-2 |
| JOB LOCATION: | MIRABEL QC | EQUIPMENT TYPE: | MODEL 6 MOTOR CONTROL CENTER |
| DRAWN BY: | CAD | DRAWING TYPE: | ELEMENTARY DIAGRAM |
| ENGR: | STEPH USES | | SQUARE D Schneider Electric |
| DATE: | June 15 2005 | | |
| DRAWING STATUS: | RECORD | DWG# E20507290-001-01 | PG 1 OF 1 REV A |

11.6.2

| REV | DESCRIPTION | BY | DATE | | | | |
|---|---|---|---|---|---|---|---|
| A | REV. AS PER APPROVAL | SU | 07/19/05 | - | ---- | -- | --/--/-- |

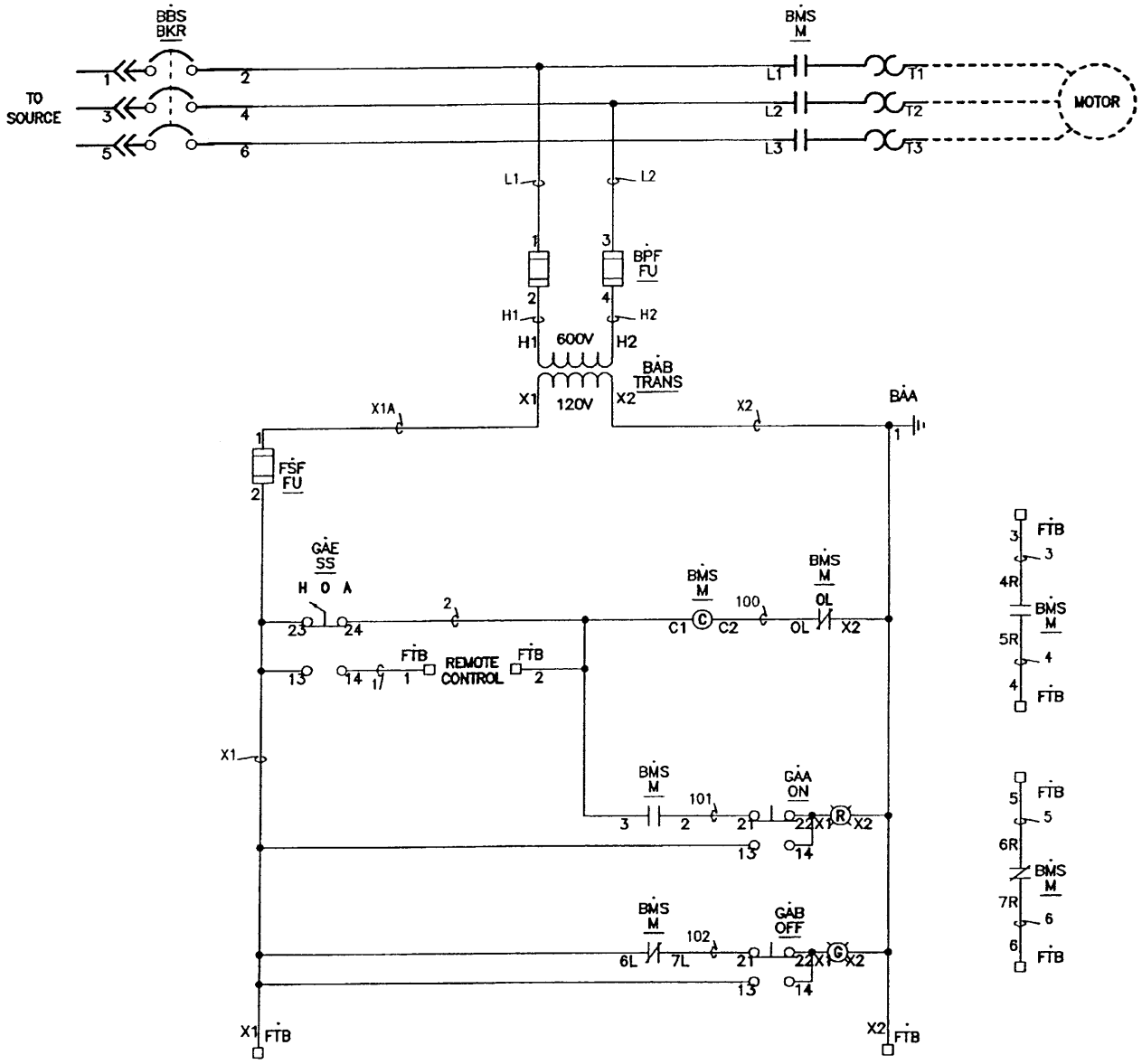



THERMAL UNITS INCLUDED
HEATSHRINK WIRE MARKERS

| | | | |
|---|---|---|---|
| JOB NAME: | IQUALUIT SEWAGE WATER STATION | EQUIPMENT DESIGNATION: | MCC-2 |
| JOB LOCATION: | MIRABEL QC. | EQUIPMENT TYPE: | MODEL 6 MOTOR CONTROL CENTER |
| DRAWN BY: | CAD | DRAWING TYPE: | ELEMENTARY DIAGRAM |
| ENGR: | STEPH USES | | SQUARE D Schneider Electric |
| DATE: | June 15 2005 | | |
| DRAWING STATUS: | RECORD | DWG# E20507290-001-02 | PG 1 OF 1 REV A |

11.6.3

| REV | DESCRIPTION | BY | DATE | | | | |
|---|---|---|---|---|---|---|---|
| A | REV. AS PER APPROVAL | SU | 07/19/05 | - | ---- | -- | --/--/-- |




THERMAL UNITS INCLUDED
HEATSHRINK WIRE MARKERS

| | | | |
|---|---|---|---|
| JOB NAME: | IQUALUIT SEWAGE WATER STATION | EQUIPMENT DESIGNATION: | MCC-2 |
| JOB LOCATION: | MIRABEL QC | EQUIPMENT TYPE: | MODEL 6 MOTOR CONTROL CENTER |
| DRAWN BY: | CAD | DRAWING TYPE: | ELEMENTARY DIAGRAM |
| ENGR: | STEPH USES | | SQUARE D Schneider Electric |
| DATE: | June 15 2005 | | |
| DRAWING STATUS: | RECORD | DWG# E20507290-001-03 | PG 1 OF 1 REV A |

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| REV | DESCRIPTION | BY | DATE | | | | |
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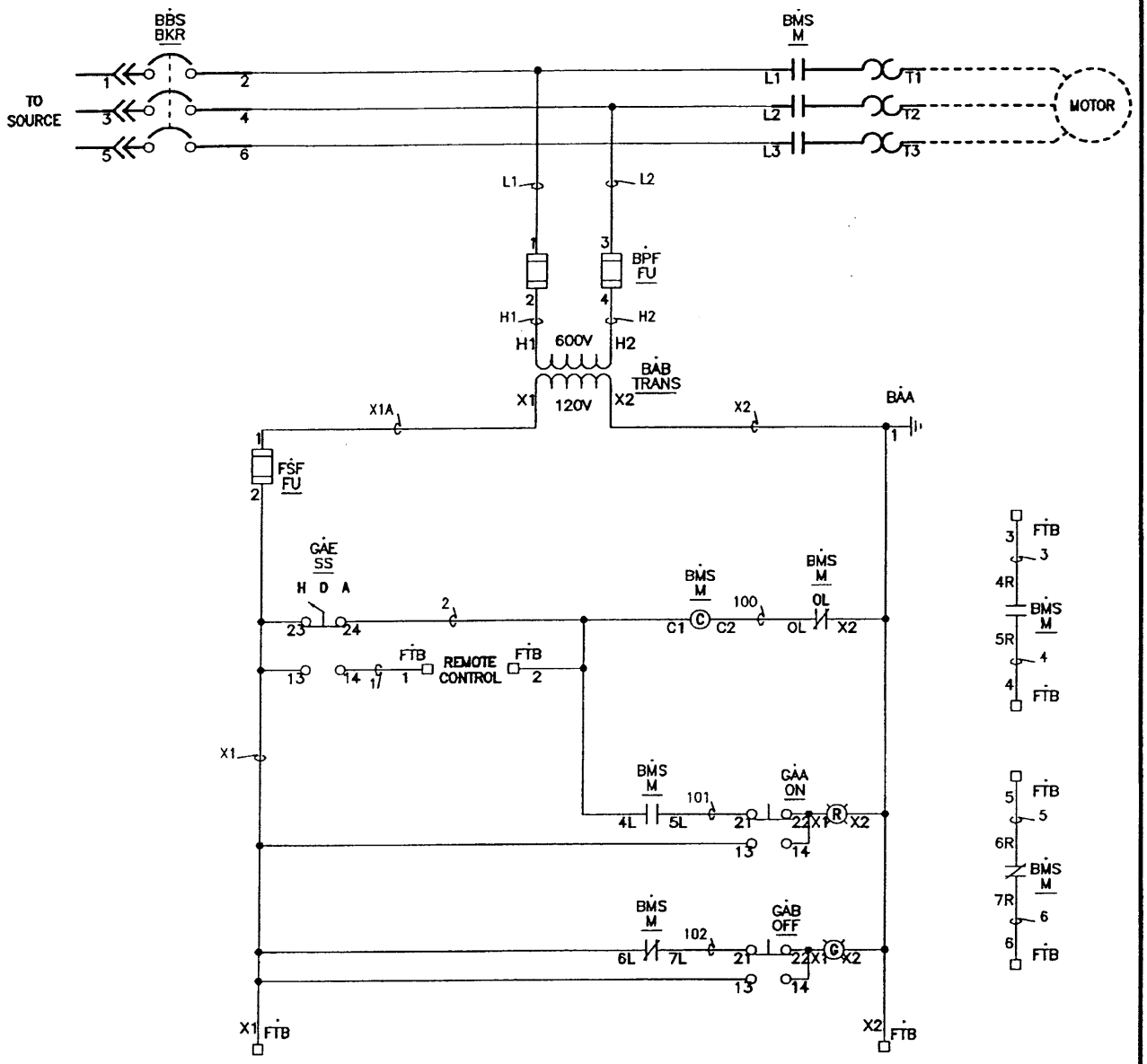
| A | REV. AS PER APPROVAL | SU | 07/19/05 | - | ---- | -- | --/--/-- |




THERMAL UNITS INCLUDED
HEATSHRINK WIRE MARKERS

| | | | |
|---|---|---|---|
| JOB NAME: | IQUALUIT SEWAGE WATER STATION | EQUIPMENT DESIGNATION: | MCC-2 |
| JOB LOCATION: | MIRABEL QC | EQUIPMENT TYPE: | MODEL 6 MOTOR CONTROL CENTER |
| DRAWN BY: | CAD | DRAWING TYPE: | ELEMENTARY DIAGRAM |
| ENGR: | STEPH USES | | SQUARE D Schneider Electric |
| DATE: | June 15 2005 | | |
| DRAWING STATUS: | RECORD | DWG# E20507290-001-04 | PG 1 OF 1 REV A |

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| REV | DESCRIPTION | BY | DATE |
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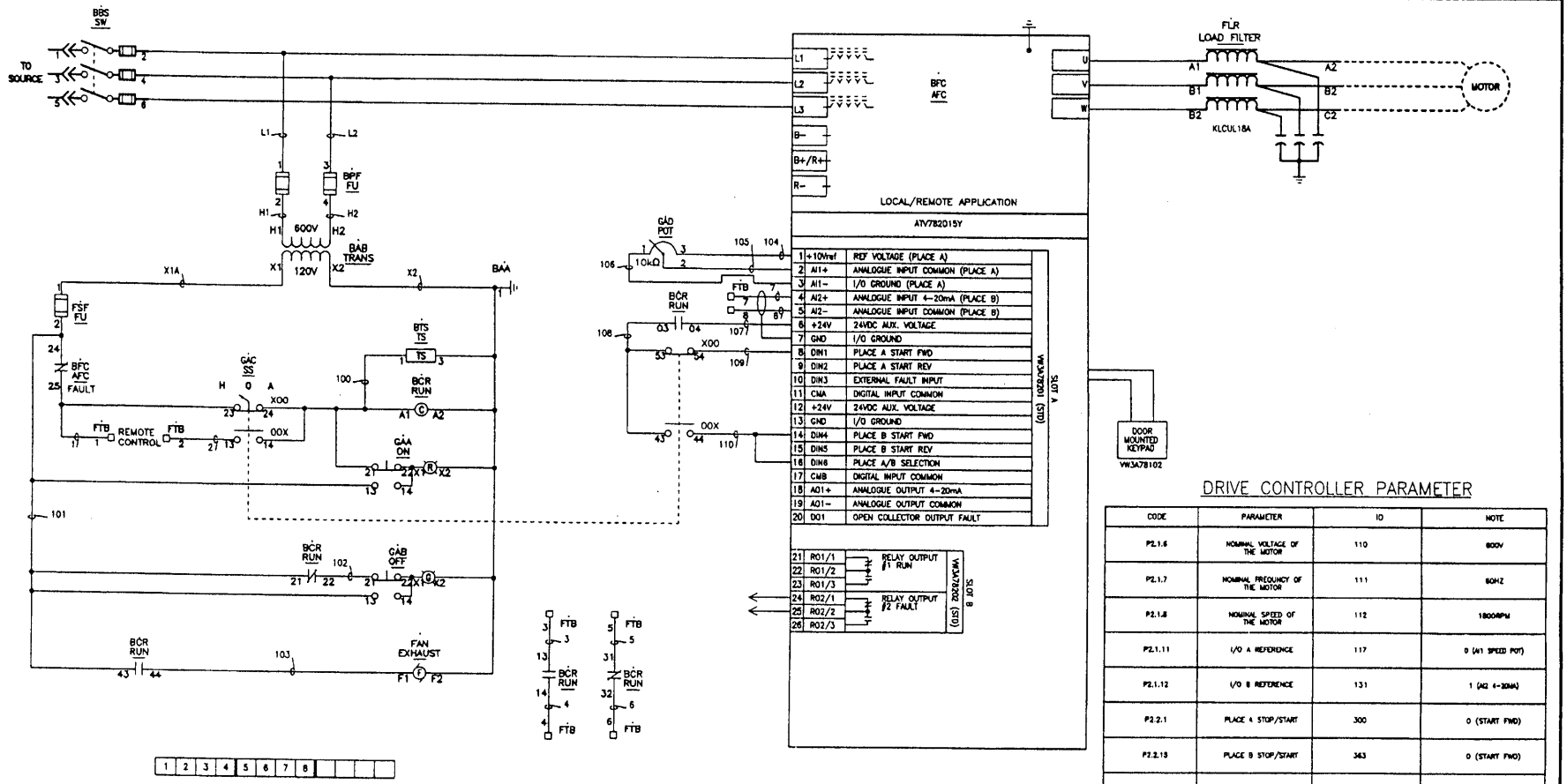
| A | REV. AS PER APPROVAL | SU | 07/19/05 |




| | | |
|---|---|---|
| 1 | +10Vref | REF VOLTAGE (PLACE A) |
| 2 | AI1+ | ANALOGUE INPUT COMMON (PLACE A) |
| 3 | AI1- | I/O GROUND (PLACE A) |
| 4 | AI2+ | ANALOGUE INPUT 4-20mA (PLACE B) |
| 5 | AI2- | ANALOGUE INPUT COMMON (PLACE B) |
| 6 | +24V | 24VDC AUX. VOLTAGE |
| 7 | GND | I/O GROUND |
| 8 | DIN1 | PLACE A START FWD |
| 9 | DIN2 | PLACE A START REV |
| 10 | DIN3 | EXTERNAL FAULT INPUT |
| 11 | CMA | DIGITAL INPUT COMMON |
| 12 | +24V | 24VDC AUX. VOLTAGE |
| 13 | GND | I/O GROUND |
| 14 | DIN4 | PLACE B START FWD |
| 15 | DIN5 | PLACE B START REV |
| 16 | DIN6 | PLACE A/B SELECTION |
| 17 | CMB | DIGITAL INPUT COMMON |
| 18 | AO1+ | ANALOGUE OUTPUT 4-20mA |
| 19 | AO1- | ANALOGUE OUTPUT COMMON |
| 20 | DO1 | OPEN COLLECTOR OUTPUT FAULT |
| 21 | RO1/1 | RELAY OUTPUT #1 RUN |
| 22 | RO1/2 | |
| 23 | RO1/3 | |
| 24 | RO2/1 | RELAY OUTPUT #2 FAULT |
| 25 | RO2/2 | |
| 26 | RO2/3 | |

## DRIVE CONTROLLER PARAMETER

| CODE | PARAMETER | ID | NOTE |
|---|---|---|---|
| P2.1.6 | NOMINAL VOLTAGE OF THE MOTOR | 110 | 600V |
| P2.1.7 | NOMINAL FREQUENCY OF THE MOTOR | 111 | 60HZ |
| P2.1.8 | NOMINAL SPEED OF THE MOTOR | 112 | 1800RPM |
| P2.1.11 | I/O A REFERENCE | 117 | 0 (A1 SPEED POT) |
| P2.1.12 | I/O B REFERENCE | 131 | 1 (A2 4-20MA) |
| P2.2.1 | PLACE A STOP/START | 300 | 0 (START FWD) |
| P2.2.13 | PLACE B STOP/START | 363 | 0 (START FWD) |
| P2.6.3 | CONSTANT OR VARIABLE | 108 | 0 (LINEAR = CONSTANT TORQUE) |

USE LOCAL/REMOTE APPLICATION IN MENU M6 ON PAGE 86.2.

HEATSHRINK WIRE MARKERS

| | |
|---|---|
| JOB NAME: | IQUALUIT SEWAGE WATER STATION |
| JOB LOCATION: | MIRABEL QC |
| DRAWN BY: | CAD |
| ENGR: | STEPH USES |
| DATE: | June 15 2005 |
| DRAWING STATUS: | RECORD |

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|---|---|
| EQUIPMENT DESIGNATION: | MCC-2 |
| EQUIPMENT TYPE: | MODEL 6 MOTOR CONTROL CENTER |
| DRAWING TYPE: | ELEMENTARY DIAGRAM |
| | SQUARE D Schneider Electric |
| DWG# | E20507290-001-05 |
| PG 1 OF 1 | REV A |

11.6.6

| REV | DESCRIPTION | BY | DATE |
|---|---|---|---|
| A | REV. AS PER APPROVAL | SU | 07/19/05 |

# COMPONENT INFORMATION

MCC DESIGNATION

| | MCC-2 | | | | | CONTROL (or DISTRIBUTION) TRANSFORMER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| UNIT LOC | NAMEPLATE DESIGNATION | UNIT TYPE | SIZE | HP | DISC AMPS | VA | FUSE SIZE PRI | FUSE SIZE SEC | UNIT FEATURES | DRAWING NUMBER |
| 1A | INCOMING | MN.LUGS | | | 600 | | | | U213,U672 | |
| 1C | AHU-3 | 2S1WCHP | 1 | 3.75 KW | 15 | 100 | .5 | 1 | FT,U213,X11,X119, Y92,C25,U269,P21, P22,N300,U672, | E20507290-001-01-1 |
| | | | | | | | | | U258,L3 | |
| 1J | SPARE | 2S1WCHP | 1 | 3.75 KW | 15 | 100 | .5 | 1 | FT,U213,X11,X119, Y92,C25,U269,P21, P22,N300,U672, | E20507290-001-01-1 |
| | | | | | | | | | U258,L3 | |
| 1Q | PUMP PF-105 | FVNR | 2 | 10.1 KW | 30 | 100 | .5 | 1 | FT,U213,X11,Y92,C, U269,P21,P22, N300,U672,U258,L3 | E20507290-001-02-1 |
| 1U | SSCR-105 | FVNR | 1 | 1.5 KW | 7 | 100 | .5 | 1 | T1,U213,X11,Y92,C, U269,P21,P22, N300,U672,U258,L3 | E20507290-001-03-1 |
| 2A | SSCR-106 | FVNR | 1 | 1.5 KW | 7 | 100 | .5 | 1 | T1,U213,X11,Y92,C, U269,P21,P22, N300,U672,U258,L3 | E20507290-001-03-1 |
| 2E | SPARE | FVNR | 1 | 3.75 KW | 15 | 100 | .5 | 1 | T1,U213,X11,Y92,C, U269,P21,P22, N300,U672,U258,L3 | E20507290-001-03-1 |
| 2I | MXR-201 FUTURE | FVNR | 1 | 1.88 KW | 7 | 100 | .5 | 1 | T1,U213,X11,Y92,C, U269,P21,P22, N300,U672,U258,L3 | E20507290-001-03-1 |
| 2M | EXHAUST FAN EF-1 FUTURE | FVNR | 1 | 5.5 KW | 15 | 100 | .5 | 1 | T1,U213,X11,Y92,C, U269,P21,P22, N300,U672,U258,L3 | E20507290-001-03-1 |
| 2Q | EXHAUST FAN EF-2 FUTURE | FVNR | 1 | 5.5 KW | 15 | 100 | .5 | 1 | T1,U213,X11,Y92,C, U269,P21,P22, N300,U672,U258,L3 | E20507290-001-03-1 |
| 2U | PUMP P-04 FUTURE | FVNR | 1 | 0.56 KW | 3 | 100 | .5 | 1 | T1,U213,X11,Y92,C, U269,P21,P22, N300,U672,U258,L3 | E20507290-001-03-1 |
| 3A | SPARE | FVNR | 1 | 3.75 KW | 15 | 100 | .5 | 1 | T1,U213,X11,Y92,C, U269,P21,P22, N300,U672,U258,L3 | E20507290-001-03-1 |
| 3E | SPARE | FVNR | 1 | 3.75 KW | 15 | 100 | .5 | 1 | T1,U213,X11,Y92,C, U269,P21,P22, N300,U672,U258,L3 | E20507290-001-03-1 |
| 3I | MXR-202 FUTURE | FVNR | 1 | 1.88 KW | 7 | 100 | .5 | 1 | T1,U213,X11,Y92,C, U269,P21,P22, N300,U672,U258,L3 | E20507290-001-03-1 |
| 3M | 9PF-407 FUTURE | FVNR | 2 | 9 KW | 30 | 100 | .5 | 1 | FT,U213,X11,Y92,C, U269,P21,P22, N300,U672,U258,L3 | E20507290-001-02-1 |
| | | | | | | | | | | |

| | | | | | | CONTROL (or DISTRIBUTION) TRANSFORMER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| UNIT LOC | NAMEPLATE DESIGNATION | UNIT TYPE | SIZE | HP | DISC AMPS | VA | FUSE SIZE PRI | FUSE SIZE SEC | UNIT FEATURES | DRAWING NUMBER |
| 3Q | LFS-207 FUTURE | FVNR | 3 | 30 KW | 100 | 150 | .75 | 1.6 | FT,U213,X11,Y92,C, U269,Y532,P21, P22,N300,U672, | E20507290-001-04-1 |
| | | | | | | | | | U258,L3 | |
| 3W | | SPACE | | | | | | | U672 | |
| 4A | PUMP P-102 | DRIVE C.T. | D15 | 11.25 KW | F30 | 100 | .5 | 1 | FT,U213,C,U269, Y316,P21,P22,N300, U672,U258,L3,NOTE1 | E20507290-001-05-1 |
| 4Q | | SPACE | | | | | | | U672 | |
| 4U | | SPACE | | | | | | | U672 | |
| 5A | PUMP P-103 | DRIVE C.T. | D15 | 11.25 KW | F30 | 100 | .5 | 1 | FT,U213,C,U269, Y316,P21,P22,N300, U672,U258,L3,NOTE1 | E20507290-001-05-1 |
| 5Q | | SPACE | | | | | | | U672 | |
| 5U | | SPACE | | | | | | | U672 | |
| 6A | PUMP P-104 | DRIVE C.T. | D15 | 11.25 KW | F30 | 100 | .5 | 1 | FT,U213,C,U269, Y316,P21,P22,N300, U672,U258,L3,NOTE1 | E20507290-001-05-1 |
| 6Q | | SPACE | | | | | | | U672 | |
| 6U | | SPACE | | | | | | | U672 | |
| 7A | TERMINAL CONTROL SECTION | MT.UNIT | | | | | | | U672,L3 | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

C H-O-A SEL. SW.
P21 RED ON PTT PL
U258 WIRE LABELS
X119 1 NO 1 NC INTK.
C25 H-L-O-A SS

FT FUSED CTRL XFMR
P22 GRN OFF PTT PL
U269 P22mm DEVICES
Y532 HIGH IC BREAKER

L3 WHITE INTERIORS
T1 XCAP CTRL XFMR
U672 UNIT NP WHITE
Y92 THERMAL UNITS

N300 CNTRL XFMR TAPS
U213 600V LINE
X11 1 NO 1 NC INTK.
Y316 CLASS J CLIPS

NOTE1: UNIT C/W ATV78 DRIVE & KLC FILTER

| | |
|---|---|
| JOB NAME: | IQUALUIT SEWAGE WATER STATION |
| JOB LOCATION: | MIRABEL QC |
| DRAWN BY: | CAD |
| ENGR: | STEPH USES |
| DATE: | June 15 2005 |
| DRAWING STATUS: | RECORD |

| | |
|---|---|
| EQUIPMENT DESIGNATION: | MCC-2 |
| EQUIPMENT TYPE: | MODEL 6 MOTOR CONTROL CENTER |
| DRAWING TYPE: | COMPONENT INFORMATION |

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DWG# I20507290-001-01 | PG 1 OF 1 | REV A

| REV | DESCRIPTION | BY | DATE |
|---|---|---|---|
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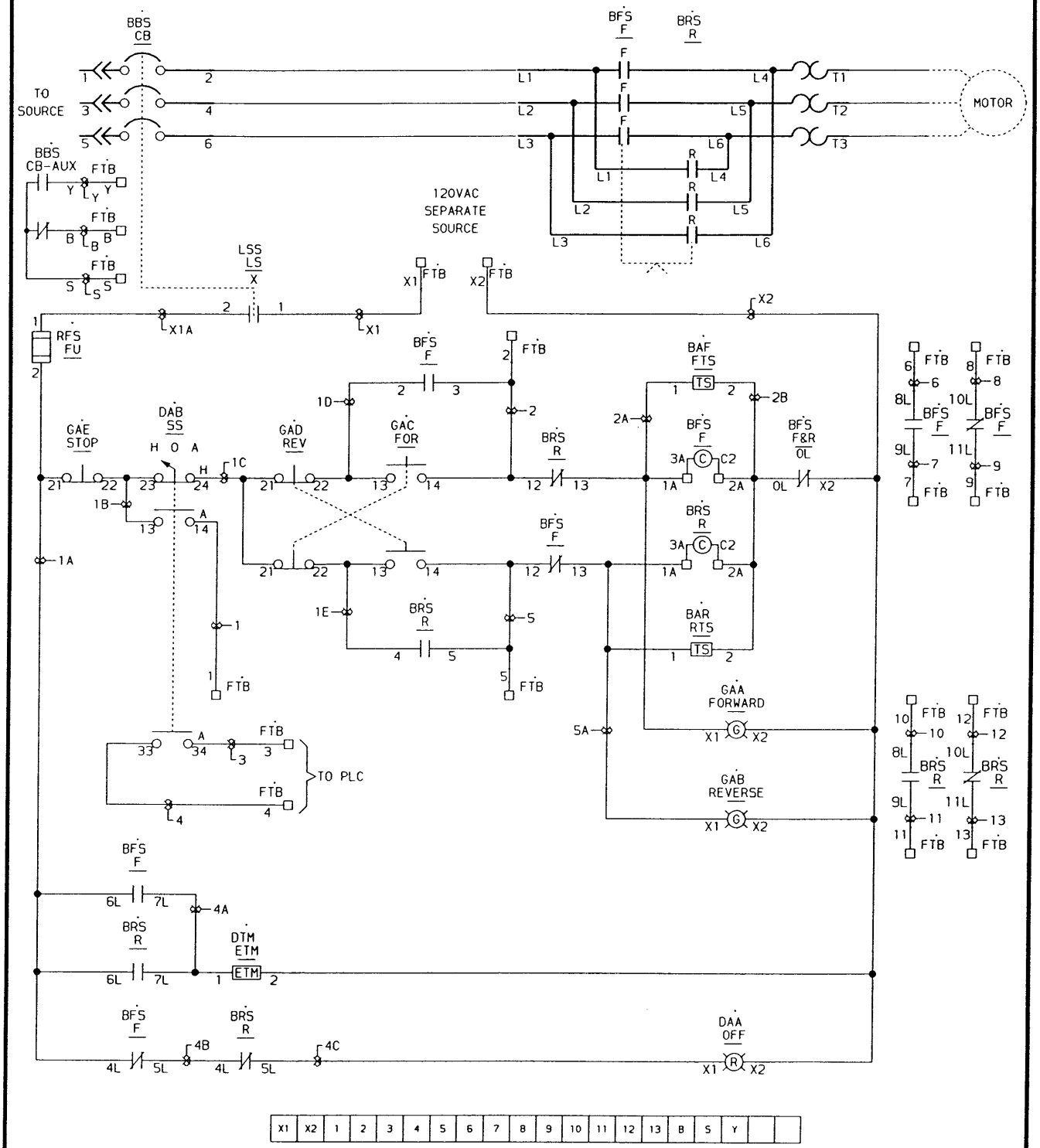



| X1 | X2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | B | S | Y | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

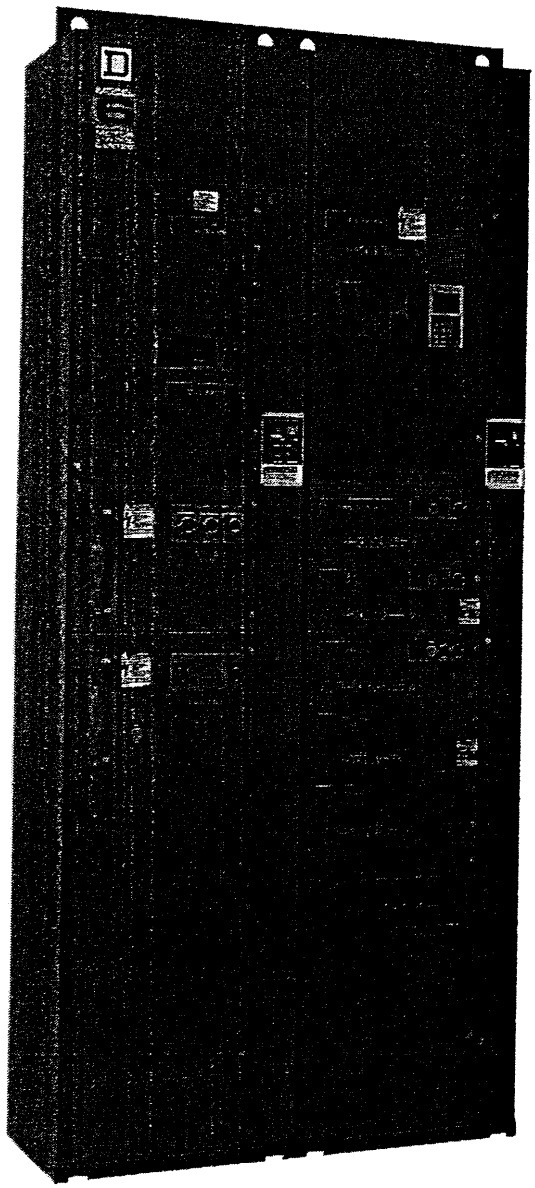
| | | | |
|---|---|---|---|
| JOB NAME: | HILL MURRAY & ASSOCIATES | EQUIPMENT DESIGNATION: | **MCC ADDER** |
| JOB LOCATION: | SIDNEY BC | EQUIPMENT TYPE: | MODEL 6 MOTOR CONTROL CENTER |
| DRAWN BY: | CAD | DRAWING TYPE: | ELEMENTARY DIAGRAM |
| ENGR: | S.U. | GROUPE SCHNEIDER | SQUARE D |
| DATE: | MAY 28, 1999 | DWG# E12461865-001-02 | PG 1 OF 1 REV - |
| DRAWING STATUS: | RECORD | | |

11.6.98

# Model 6 Motor Control Centers
## Class 8998

Instruction Bulletin

**Retain for future use.**



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11.7

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# SECTION 1—ABOUT THE MODEL 6 MCC

Motor control centers (MCCs) provide the most suitable method for grouping electrical motor control and other related devices in a compact, economical, and free-standing installation. A motor control center is made of standardized vertical sections consisting of totally enclosed, dead front, free-standing structures bolted together. These sections support and house control units, a common bus bar for distributing power to the control units, and a network of wire trough and conductor entrance areas to accommodate outgoing load and control wires.

The control units consist of components such as combination motor starters, branch feeder devices, and lighting panelboards. Each is mounted in an individual, isolated compartment having its own cover. When front-of-board unit arrangement is selected, all units are mounted on the front side of the MCC. A 15 in. (381 mm) or 20 in. (508 mm) deep section is provided for front-of-board mounting. The standard MCC width is 20 in. (508 mm) with a 4 in. (102 mm) wide vertical wireway.

An optional 25 in. (635 mm) wide section with a 9 in. (229 mm) wide wireway is also available. Larger sections are available for mounting larger equipment. When a back-to-back arrangement is selected, the units are mounted on both the front and rear of 31 in. (787 mm) or 41 in. (1041 mm) deep structures. Approximately 1 in. (25 mm) of space is between back-to-back sections. The standard height of all MCC structures is 91.5 in. (2324 mm) without the 3 in. lifting angle.

## Schneider Electric Literature List

The following Schneider Electric publications may be useful in the maintenance and regular operation of your Model 6 MCC. Your Schneider Electric field sales representative can provide them upon your request. Or, you can download these documents from the Technical Library at www.us.SquareD.com.

**Table 1: MCC-Related Literature**

| Publication No. | Title |
|---|---|
| 8998CT9701 | Model 6 Catalog, Class 8998 Motor Control Centers |
| 80442-291-01_ | Altivar® Adjustable Speed Drive Controllers, NEMA Types 1 and 1A |
| 80442-772-01_ | Altivar Drive Controllers in Motor Control Centers |
| 80442-507-01_ | Altivar Drive Controller Units in Motor Control Centers |
| 80444-035-01_ | Altivar 58 Drive Controllers in Motor Control Centers |
| 80438-069-02_ | Altistart® 48 Soft Start Units for Motor Control Centers |
| 30072-013-29_ | Motor Logic® Relay |
| 30072-013-98 | Motorlogic Plus Programmable Solid State Overload Relay |
| 30072-013-99 | Motorlogic Plus Solutions Software |
| 30072-013-101 | Motorlogic Plus Lug Kit |
| 30072-013-102 | Motorlogic Plus Network Communication Module |
| 30072-013-52_ | 8536 Type S•, Series B, Form H•• Starter, Size 00 |
| 30072-013-22_ | 8536 Type S•, Series A, Form H•• Starter, Size 0 |
| 30072-013-23_ | 8536 Type S•, Series A, Form H•• Starter, Size 1 |
| 30072-013-24_ | 8536 Type S•, Series A, Form H•• Starter, Size 2 |
| 30072-013-25_ | 8536 Type S•, Series A, Form H•• Starter, Size 3 |
| 30072-013-26_ | 8536 Type S•, Series A, Form H•• Starter, Size 4 |
| 30072-013-47_ | 8536 Type S•, Series A, Form H•• Starter, Size 5 |
| 30072-013-60_ | 8536 Type S•, Series B, Form H3• Starter, Size 6 |
| 3020IM9503 | PowerLogic® Power Meter |
| 3020IM9806 | PowerLogic Circuit Monitor Series 2000 Reference Manual |
| 63230-400-207 | PowerLogic Circuit Monitor Series 3000 (CM3000) Reference Manual |
| 63230-300-213 | PowerLogic Circuit Monitor Series 4000 (CM4000) Reference Manual |
| 0100PL0301 | Square D Digest 173 |

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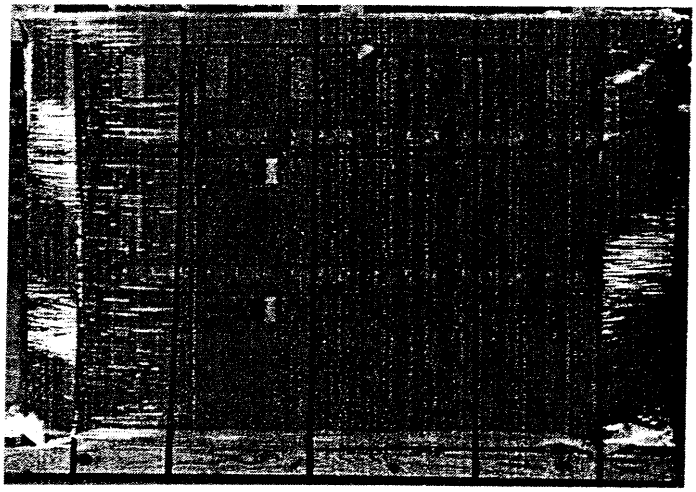
# SECTION 3—RECEIVING, HANDLING, AND STORING THE MCC

MCCs are constructed in shipping blocks of up to three vertical sections. This allows for ease of handling during transportation and installation. The main horizontal bus of all shipping blocks will be spliced together at the job site with the use of captive horizontal splice bars.

Before shipment from the factory, the MCC is inspected visually, electrically, and mechanically by professional quality control analysts. Certification of quality control testing is available upon request.

After leaving Quality Control, each shipping block is carefully packaged and attached to a skid (see Figure 1).

**Figure 1: Packaged Motor Control Center**




## Receiving the MCC

Inspect the MCC for damage as soon as it is received. Delivery of the equipment to a carrier at any of the Schneider Electric plants or other shipping point constitutes delivery to the purchaser. Title and all risk of loss or damage in transit shall pass to the purchaser at that time. Refer to the Schneider Electric Conditions of Sale for more details. All claims for loss and damage must be made by the purchaser to the carrier.

If the packaging material is removed, replace it for protection until installation.

## Handling the MCC

**⚠ WARNING**

**HAZARD OF BODILY INJURY OR EQUIPMENT DAMAGE**

- Use extreme caution when moving sections. The MCC has a high center of gravity, which may cause it to tilt.
- Do not attempt to lift or attach lifting means to sections equipped with pull boxes.

**Failure to follow these instructions can result in death or serious injury.**

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After the shipping section is in place, its lifting angle may be removed and discarded. To prevent the entrance of foreign materials, replace all hardware that secured the lifting angle.

*NOTE: Do not attempt to lift or attach lifting means to sections equipped with pull boxes.*

## Storing the MCC

**⚠CAUTION**

**EQUIPMENT DAMAGE HAZARD**

Never store MCCs outdoors. Outdoor storage is inadequate, even with the protection of a tarpaulin.

**Failure to follow this instruction can result in equipment damage.**

If the MCC cannot be placed into service upon receipt, store it in a clean, dry, ventilated building free from temperature extremes. Acceptable storage temperatures are from 0 °C (32 °F) to 40 °C (104 °F).

If the storage area is cool and/or damp, provide enough heat to prevent condensation inside the MCC. Contact your Schneider Electric field sales representative for specific requirements.

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## Joining NEMA 1/ NEMA 1 Gasketed/ NEMA 12 Sections

Before positioning the MCC sections (see Figure 4 on page 7), check for damaged bus bars and insulators. If the bus is bent or insulators are broken, do not install the MCC. Report any damage to the carrier.

*NOTE: A joining hardware kit is bagged and tied to the right front corner channel of each shipping split. Captive splice bars are pre-assembled on the horizontal bus on the left side of each shipping split.*

*NOTE: For gasket installation instructions, see "Installing Splice Gaskets in NEMA 1 Gasketed and NEMA 12 Enclosures" on page 14 before joining sections.*

### Positioning the MCC

To mount and splice a new MCC section to an existing Model 6 section, or to join factory shipping splits, follow these steps:

1. Remove the upper and lower horizontal wire trough covers in all sections, providing access to each section's front splicing bolts (see Figure 4b).

**Figure 4: Motor Control Center Views**

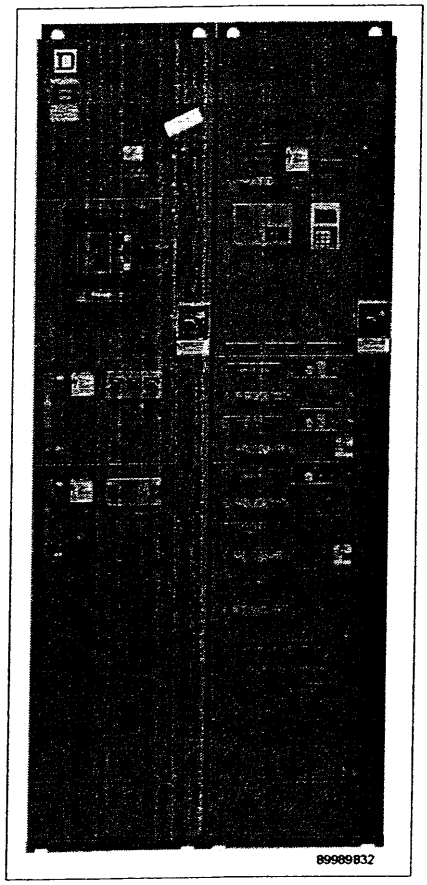


**Figure 4a:All Covers in Place**

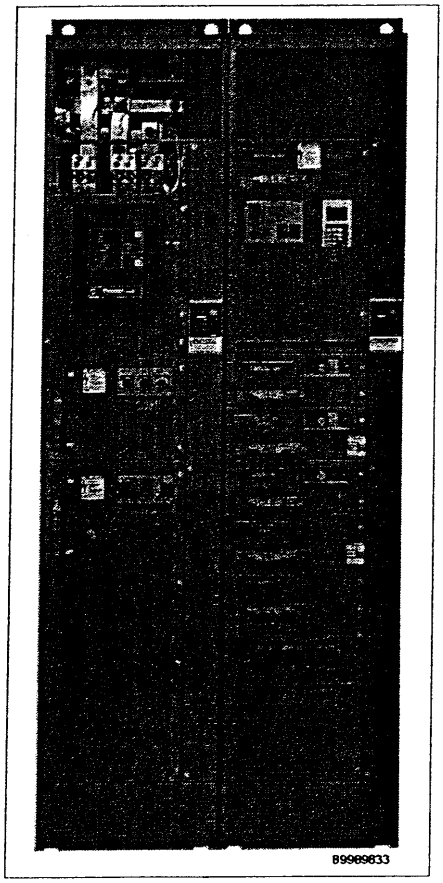


**Figure 4b:Upper Horizontal Wire Trough Covers Removed**

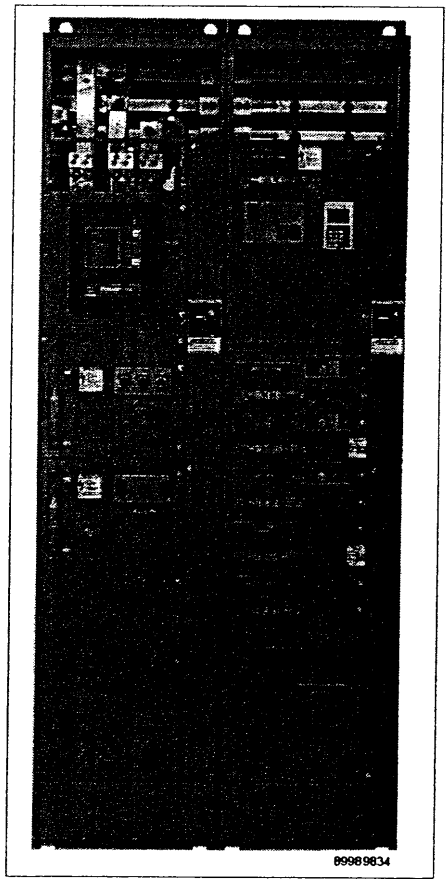


**Figure 4c:Two-piece Bus Barriers Removed (splice connection made)**

2. To gain access to each section's rear splicing bolts, slide the panels of the two-piece bus barriers (see Figure 4b) in the sections adjacent to a splice connection (the left and right sections).

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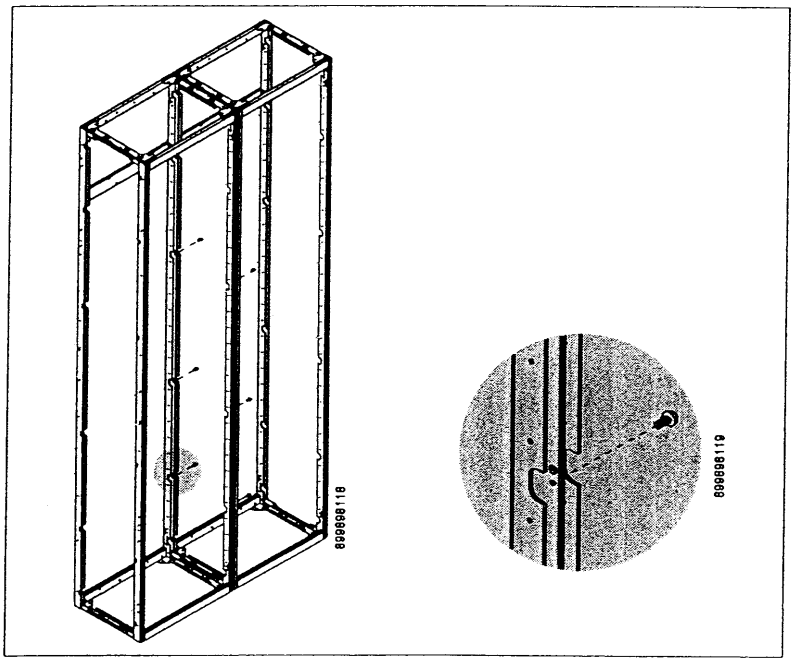
**Figure 6: Bolting Sections Together**

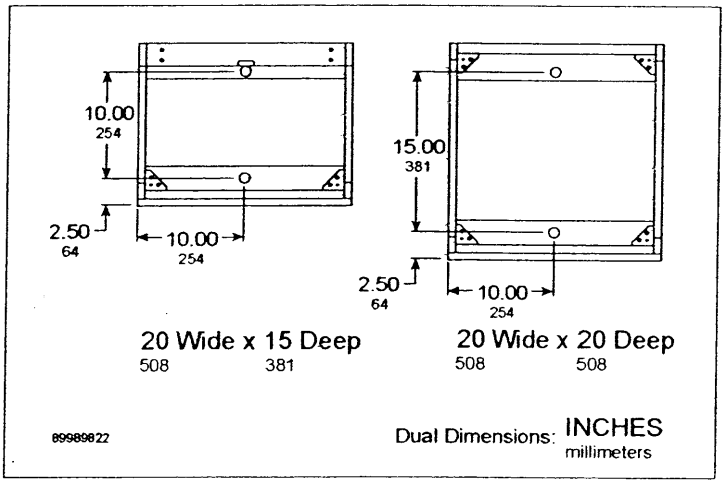



Securing Structures to the Floor

Fasten each section to the floor (see Figure 7) using 3/4 in. or 1/2 in. grade 5 or higher bolts and flat washers (furnished by the installer). 0.88 in. (22 mm) diameter base channel mounting holes provide clearance for bolt expansion anchors for 1/2 in. bolts.

*NOTE: Although sections are free-standing, floor fastening prevents movement, thereby preventing conduit connection damage.*

**Figure 7: Standard Base Channel Mounting**

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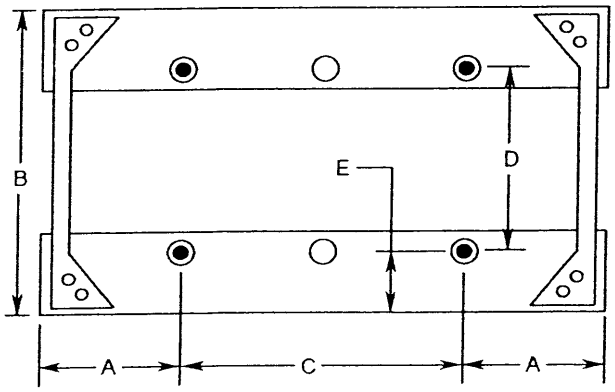
Securing Structures to Floor—Seismic Hazard[1] Designated Locations

Each section must be anchored per detail supplied by engineer of record to the load-bearing path of the building structural system. For floor mounting locations see Figure 8 (NEMA 1, 1A, and 12 enclosures) or Figure 9 on page 12 (NEMA 3R enclosures). Use 0.50 in. or 0.75 in. grade 5 or higher bolts (furnished by others) and Belleville washers (furnished by Schneider Electric). Torque bolts to the value specified by the manufacturer of the anchor.

**Figure 8: NEMA 1, 1A, and 12 Seismic Tie-Down Locations**



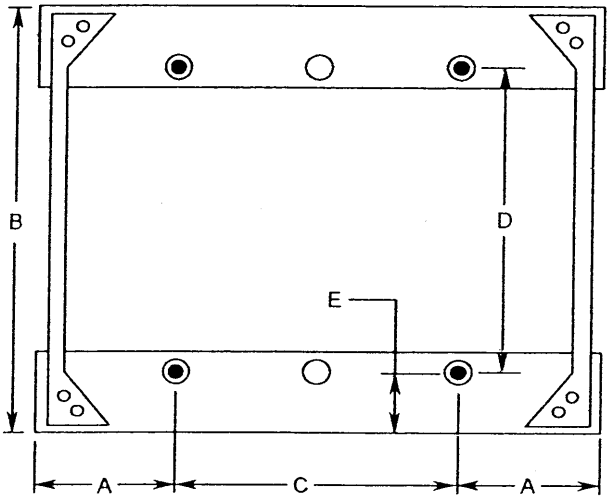

● Seismic Tie-Down Locations

Dimension Tables

Section Dimensions A–B & D–E

| Letter | Dim |
|---|---|
| A | 5 |
| B | 15 |
| D | 9.98 |
| E | 2.5 |

| Section Width | C-Dimension |
|---|---|
| 20 | 10 |
| 25 | 15 |
| 30 | 20 |
| 35 | 25 |




Dimension Tables

Section Dimensions A–B & D–E

| Letter | Dim |
|---|---|
| A | 5 |
| B | 20 |
| D | 14.98 |
| E | 2.5 |

| Section Width | C-Dimension |
|---|---|
| 20 | 10 |
| 25 | 15 |
| 30 | 20 |
| 35 | 25 |

*NOTE: The dimensions shown are tie-down locations within individual MCC sections. Refer to factory supplied drawings to determine appropriate anchor locations for the equipment pad.*

[1] Seismic hazard for site specific locations as defined by the current edition of the International Building Code or NFPA 5000 or relevant local building code or consulting engineer of record.

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**⚠ DANGER**

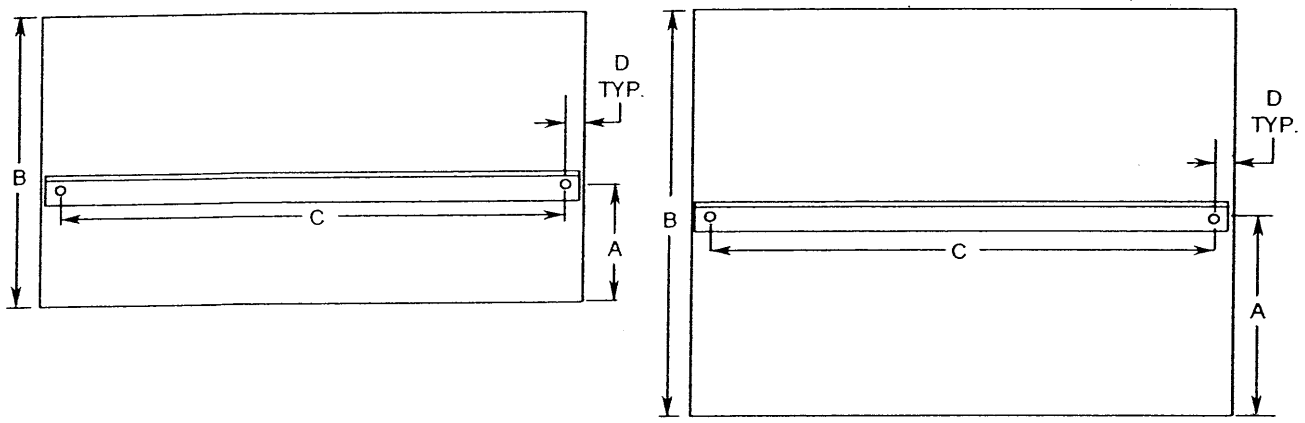
**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Turn off power supplying equipment before installing lateral bracing.
- Bolts must not penetrate top plate by more than 0.50 in.

**Failure to follow these instructions will result in death or serious injury.**

Remove the lifting angle and fasten each section to the lateral restraint system using the same attachment points used to secure the lifting angle. Re-use bolts [3/8 (.375 in.) by 7/8 (.875 in.) long #16 thread] and lock washer (.094 in. thick) supplied with the lifting angle or hardware supplied by others as appropriate. Pay particular attention to the limitation on the depth the bolt can penetrate below the surface of the top plate. The bolts must not penetrate the top plate of the enclosure by more than 0.50 in.

**Figure 10: Attachment Locations for Top Lateral Bracing**




Dimension Tables

Section Dimensions A, B, & D

| Letter | Dim |
|---|---|
| A | 5.25 |
| B | 15 |
| D | 0.8 |

| Section Width | C-Dimension |
|---|---|
| 20 | 18.4 |
| 25 | 23.4 |
| 30 | 28.4 |
| 35 | 33.4 |

Dimension Tables

Section Dimensions A, B, & D

| Letter | Dim |
|---|---|
| A | 10.25 |
| B | 20 |
| D | 0.8 |

| Section Width | C-Dimension |
|---|---|
| 20 | 18.4 |
| 25 | 23.4 |
| 30 | 28.4 |
| 35 | 33.4 |

*NOTE: The dimensions shown are for locating top lateral bracing locations within individual MCC sections. Refer to factory supplied drawings to determine appropriate anchor locations for the top lateral brace support system.*

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5. Applying thumb pressure, firmly press the gasket in place from top to bottom. Ensure that the gasket is flat along the entire length.
6. Join sections together following the appropriate steps in "Joining NEMA 1/ NEMA 1 Gasketed/ NEMA 12 Sections" on page 7.

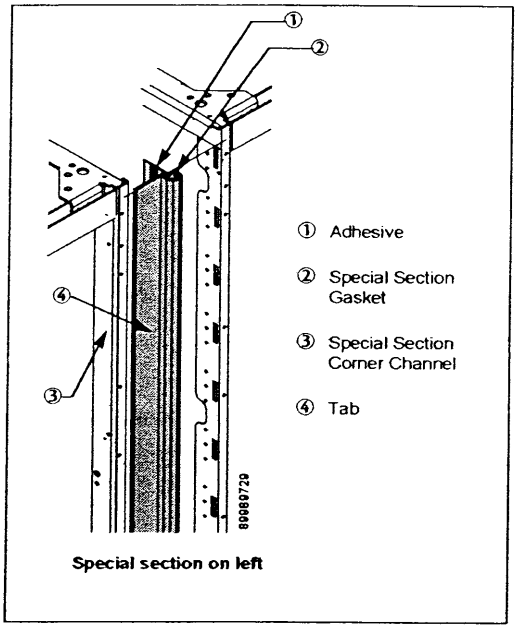
## Special Section Splicing Instructions

For purposes of this instruction manual, a special section is an MCC section without vertical bus. A special section may contain a main device, a branch device, a starter unit, or a removable relay mounting pan.

To splice an existing MCC to a special section, follow these instructions:

1. Remove the side plate, gasketing, and top and bottom front covers from the existing MCC.
2. Remove the white paper backing from the new gasket to expose the adhesive. This adhesive temporarily holds the gasket in place while the sections are being positioned.
3. Apply the gasket to the front right vertical corner channel of the special section as shown in Figure 12.

**Figure 12: Special Section Splicing**




4. Verify that the gasket edge is flush with the top of the corner channel and that the tab is flat on the front of the existing corner channel.
5. Applying thumb pressure, firmly press the gasket in place from top to bottom. Verify that the gasket is flat along the entire length.
6. Join sections together following the appropriate steps in "Joining NEMA 1/ NEMA 1 Gasketed/ NEMA 12 Sections" on page 7.

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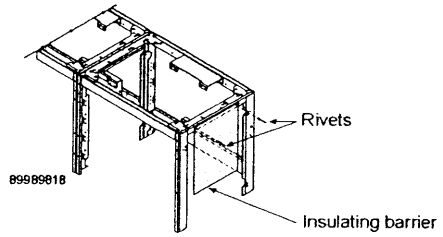
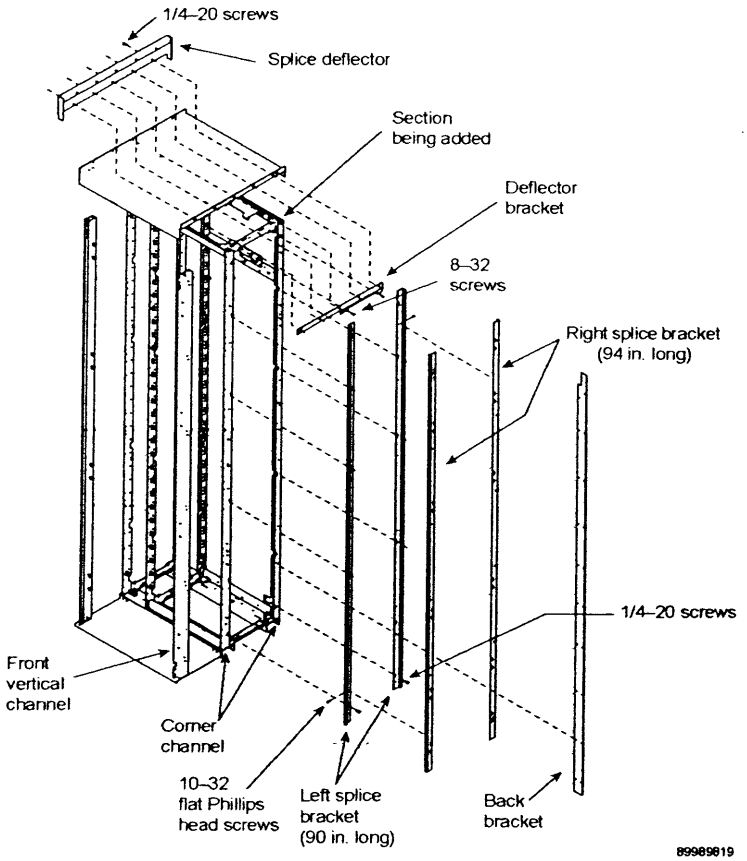
**Figure 14: Removing the Insulating Barrier**




5. Install the deflector bracket (see Figure 15) on the rightmost section of the MCC being added using two 8-32 Phillips head screws included in the kit. The same holes from which the rivets were removed will be used to mount the deflector bracket. Ensure that the top holes of the bracket align with the holes in the top plate of the enclosure.

**Figure 15: Installing the Deflector Bracket**




6. Attach a left splice bracket (see Figure 15), 90 inches long, to the front corner channel of the rightmost section of the MCC being added using six 1/4–20 screws contained in the kit. Ensure that the short flange is flush with the front of the corner channel and that the holes in the bracket line up with the holes in the corner channel.

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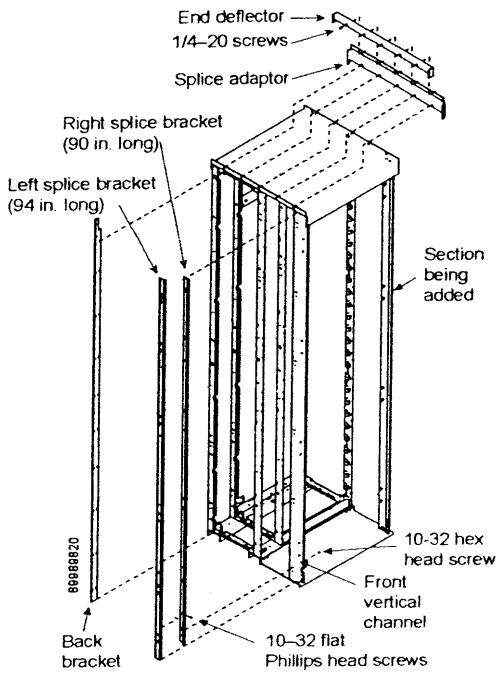
Joining to the Right Side of an Existing NEMA 3R MCC Enclosure

**Figure 17: Installing the Splice Deflector**




1. Remove the end deflector (see Figure 13 on page 16) from the rightmost section of the existing MCC and the end deflector, if supplied, from the leftmost section of the MCC being added. Retain hardware for use in Step 12. Discard both end deflectors.
2. Remove the back plate from the rightmost section of the existing MCC and also from the leftmost section of the MCC being added. Retain the back plates and mounting hardware for re-installation.
3. Remove the end plate (see Figure 13 on page 16) from the rightmost section of the existing MCC and the end plate, if supplied, from the leftmost section of the MCC being added. Discard both end plates.
4. Remove the clear insulating barrier (see Figure 14 on page 17) from the rightmost section of the existing MCC by punching out the rivets that are holding the barrier in place. Repeat this procedure for the barrier, if provided, located in the leftmost section of the MCC being added. Discard both barriers.

   *NOTE: Ensure that rivet parts do not fall into the MCC.*
5. Install the left splice bracket (see Figure 17), 94 inches long, to the right front vertical channel of the existing MCC. Use six 10–32 hex head screws provided in the kit. The long flange of the splice channel will mount to the side of the vertical channel with the short flange near the front of the vertical channel. When properly installed, the bottom of the left splice bracket will be flush with the bottom of the vertical channel.
6. Install the right splice bracket (see Figure 17), 90 inches long, to the left splice bracket installed in Step 5 using six 10–32 flat Phillips head screws provided in the kit. Ensure that the short flange of the right splice bracket is in front of the flange of the left splice bracket. When properly installed, the left splice bracket will extend approximately one inch below the right splice bracket.
7. Position the structures that are to be spliced together. Make sure that the fronts are flush. This ensures proper alignment of all components.
8. Splice sections using the instructions in the Model 5 Instruction Bulletin (8998IM9101R5/92) if joining to a Model 5 MCC, or the instructions on page 14 of this instruction bulletin if joining to a Model 6 MCC. Use the 12 1/4–20 hex head screws provided in the kit to splice the corner channels of the existing MCC to the corner channels of the new MCC.
9. Re-attach the back plate (see Figure 16 on page 18) to the leftmost section of the MCC being added by using the 10–32 hex head screws removed in Step 3. Install the back bracket (see Figure 17) under the back plate using the right side holes of the back bracket. Ensure that the notch at the top of the back bracket is installed toward the new MCC section.
10. Using the hardware removed in Step 2, re-attach the back plate (see Figure 16 on page 18) to the rightmost section of the existing MCC.
11. Install the splice adaptor (see Figure 17) to the leftmost section of the MCC being added by using five 1/4–20 screws provided in the kit.
12. Next, position the end deflector, provided in the kit, over the top plate flanges of both sections (see Figure 17) and install with five 1/4–20 screws removed in Step 1.
13. Using six 10–32 hex head screws, provided in the kit, secure the right front vertical channel of the MCC being added to the right splice bracket installed in Step 6 (see Figure 17).
14. Before energizing the equipment, replace all covers and barriers.

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## Splicing Power Bus for NEMA 1 and NEMA 12 Enclosures

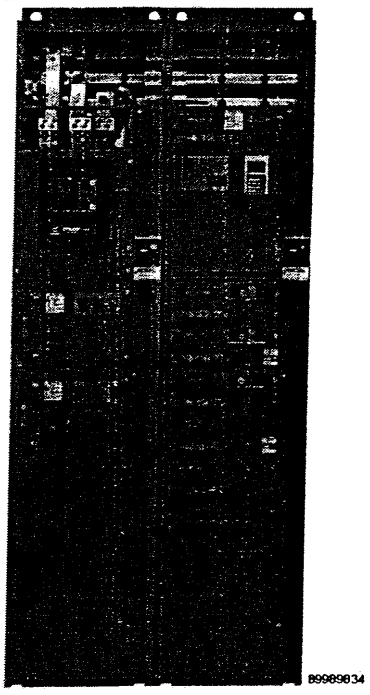
**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

**Failure to follow these instructions will result in death or serious injury.**

**Figure 22: Horizontal Bus Covers and Bus Barriers Removed**




To splice the power bus, follow these steps:

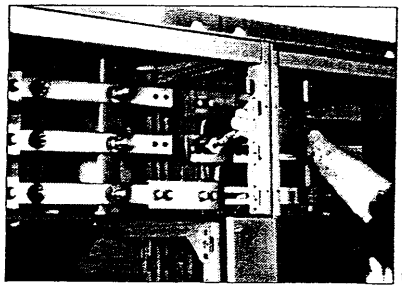
1. Remove the horizontal bus covers and slide horizontal bus barriers from the left and right sections (see Figure 22).

   *NOTE: On the integral splice assembly, located on the left side of each phase bus, the number of bus links is one greater than the number of horizontal bus bars. This creates a sandwich splice. The rear-most splice link contains the captive nuts.*

2. Remove the two left bolts. Loosen, but do not remove, the two right bolts on the splice assembly (see Figure 23).

   *NOTE: Do not remove the two right bolts from the splice assemblies. Doing so will permit spacers to fall from the splice assembly. If this occurs, re-assemble the splice bars and spacers (if applicable) in the proper order before continuing.*

**Figure 23: Removing the Left Bolts and Loosening the Right Bolts on the Splice Assembly**




3. Slide the splice assembly to the left until the two left holes are in line with the corresponding holes in the horizontal bus on the left section (see Figure 25 on page 22).

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## Splicing Power Bus in NEMA 3R Enclosures

**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

**Failure to follow these instructions will result in death or serious injury.**

This section describes how to splice the power bus of a NEMA 3R enclosure (manufactured after February 1998) to the power bus of another NEMA 3R section. Bus splicing material is not captive if the section is equipped with offset bus. Refer to bulletin 80453-649-01_ for instructions for splicing offset power bus in NEMA 3R enclosures.

To splice power bus, follow these steps.

1. Remove the horizontal bus covers from the left and right sections (see Figure 27). Slide horizontal bus barriers open.

   *NOTE: All splice connections have one more splice bar than the number of laminations of the horizontal bus. The rear-most splice bar contains captive nuts.*

2. Remove the two left bolts from each splice assembly. Then loosen, but do not remove, the two right bolts of each splice assembly (see Figure 28). If the bus has optional 85,000 A bus bracing supplied (see Figure 29), also loosen the center nut of each splice assembly.

   *NOTE: Do not remove the two right bolts or the center bolt (if applicable) from the splice assemblies. Doing so will permit spacers to fall from the splice assembly. If this occurs, re-assemble the splice bars and spacers (if applicable) in the proper order before continuing.*

3. Slide the splice assembly to the left until the two left holes are in line with the corresponding holes in the horizontal bus in the left section (see Figure 30).

**Figure 27: Bus Covers Removed and Horizontal Bus Barriers Open**

**Figure 28: Loosen Bolts**

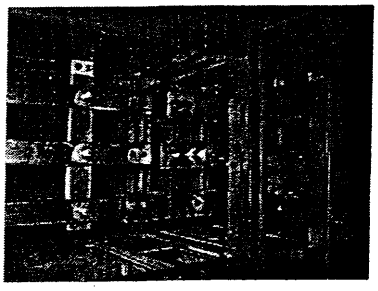



**Figure 29: Optional 85,000 A Bus Bracing**

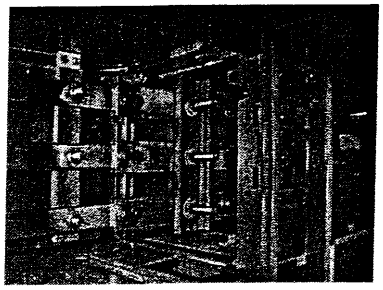
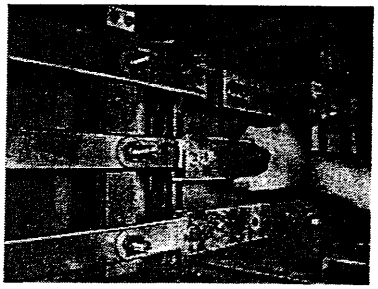



**Figure 30: Slide the Splice Assembly to the Left**

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## Power Bus Splicing of Two-Inch Bus with 100,000 Ampere Short Circuit

This section provides instructions for splicing the power bus of one NEMA 1 or NEMA 12 section with two-inch bus braced for 100,000 A to the power bus of another section of the same type. Splicing material is captive on the integral splice assembly unless the section is equipped with offset bus.

**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

**Failure to follow these instructions will result in death or serious injury.**

To splice the power bus, follow these steps:

1. Remove the horizontal bus covers from the left and right sections (see Figure 22 on page 21).

   *NOTE: The integral splice assembly, located on the left side of each phase bus, creates a sandwich splice. The rear of the splice housing contains the captive nuts.*

2. Remove all four bolts from each splice assembly (see Figure 35).
3. Slide the splice assembly to the left until the two left holes are in line with the corresponding holes in the horizontal bus on the left section (see Figure 36).

**Figure 35: Removing the Bolts from the Splice Assembly**

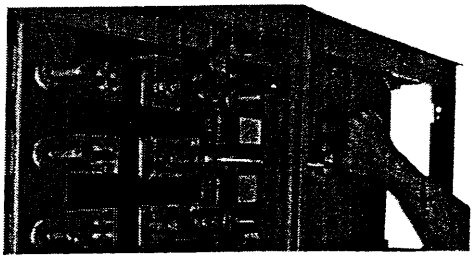

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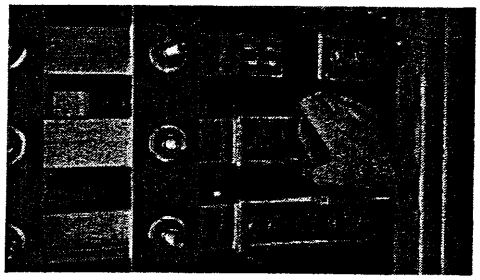
**Figure 36: Aligning the Splice and Bus Holes**



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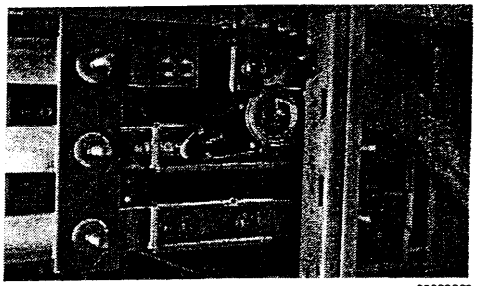
4. Reinstall all four bolts through the splice assembly and into the horizontal bus; make sure the original conical washers are reinstalled with the concave side facing the splice bus (see Figure 31 on page 24).
5. Torque all bolts, on both ends, to 31–32 lb-ft (41.87–43.22 N•m). See Figure 37.
6. Repeat Steps 1 through 5 for all phases and the neutral bus (if supplied).
7. Before energizing the equipment, replace all covers and barriers.

**Figure 37: Torquing the Bolts**



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## Conductor Entry

**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

**Failure to follow these instructions will result in death or serious injury.**

Conduit entry space is provided at the top and bottom of the MCC structure. The top plates (and closing plates in bottom, if present) are removable for convenience in wiring and cutting conduit openings). A hinged door allows access to the main lug, main circuit breaker, or main switch compartment. In some cases, the horizontal wire trough cover must be removed.

Pullboxes are available if additional wiring space is required.

Cable connection torque values are listed in Table 3 and Table 4 on page 33.

## Vent Hood Installation for Motor Control Centers with 2500 A Horizontal Bus

**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.
- Do not drill or cut in the top area of the motor control center.
- Avoid contaminating the motor control center with dust or debris.
- DO NOT lift the cabinet by the vent hood or by attaching lifting angles to the vent hood.

**Failure to follow these instructions will result in death or serious injury.**

This section contains instructions for installing a vent hood over the top plate vents on a motor control center (MCC) with 2500 A horizontal bus.

*NOTES:*
- *Do not install the vent hood until the MCC is in its final location.*
- *Retain all hardware.*

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## Vented Pullbox Installation for Motor Control Centers with 2500 A Horizontal Bus

**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.
- Do not drill or cut in the top area of the motor control center.
- Avoid contaminating the motor control center with dust or debris.
- DO NOT lift the cabinet by the vent hood or by attaching lifting angles to the vent hood.

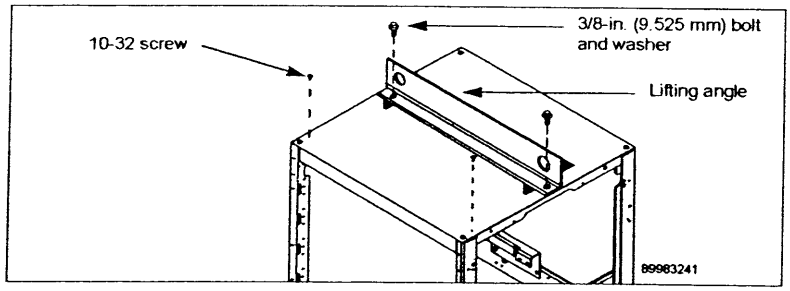
**Failure to follow these instructions will result in death or serious injury.**

This section contains instructions for installing a vented pullbox on a motor control center with 2500 A horizontal bus. Pullboxes are either 12 or 18 inches high and mount on the top of the MCC.

*NOTES:* • *Do not install the pullbox until the MCC is in its final location.*
• *Retain all hardware.*

1. Remove the 3/8-in. (9.525 mm) bolts, washers, and the lifting angle (see Figure 39).

**Figure 41: Remove the Hardware**




2. Remove the two 10-32 screws that secure the closing plate to the top of the cabinet (see Figure 39).
3. Remove the top plate from the structure.

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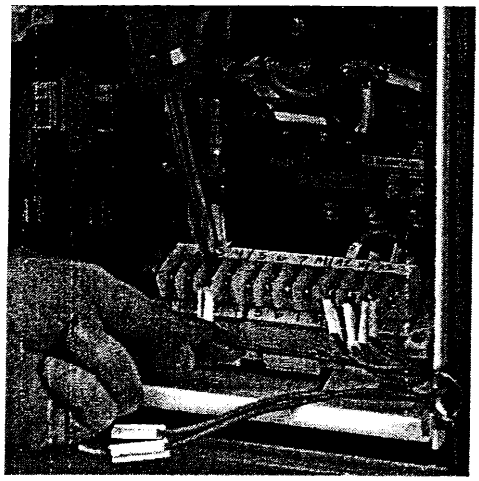
Pull-apart control terminals (see Figure 45) are mounted on a 35 mm DIN-rail located adjacent to the wiring ports toward the front of the unit. Terminate field control wiring on the removable portion of the block.

**Figure 45: Pull-apart Type Terminal Blocks**



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## Cable Connection Torque Values

The following tables provide main disconnect and branch feeder torque values, which apply to both aluminum and copper conductors.

**Table 3: Connection Torque Values for Main Lug Compartments**

| Socket Size Across Flat | Torque |
|---|---|
| 3/8 in.. | 375 lb-in. (42.21 N•m) |
| 1/2 in. | 600 lb-in. (67.79 N•m) |

**Table 4: Connection Torque Values for Main and Branch Feeders**

| Frame Size | Ampere Rating | Torque |
|---|---|---|
| FA | 15–30 A<br>35–100 A | 35 lb-in. (3.94 N•m)<br>80 lb-in. (9.00 N•m) |
| FC | 20–30 A<br>40–100 A | 35 lb-in. (3.94 N•m)<br>65 lb-in. (7.32 N•m) |
| KA | 70–250 A | 250 lb-in. (28.14 N•m) |
| KC | 110–250 A | 250 lb-in. (28.14 N•m) |
| LA | 125–400 A | 200 lb-in. (22.51 N•m) |
| MA | 200–400 A<br>450–1000 A | 300 lb-in. (33.76 N•m)<br>300 lb-in. (33.76 N•m) |
| PA | 800–2000 A | 300 lb-in. (33.76 N•m) |

## Component Instructional Information

Component manuals for devices such as adjustable frequency drive controllers, solid state reduced voltage starters, and programmable logic controllers are included with the MCC instruction information packet.

Thermal overload selection data is listed on the inside of the vertical wire trough door of each section. This information is also listed in this bulletin; see "Thermal Overload Unit Selection" beginning on page 87. Select proper thermal overloads from the applicable starter size tables.

**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

**Failure to follow these instructions will result in death or serious injury.**

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# SECTION 5—OPERATION

Included in this section are the pre-operation checklist and energizing procedures. For information regarding solid state overload relay operation, see "Section 7—Motor Logic® Solid State Overload Relay" on page 49. For Compac™ 6 operating instructions, see "Compac™ 6 Units" on page 80. For Mag-Gard® circuit breaker operating instructions and selection information, see "Mag-Gard Magnetic Trip Adjustment in a Standard Unit" on page 53.

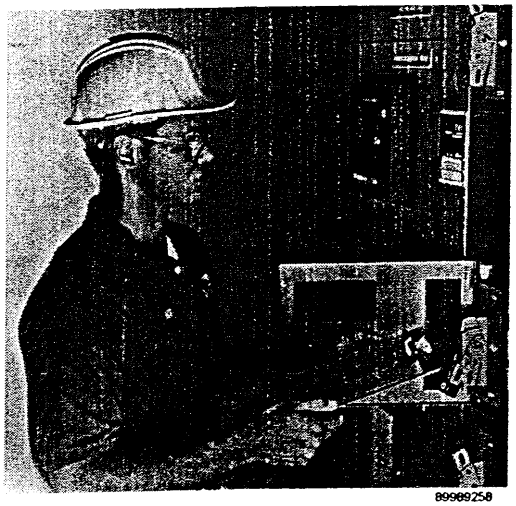
## Pre-operation Checklist

To ensure proper operation of the MCC, check the items listed below before energizing the MCC:

- Complete the maintenance procedures beginning on page 37 and continuing up to "Insulation Test" on page 46. This initial maintenance is necessary to detect any shipping damage or loose connections. Do not energize the MCC until initial maintenance is complete.

  *NOTE: The following maintenance procedures are not necessary before energizing the MCC for the first time:*
  *Control Unit Removal, Stab Assemblies, Starter Contacts and Barriers/Insulators.*
- Perform an insulation test on the MCC (see "Insulation Test" on page 46).
- If the MCC is equipped with ground fault protection, properly adjust and test the ground fault protective device before energizing.
- Remove all blocks or other temporary holding means from the electrical devices.
- Remove any secondary shunt bars from the current transformers. Do not operate a current transformer with its secondary open-circuited.
- Manually exercise all switches, circuit breakers, and other operating mechanisms to ensure that they are properly aligned and operate freely.
- Electrically exercise all electrically-operated switches, circuit breakers and other mechanisms (but not under load) to ensure that the devices operate properly. An auxiliary source of control power may be required.
- Verify proper interval and contact operation of the timers.
- Verify that proper overload units are installed by checking the overload selection tables against motor full load current. Motor Logic® and IEC overload relays (if supplied) do not require thermal units, but are set at the lowest setting at the factory.
- Verify that all load and remote control connections have been made and that they agree with the wiring diagrams provided.
- Verify that all ground connections are made properly.
- Install the covers and close the doors; ensure that all are properly tightened.

**Figure 49: Pre-operation Check**

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# SECTION 6—MAINTAINING THE MCC

Before energizing any new MCC equipment, perform the maintenance described in this section. Perform regular maintenance at least annually, or more frequently if indicated by service conditions and your established maintenance policy. Also perform maintenance following any service interruption, electrical fault, or unusual occurrence.

## Examining the Enclosure

Examine the interior and exterior of the MCC for moisture, oil, or other foreign material. Eliminate all foreign material and clean the MCC.

Clean the interior and exterior of the MCC with a vacuum cleaner. ***Do not use compressed air; it will redistribute contaminants to other surfaces.*** Check the enclosure for damage that might reduce electrical clearances.

Examine the finish of the enclosure. Touch up the paint if necessary. Replace any badly corroded or damaged enclosure parts.

## Maintaining Bus Bars and Incoming Line Compartments

**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

**Failure to follow these instructions will result in death or serious injury.**

**⚠ CAUTION**

**HAZARD OF EQUIPMENT DAMAGE**

- Never brush or use sandpaper on the bus; doing so will remove plating and cause oxidation. Use a cleaning fluid approved for such use. Do not use cleaning fluid on insulators.
- Do not attempt to clean bus bars or connectors that are damaged in any way. Replace them with new parts.

**Failure to follow these instructions can result in equipment damage.**

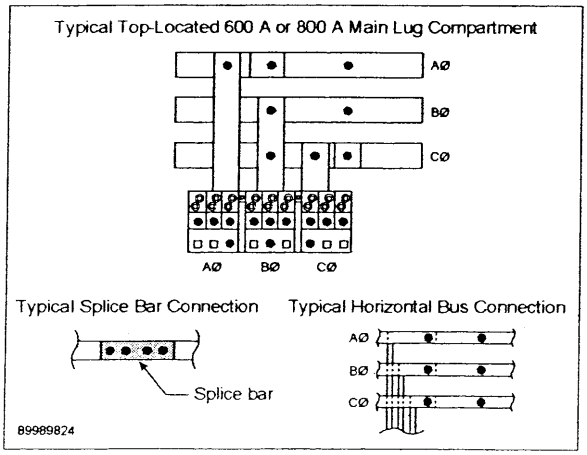
Perform maintenance of bus and incoming line lug connections at least annually, or more frequently if indicated by service conditions and your established maintenance policy. Follow the steps below at the time of installation to locate and tighten any connections that may have loosened during shipment and handling:

1. Remove the top and bottom horizontal wire trough covers in each section.
2. Expose the bus and bus connections by removing the two-piece bus barrier in each section.
3. Examine all bus bars and connectors. Replace any parts that are badly discolored, corroded, or pitted. Also replace parts subjected to excessive temperatures.
4. Verify that all bolts at the bus connection points indicated by a hexagon in Figure 50 are in place and properly tightened. Although one specific type of compartment or bus is shown in Figure 50, perform this maintenance on all bolted connections. See Table 5 for torque values.

**Table 5: Bus Connection Torque Values**

| Bolted Connection Location | Torque Range |
|---|---|
| Horizontal bus (all locations) | 68–70 lb-ft (92.29–94.54 N•m) |
| Splice bars – 0.375 in. diameter bolts | 31–32 lb-ft (41.64–43.33 N•m) |
| Horizontal ground bus (all locations) | 5–6 lb-ft (6.75–8.44 N•m) |

**Figure 50: Typical Bus Connection Points**

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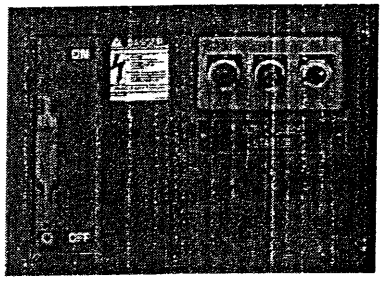
## Removing the Control Unit

Figure 53: Operating Mechanism in the Off Position

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**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Do not attempt to remove the unit from the structure with the disconnect in the *on* position.
- The control unit is interlocked with the MCC structure to prevent the unit from being withdrawn while the disconnect is in the *on* position. Do not attempt to override the mechanism-to-structure interlock.
- Replace all devices, doors, and covers before turning on power to this equipment.

**Failure to follow these instructions will result in death or serious injury**

Figure 54: Loosening Captive Quarter-Turn Fasteners

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Figure 55: Releasing the Lock-in Device (when supplied)

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The Model 6 MCC is designed for convenient and quick control unit removal and replacement. Follow these steps to remove control units:

1. Move the operating mechanism to the *off* position (see Figure 53).
2. Loosen the captive quarter-turn fasteners (see Figure 54) on the door and open it. Use a properly rated voltmeter to check for live circuits. De-energize any voltage sources.
3. Release the lock-in device located at the bottom front of the unit (when supplied) by turning the screw on the front of the device until the locking pawl is parallel to the bottom of the unit (see Figure 55).
4. Disconnect the power wiring from the starter terminals or, if provided, the power terminal blocks. Tag the terminations for re-installation (see Figure 56).

   Remove the top portion of the pull-apart control terminal blocks to which field wiring is connected.

Figure 56: Disconnected Terminal Blocks

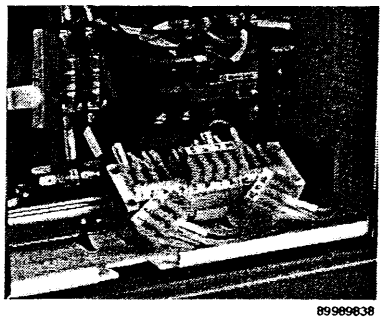

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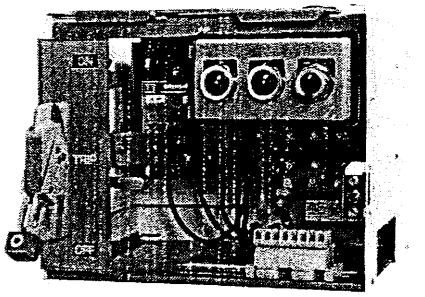
**Figure 61: Control Unit Removed**

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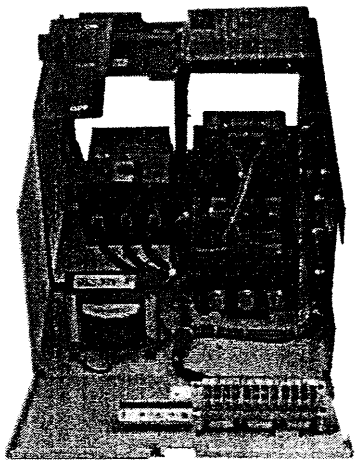
9. Remove the control unit from the structure for servicing (see Figure 61). In units with a full bottom plate, additional accessibility to the components and wiring can be achieved by folding the bottom plate down. To do so, lean the unit on its back, remove the two front screws, and fold the bottom plate down (see Figure 62).

**Figure 62: Control Unit Bottom Plate Folded Down**



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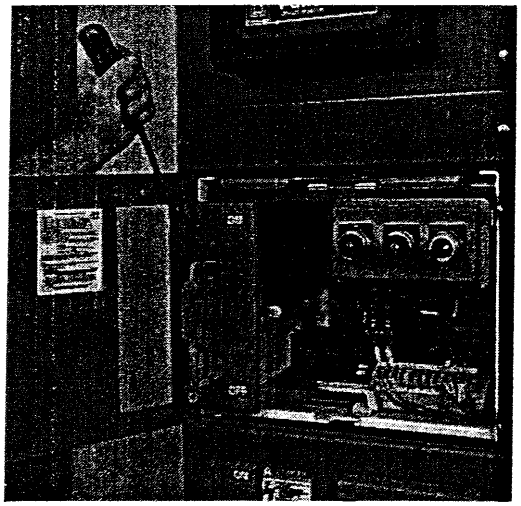
10. If necessary, the door can be taken off its hinges without removing the unit. To do so, drive the hinge pins out of the hinge collars, using a small flat-bladed screwdriver or small punch (see Figure 63). Remove the bottom hinge pin first.

**Figure 63: Driving Out Hinge Pin**



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11. When reinstalling the hinge pin, make certain that the hooked end is fully engaged into the hinge collar.

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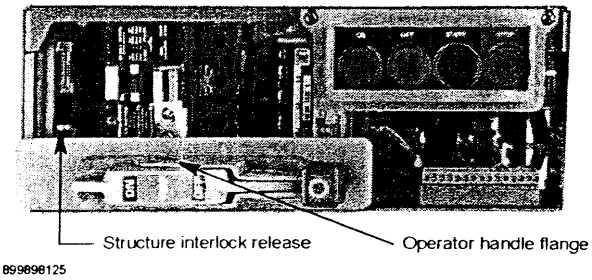
3. Disconnect the power wiring from the starter terminals. Tag the terminations for re-installation.
4. Remove the top portion of the pull-apart control terminal block to which field wiring is connected.
5. Push the power leads and the top portion of the control pull-apart terminal blocks through the wiring port and into the vertical wire trough.
6. Grasp the operating handle flange and press down on the structure interlock release (see Figure 67).

**Figure 67: Operator Handle and Interlock Release**




7. Firmly pull the unit forward to disengage the power stabs from the vertical bus. The unit should now slide freely from the MCC structure.
8. The operating mechanism-to-structure interlock prevents the control unit from being inserted or withdrawn with the handle in the ON position.
9. If the withdrawn unit is left in the structure, use appropriate lock-out/tag-out procedures to avoid re-loading by non-authorized personnel.
10. Remove the control unit from the structure and place it on a flat surface for servicing.

*NOTE: Partial disassembly of the unit may be necessary to gain access to various electrical connections for servicing.*

### Tests and Maintenance Performed with the Control Unit Removed

**⚠CAUTION**

**HAZARD OF EQUIPMENT DAMAGE**

Do not remove the protective lubricant from the stabs. If additional lubricant is required, order Schneider Electric electrical joint compound #PJC-7201.

**Failure to follow this instruction can result in equipment damage.**

Once the control unit is removed, perform the following tests and maintenance:

**Stab Assemblies**—Inspect the stab assemblies (see Figure 68) for signs of arcing or overheating. Replace the disconnect assembly immediately if overheating has occurred. For replacement disconnect assemblies, see "Section 13—Circuit Breaker and Fusible Switch Selection" beginning on page 94.

*NOTE: If the stab assembly is badly pitted, the vertical bus may also need to be replaced.*

**Figure 68: Stab Assembly**

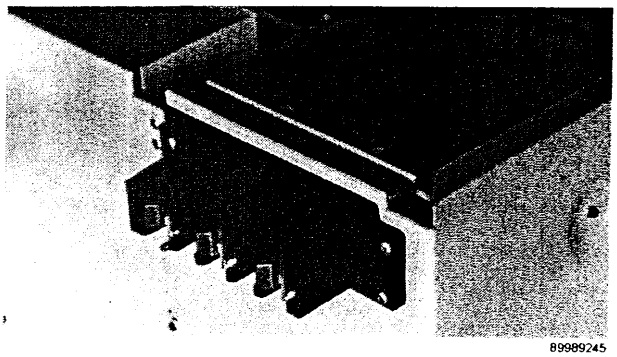



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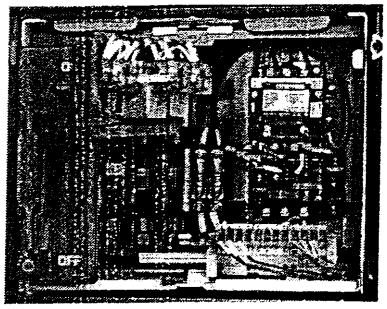
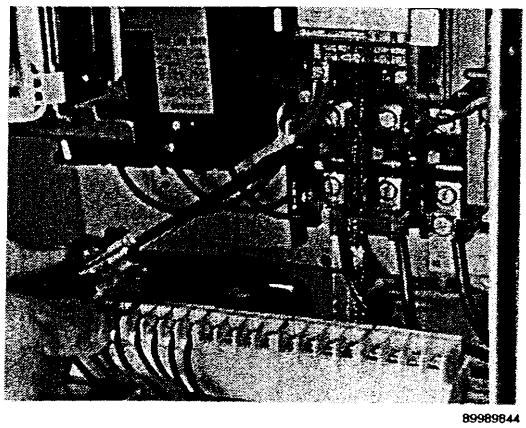
**Figure 72: Control Devices**




**Control Devices**—Check for proper operation of starters, relays, timers, and other control devices (see Figure 72).

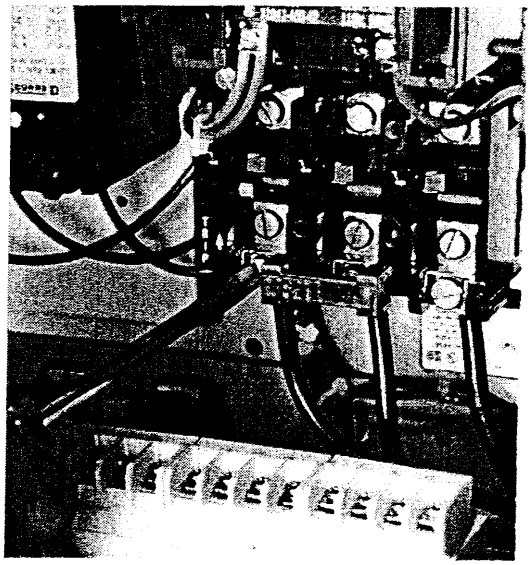
**Overload Relay**—Manually trip the overload relay to ensure proper operation (see Figure 73). Verify that the thermal unit is the proper size for the application. Refer to the thermal unit selection tables on the inside of the vertical wire trough doors.

**Figure 73: Tripping the Overload Relay**




**Wiring and Electrical Connections**—Verify that all electrical connections are correct; tighten them if necessary (see Figure 74). Also inspect all power and control wiring, replacing any wire that has worn insulation or shows signs of overheating or cracking.

**Figure 74: Tightening Electrical Connections**




**Starter Interlocks**—Check the mechanical interlocks on reversing, multi-speed, or reduced voltage starters.

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Before an MCC is re-energized (after installation or regular maintenance), take resistance measurements. Use an insulation tester (megohmmeter) with a potential of 500–1000 V.

Take readings between each phase and from each phase to ground, with the branch disconnects *off* and *on*. Make sure the main disconnect is *off* during all insulation tests.

Readings from a megohmmeter with all disconnects *off* will typically be 5–20 megohms. On new equipment that has been stored in a damp area, lower readings may occur during start-up. If the readings are below one megohm, a few branch units may be energized to help dry out the MCC. If additional readings are above one megohm, additional units may be energized. After the equipment has been in operation for 48 hours, readings should be in the 5–20 megohm range.

When megohmmeter readings are taken with the disconnects *on* (except for the main), disconnect all devices completing circuits between phases or between phases and neutral (*e.g.*, control transformers). Although readings may be slightly different, observe the one megohm lower limit during start-up.

Record all megohmmeter readings on the insulation resistance chart on page 86. Any sudden change in resistance values (even within the acceptable range) may indicate potential insulation failure. Early detection and replacement of faulty insulating components helps avoid equipment damage.

If megohmmeter readings are below 5 megohms (one megohm during start-up) consult your Schneider Electric field sales representative.

Re-energize the equipment in sequence, starting with the main devices, the feeder devices next, and then the motor starter devices. (See "Energizing the MCC" beginning on page 36).

### Maintenance after a Fault Has Occurred

**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

**Failure to follow these instructions will result in death or serious injury.**

Excessive currents occurring during a fault may result in structure, component, bus or conductor damage. This damage is caused by mechanical distortion, thermal damage, metal deposits, or smoke from fault currents. After a fault, locate and correct the cause of the fault. Inspect all equipment and make any necessary repairs or replacements before putting the equipment into service again. Make sure all replacement parts are rated properly and are suitable for the application. If in doubt, consult your Schneider Electric field sales representative.

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# SECTION 7—MOTOR LOGIC® SOLID STATE OVERLOAD RELAY

The following describes 600 V rated MCC starter units equipped with the Motor Logic solid-state overload relay (SSOLR). Read and understand the safety precautions at the beginning of this section before you install, adjust, or perform maintenance on these units. For full details about MCC installation, refer to "Section 4—Installing the MCC" on page 6.

**Figure 77: Motor Logic SSOLR**

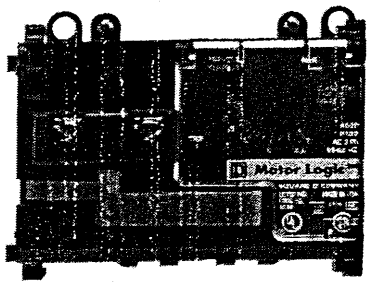


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**Figure 78: NEMA Rated Compac™ 6 Unit**

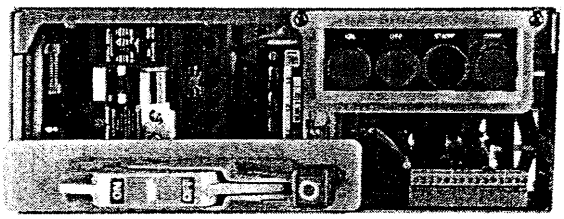

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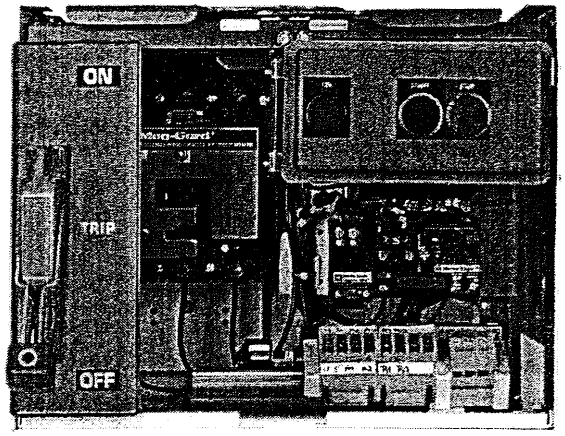
**Figure 79: NEMA Rated Standard Unit**

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Box lugs (on interposing power terminal blocks supplied with selected units) are suitable for wire sizes #14–8 AWG, solid or stranded. Terminal instruction labels are located adjacent to the terminal block. Table 6 provides additional termination data.

**Table 6: Lug Types and Wire Sizes**

| Class 9065 Motor Logic® Overload Relay Size① | Rating | Lug Type | Wire Size② | Torque Values④ |
|---|---|---|---|---|
| 00B | 1.5–4.5 A | Pressure Wire③ | 14–8 AWG (2.5–6 $mm^2$) | 25 lb-in |
| 00C | 3–9 A | Pressure Wire③ | 14–8 AWG (2.5–6 $mm^2$) | 25 lb-in |
| 0 | 6–18 A | Box Lug | 14–4 AWG (2.5–16 $mm^2$) | 50 lb-in |
| 1 | 9–27 A | Box Lug | 14–4 AWG (2.5–16 $mm^2$) | 50 lb-in |
| 3 | 30–90 A | Box Lug | 14–1/0 AWG (2.5–50 $mm^2$) | 100 lb-in |
| 4 | 45–135 A | Box Lug | 8–250 MCM (6–120 $mm^2$) | 200 lb-in |
| 5 | 90–270 A | Box Lug | 250–500 MCM (120–240 $mm^2$) | 250 lb-in |
| 6 | 180–540 A | Clamp Lug | 250–500 MCM (120–240 $mm^2$) | 375 lb-in |

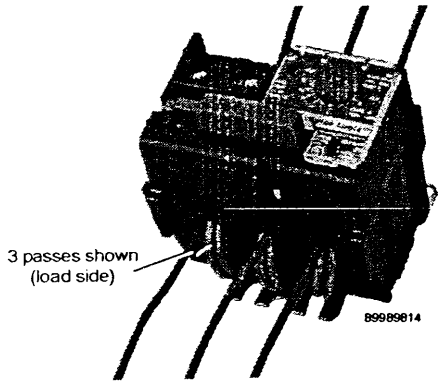
① Refer to the overload relay label next to the adjustment dial.

② Solid or stranded copper wire, 60 or 75 °C, except 45 to 135 A overload relay, which is 75 °C wire only.

③ Box lug kit may be supplied, suitable for 14 to 4 AWG wire, 50 lb-in tightening torque.

④ Does not apply to Compac™ 6 units.

**Figure 80: Looping Passes**

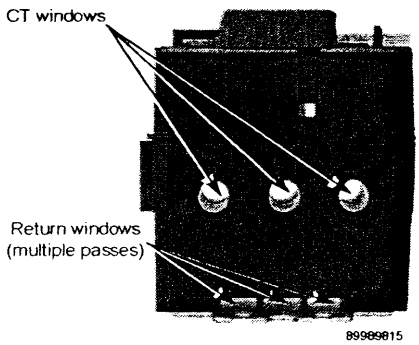



Size 00B, 00C, 0, and 1 relays have conductor (CT) windows through which the motor leads must pass before being connected to the load terminals on the contactor (T1, T2, and T3). By allowing multiple passes (turns) of the load leads through these CT windows, overload protection can be provided for motors with a full-load current lower than the specified operating range. Two passes of the load leads through each window effectively increase (by a multiple of two) the current that the overload relay senses. Three passes effectively increase the current by a multiple of three. All three conductor windows must have the same number of passes, looped in the same direction, for the overload relay to operate properly (see Figure 80).

Passes should begin from the load side of the overload through the CT window and return via the windows provided between the baseplate and overload (see Figure 81.) The final pass terminates on the load side of the contactor.

MCC units requiring multiple passes are factory supplied prelooped with #14 AWG wire and interposing terminal blocks. Refer to "Retrofit Applications" on page 50 for information concerning retrofit.

**Figure 81: Motor Logic Overload (Bottom View)**

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# SECTION 8—MAG-GARD® CIRCUIT BREAKER SETTINGS

The National Electrical Code (NEC®) and Canadian Electrical Code (CEC®) require that magnetic starters, used in combination with adjustable magnetic trip-only circuit breakers, have an overload relay in each conductor. Mag-Gard adjustable magnetic trip-only circuit breakers are the standard motor circuit protectors used in Model 6 MCCs.

## Adjusting Mag-Gard Magnetic Trip Setting

The adjustable magnetic trip setting is factory-set at Lo. This setting may have to be adjusted for proper motor start-up. Refer to the magnetic trip setpoint limits outlined in the applicable national standards.

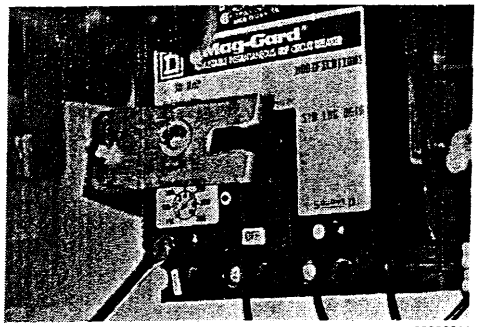
**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

**Failure to follow these instructions will result in death, serious injury or equipment damage.**

**Figure 83: Mag-Gard Magnetic Trip Adjustment in a Standard Unit**




89989211

To access the Mag-Gard trip adjustment dial:

1. Place the unit handle in the "Off" position and open the door.
2. While pushing the door interlock lever forward, trip the circuit breaker by pressing the yellow test button (see Figure 83). The disconnect handle will automatically move up, allowing access to the adjustment dial.

After obtaining the motor full load current from the motor nameplate, select an adjustable trip setpoint to test start the motor. Further adjustments may be required because of motor load characteristics. Refer to applicable national standards for permissible setpoints.

After adjusting the trip setting, reset the circuit breaker by moving the disconnect handle to the "On" position and then to the "Off" position.

*NOTE: Select replacement Mag-Gard circuit breakers for MCCs using the voltage and current ratings listed in the Model 6 MCC Catalog (8998CT9701) in addition to the Mag-Gard selection table in the Square D Digest.*

*NOTE: These circuit breakers are suitable for motors with locked-rotor indicating code letters based on applicable national codes and standards. For other motors, consult your local Schneider Electric field sales representative.*

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| Publication No.★ | Title | Publication Type |
|---|---|---|
| 80459-641-01_ | Model 6 Motor Control Centers | Instruction Bulletin |
| 8998CT9701_ | Motor Control Centers, Model 6 | Catalog |
| 30298-035-01_ | Seriplex® Design, Installation, and Troubleshooting Manual | Instruction Bulletin |
| 8330CT9601R4/99 | Seriplex Control Bus Version 2 | Catalog |
| Seriplex Toolbox | www.squared.com/us/internet/software.nsf | Software |
| 840USE10000 VER.6 | Modicon® TSX Quantum Automation Series | User Manual |
| 840USE11300 VER.3.0 | Modicon XMIT Function Block | User Manual |
| 840USE11600 VER.1.0 | Quantum NOE 771 X0 Ethernet Modules User Guide | User Manual |
| 870USE00200 VER.2 | TSX Momentum I/0 Base User Guide | User Manual |
| 870USE10100 VER.3 | Modicon TSX Momentum M1 Processor Adapter and Option Adapter User Manual | User Manual |
| 870USE11400 | Ethernet Communications Adapter, V2 | User Manual |
| 890USE10000 VER.3 | Modicon Modbus Plus® Network Planning/Installation Guide | User Manual |
| 890USE10300 REV.1.0 | Modicon Modbus Plus Network BM85 Bridge Multiplexer User's Guide | User Manual |
| Modicon TSX Quantum Automation Series | www.modicon.com/specguide98/ | Specifier's Guide |
| PI-MBUS-300 REV.J | Modicon – Modbus® Protocol Reference Guide | User Manual |
| 30072-013-98_ | Motor Logic Plus™ Programmable Solid-State Overload Relay | Instruction Bulletin |
| 30072-013-99_ | Solutions Software for Motor Logic Plus SSOL, Version 1.2 | Instruction Bulletin |
| 30072-013-101_ | Motor Logic Plus Lug-Lug Kit | Instruction Bulletin |
| 30072-013-102_ | Motor Logic Plus Network Communication Module | Instruction Bulletin |
| 30072-450-40 | Altistart® 48 Soft Start Control Board Replacement, VX4G481 | Instruction Bulletin |
| 30072-450-61 | Altistart 48 Y-Range Soft Start Controllers | Installation Guide |
| VD0C32S301_ | Altistart 46 Soft Start Controller User's Manual | Instruction Bulletin |
| VD0C32S303 | Altistart 46 Communication Option | Instruction Bulletin |
| VVDED397044US R12/00 | Altivar® 58 Modbus Plus Communication Option VW3A58302U | Instruction Bulletin |
| VVDED397047US R7/00 | Altivar 58 Drive Controllers Keypad Display VW3A58101 | Instruction Bulletin |
| VVDED397048US R6/00 | Altivar 58 Adjustable Speed Drive Controllers Installation Guide, Type H Controllers | Instruction Bulletin |
| VVDED397054US | Altivar 58 Modbus/JBUS/UNITELWAY User's Guide | Instruction Bulletin |
| 3000DB0001 | PowerLogic® System Architecture and Application Guide | Data Bulletin |

★ Represents the current revision level of the document, and may vary from the document number shipped with your equipment.

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cables in the bottom horizontal wireway, make sure to maintain a 0.25-in. (6 mm) distance between the communications cabling and all other cabling.

## MODBUS® COMMUNICATIONS NETWORK

There are three primary ways to connect the Modbus communications network: via bridges/repeaters, programmable logic controllers (PLCs), or a direct cable connection. Follow the applicable instructions below to make the cabling connections for Modbus in your Model 6 OMNI Center.

### Bridges/Repeaters

If the PLC is not in the local area of the MCC, you will typically need to use a bridge/repeater to connect the Modbus communications network. Schneider Electric recommends installing and operating one of the bridges listed in the following table.

**Table 7: Recommended Bridges/Repeaters**

| Type | Manufacturer | Bridge/Repeater No. | Reference Material |
|---|---|---|---|
| N/A | B&B Electronics | Bridge: RS-485<br>Repeater: 4850PDR3399 | 4850PDR3399<br>Operational Bulletin |
| Modbus/Ethernet (TCP/IP) | Schneider Automation | Bridge: 174-CEV30010 | 890USE15500* |
| Modbus/Ethernet | Schneider Electric | Bridge: 3090-EGW-2 | 3050IM9601 R2/99* |
| Modbus/Modbus Plus® | Schneider Automation | Bridge Multiplexer: NW-BM85D-0002 | 890USE10300* |
| Momentum I/O Base Modbus | Schneider Automation | Bridge: 170ADM54080 | 870USE00200 VER.2* |
| PowerLogic® RS-232/RS-485 | Schneider Electric | Converter: 3090-MCI-101 | MCI-101 |

* See "OMNI Center-Related Literature List" on page 54.

Follow the general steps below to connect the Modbus network to a bridge/repeater. Consult the reference manual for your particular bridge/repeater for specific installation and configuration instructions:

1. Provide control power to the bridge device, if not provided by the MCC.
2. Connect the incoming communications cable to the customer side of the bridge/repeater.
3. Read and understand the instructions contained in the reference material for your device. Follow the installation and configuration instructions contained in that material to complete the setup of the bridge/repeater.

#### Grounding

If a Programmable Logic Controller (PLC) and/or repeater is provided with your OMNI Center, grounding is done at the factory. If not, the MCC network is supplied ungrounded and you will need to ground it at only one point, either a personal computer (PC), PLC, or repeater.

For typical grounding requirements, refer to Modicon® —Modbus Protocol Reference Guide, document number PI-MBUS-300 (see "OMNI Center-Related Literature List" on page 54).

#### Terminating Resistors

In order for the Modbus communications network to operate properly, terminating resistors are required on each end of the network. See "OMNI Center Cabling Replacement Parts" on page 73 for a list of available terminating resistors. If your OMNI Center is shipped with a bridge, repeater, and/or PLC, external terminal blocks (MCT485) are included with shipment.

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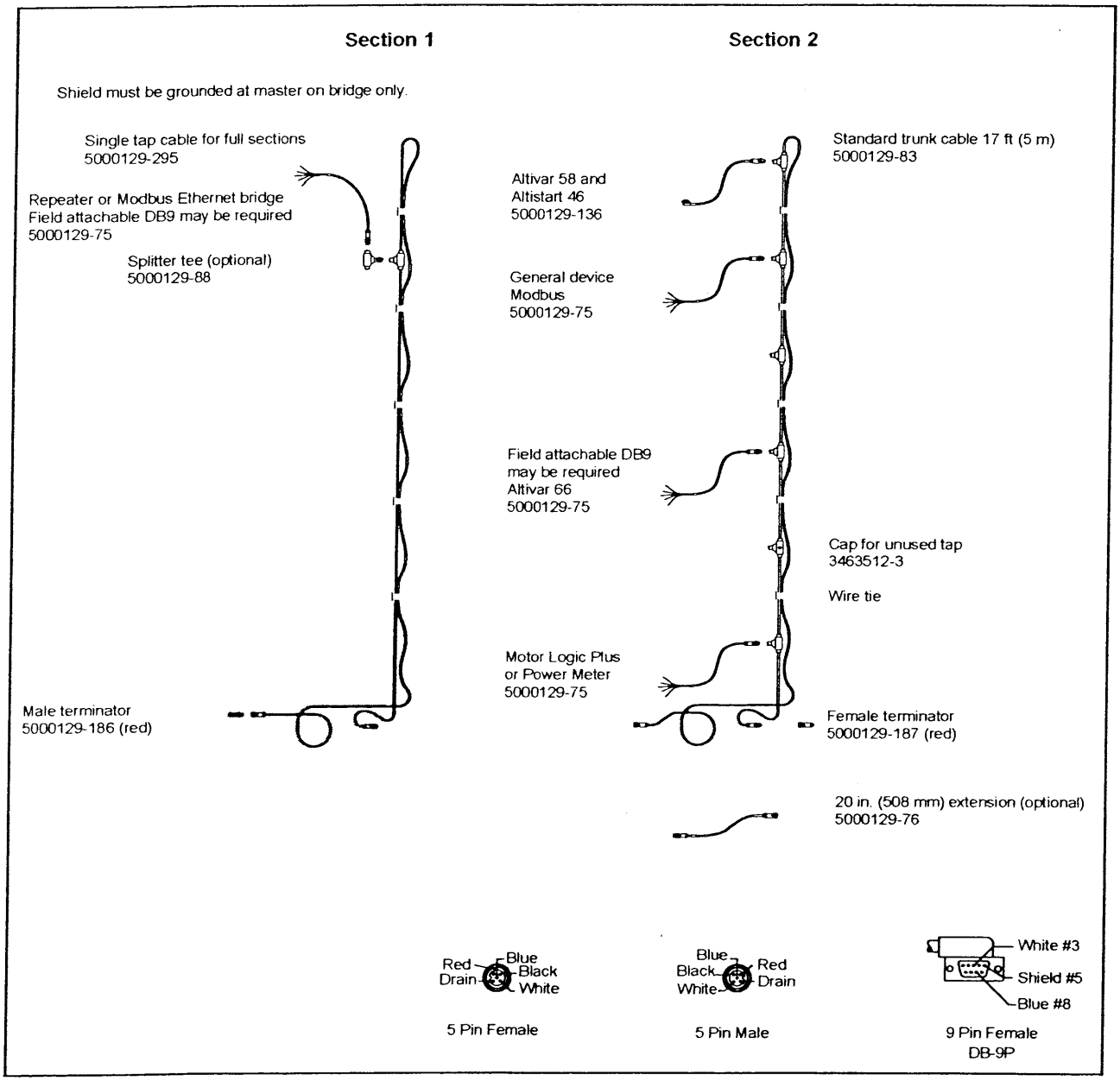
**Figure 84: Typical Cabling Scheme for Modbus® 4-Wire**




## OPERATION

This section contains pre-operation checklists, energizing procedures, and remote and local programming procedures for Motor Logic Plus™, PowerLogic® Power Meter, PowerLogic Circuit Monitor, Altivar® 58, Altivar 66, Altistart® 46, and Altistart 48.

For COMPAC™ 6 operating instructions, see "Compac™ 6 Units" on page 80. For Mag-Gard® circuit breaker operating instructions and selection information, see "Section 8—Mag-Gard® Circuit Breaker Settings" on page 53.

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### Communications Setup

- ☐ Use the following table to make sure that all devices are configured for the correct communications parameters:

**Table 8: Modbus® Communications Protocol**

| Protocol | Modbus RTU RS-485, 4-wire |
|---|---|
| Transmission speed | 19,200 baud |
| Data bits | 8 |
| Start bits | 1 |
| Stop bits | 1 |
| Parity | Even |

- ☐ Verify that all devices have been assigned correct addresses (typically from 1–32; see "Device Addressing" on page 70 for specific addressing parameters).

### PC/PLC Connections

- ☐ Refer to Table 8 above to verify that the proper communications protocol is being used.
- ☐ Test the RS-232 communications port of the master device (either a PC or PLC).

## Energizing the MCC

**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.
- Review the "Pre-operation Checklists" beginning on page 60, and verify that all items check out.

**Failure to follow these instructions will result in death, serious injury or equipment damage.**

To energize the MCC:

1. Review the "Pre-operation Checklists" on page 60 before energizing.
2. Turn off all downstream loads, including distribution equipment and other devices that are remote from the MCC.
3. Verify that all barriers, doors, and covers are closed before energizing the equipment.
4. Energize the equipment in sequence, starting with the main devices, the feeder devices next, and then the motor starter devices.
5. With all barriers in place and all unit doors closed and latched, turn on the devices with a firm, positive motion.
6. After all disconnect devices are closed, you may energize loads such as lighting circuits, starters, contactors, heaters, and motors.

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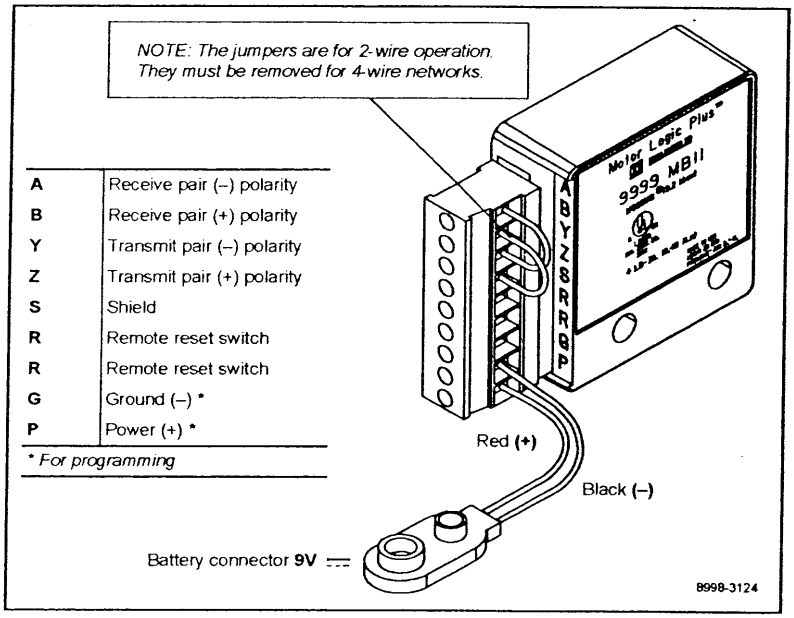
Figure 85: Motor Logic Plus™ Communication Module Terminals




Error messages are displayed on the 3-digit LED display when harmful conditions are detected. Table 9 contains a list of the error message codes and their definitions.

Table 9: Local Error Display

| Displayed Message | Meaning |
|---|---|
| oc | Tripped on over current |
| SP | Tripped on single phasing |
| ub | Tripped on voltage or current unbalance |
| uC | Tripped on under current |
| cF | Tripped on contactor failure |
| GrF | Tripped on ground fault |
| HI | Tripped on high voltage |
| Lo | Tripped on low voltage |
| rP | Incoming phases have been reversed |
| oFF | A stop command was issued from a remote source |

## Remote Programming

Remote programming can be used for setpoint programming and data acquisition purposes. Follow the steps below to remotely configure the Motor Logic Plus overload:

1. Stop the overload by sending code "02H" to the command register (C6H).
2. If network programming has not been enabled, send code "05H" to the command register.
3. Program the appropriate parameter. See Table 10 on page 64 for a register map with a list of parameters. For more detailed information, refer to bulletin # 30072-013-102_. See Table 12 and Table 13 to determine the location and addressing of parameters within the Motor Logic Plus register map.
4. Restart the overload by using code "01H."

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**Table 10: Motor Logic Plus™ Address Descriptions** *(continued)*

| Operation | Address | | Code | Description | Notes |
|---|---|---|---|---|---|
| | RAM | Relative★ | | | |
| Read only (all registers are 16-bit words) | CE | 1B7 | VUB | Voltage unbalance threshold | 2–15%, or 999 (off) |
| | D0 | 1B8 | MULT | Effective turns ratio | Determined by model |
| | D2 | 1B9 | OC | Overcurrent threshold | Current range of SSOLR |
| | D4 | 1BA | UC | Undercurrent threshold | 0.5 x OC Min. to OC Max., Off |
| | D6 | 1BB | CUB | Current unbalance threshold | 2–25%, or 999 (off) |
| | D8 | 1BC | TC | Overcurrent trip class | 5, J5, 10, J10, 15, J15, 20, J20, 30, J30 *(J = Jam protection is enabled)* |
| | DA | 1BD | RD1 | Rapid cycle timer | 2–500 s |
| | DC | 1BE | RD2 | Restart delay RD2 | 2–500 min. |
| | DE | 1BF | RD3 | Restart delay RD3 | 2–500 min. |
| | E0 | 1C0 | #RU | Restarts after UC | 0, 1, 2, 3, 4, A |
| | E2 | 1C1 | #RF | Number of restarts | 0, 1, oc1, 2, oc2, 3, oc3, 4, oc4, A, ocA *(0 = manual, A = continuous, oc = automatic restart after RD2 expires)* |
| | E4 | 1C2 | UCTD | Undercurrent trip delay | 2–60 s |
| | E6 | 1C3 | GF | Ground fault threshold | 0.15 x OC Min. to 0.2 x OC Max., Off |
| | E8 | 1C4 | ADDR | RS-485 slave address | 01–99 |

★ Required for PowerLogic software.

**Table 11: Command Line Codes**

| Code | Command |
|---|---|
| 01H | Start/reset |
| 02H | Stop |
| 03H | Display lock |
| 04H | Display unlock |
| 05H | Network program enable |
| 06H | Network program disable |
| 07H | Network watchdog enable★ |
| 08H | Network watchdog disable★ |

★ The network watchdog feature disables the Motor Logic Plus SSOLR when the device does not receive a valid communication within a 10 s period.

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**Table 12: Read Only Registers** *(continued)*

| RAM Address | Relative Address★ | Code | Description | Notes |
|---|---|---|---|---|
| B0 | 1A8 | FH★★ | NIBBLE_CODED -4 fault history | The four-fault history is based on the following scheme: 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1, where bits 1–4 = Last fault, bits 5–8 = 2nd last fault, bits 9–12 = 3rd last fault, & bits 13–16 = 4th last fault. These four bits indicate a hex value that corresponds to the following faults: |
| | | | | 01 — High voltage |
| | | | | 02 — Low voltage |
| | | | | 03 — N/A |
| | | | | 04 — Contactor failure |
| | | | | 05 — Phase reversal |
| | | | | 06 — Single phase |
| | | | | 07 — Ground fault |
| | | | | 08 — Current unbalance |
| | | | | 09 — Remote off command |
| | | | | 10 — Overcurrent |
| | | | | 11 — Undercurrent |
| B2 | 1A9 | PID★★ | Manufacture year, month, product type/scale | 8-bit year, 4-bit month, 4-bit I/O & scale |
| B4 | 1AA | VA-C | Line voltage A–C | Volts |
| B6 | 1AB | VB-C | Line voltage B–C | Volts |
| B8 | 1AC | VA-B | Line voltage A–B | Volts |
| BA | 1AD | IC | Raw current phase C | A (x100, x10, x1), multiplied by scale factor |
| BC | 1AE | IB | Raw current phase B | A (x100, x10, x1), multiplied by scale factor |
| BE | 1AF | IA | Raw current phase A | A (x100, x10, x1), multiplied by scale factor |
| C0 | 1B0 | RD1★★ | Remaining restart delay RD1 | Seconds |
| C2 | 1B1 | RD2★★ | Remaining restart delay RD2 | Seconds |
| C4 | 1B2 | RD3★★ | Remaining restart delay RD3 | Seconds |

★ Must be used with PowerLogic® software
★★ Can only be viewed via network

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Table 13: Read/Write Registers *(continued)*

| RAM Address | Relative Address | Code | Description | Range | Default | |
|---|---|---|---|---|---|---|
| E0 | 1C0 | #RU | # Restarts after undercurrent | 0, 1, 2, 3, 4, A (Automatic) | **RU Values** | |
| | | | | | 8.1 | 0–4 in decimal |
| | | | | | 8.2 | A = 255 decimal |
| E2 | 1C1 | #RF | # Restarts all faults except undercurrent | 0, 1, oc1, 2, oc2, 3, oc3, 4, oc4, A, ocA *(0 = manual, A = continuous, oc = automatic restart after RD2 expires)* | **RF Values** | |
| | | | | | 0 | 1 decimal |
| | | | | | 1 | 2 decimal |
| | | | | | oc1 | 3 decimal |
| | | | | | 2 | 4 decimal |
| | | | | | oc2 | 5 decimal |
| | | | | | 3 | 6 decimal |
| | | | | | oc3 | 7 decimal |
| | | | | | 4 | 8 decimal |
| | | | | | oc4 | 9 decimal |
| | | | | | A | 10 decimal |
| | | | | | ocA | 11 decimal |
| E4 | 1C2 | UCTD | Undercurrent trip delay | 2–60 seconds | 5 | |
| E6 | 1C3 | GF | Ground fault current threshold | (0.4) AOL current range or Off | 0.15 x Min. | |
| E8 | 1C4 | ADDR | RS-485 slave address | 01–99 | 1 | |

★ Can only be viewed via network

### PowerLogic® Power Meter

Instructions for performing local and remote programming for the Power Meter are contained in Schneider Electric instruction bulletin # 3020IM9503R6/98 (see "OMNI Center-Related Literature List" on page 54).

### PowerLogic Circuit Monitor

Instructions for performing local and remote programming for the Circuit Monitor 3000 or Circuit Monitor 4000 series are contained in Schneider Electric instruction bulletin # 63230-400-204 or 63230-300-209, respectively (see "OMNI Center-Related Literature List" on page 54).

### Altivar® 58

To accomplish local setpoint programming and fault readout for the Altivar 58, refer to Schneider Electric instruction bulletin # VVDED397047US R7/00 (see "OMNI Center-Related Literature List" on page 54).

To perform remote setpoint programming and fault readout, refer to Schneider Electric instruction bulletin # VVDED397054US (see "OMNI Center-Related Literature List" on page 54).

For Altivar 58 hardware troubleshooting, refer to Schneider Electric instruction bulletin # VVDED397048US R4/99 (see "OMNI Center-Related Literature List" on page 54).

See Table 12 on page 66 and Table 13 on page 68 to determine the location and addressing of parameters within the Altivar 58 register map.

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## Table 14: Modbus® Device Connections

| Parameter/ Device Type | Typical Bridge/Master | Momentum Master 170ADM54080 | Motor Logic Plus™ SSOLR | Altivar® 58 with Modbus Card | Altivar 66 with Modbus | Altistart® 46 | Power Meter (PM600 Series) | Circuit Monitor |
|---|---|---|---|---|---|---|---|---|
| Default protocol | | Modbus | JBUS | Modbus | Modbus | Modbus | Modbus | Modbus |
| Device address | | | Faceplate Settable (1–99) | Set by dip switch (1–31) | Set on keypad or software (1–64) | Set by software | Set on faceplate (1–198) | Set on faceplate (1–198) |
| Configuration software | | Concept, Taylor, Modsoft | Solutions Software | VW3A58104 | VW3A66331 | VW3G46105 | SMS-3000 | SMS-3000 |
| Communication connections | | Terminal strip | Terminal strip | 9-pin sub-D | 15-pin sub-D | 9-pin sub-D | Terminal strip | Terminal strip |
| 2-wire: RS-485 [1] | | | | | | | | |
| Jumpers | | Required | Required | | Not required | Not required | Required | Required |
| Green/blue | D(B)+ | 1: RX HI | A: RD+ | 7: D(B) | 14: D(B) | 7: D(B) | 5: IN+ | TX(B)+ |
| White | D(A)- | 2: RX Lo | B: RD- | 3: D(A) | 7: D(A) | 3: (D)A | 4: IN- | TX(A)- |
| Bare | to ground | 5: PE | S: Shld | 4: 0V | 15: 0V | 4: 0V | 1: Shld | to ground |
| 4-wire: RS-422/485 [2] | | | | | | | | |
| Green/blue | TX(B)+ | 3: TX HI | A: RD+ | 6: RD(B) | 3: RD(B) | 6: RD(B) | 5: IN+ | TX(B)+ |
| White | TX(A)- | 4: TX Lo | B: RD- | 2: RD(A) | 8: RD(A) | 2: RD(A) | 4: IN- | TX(A)- |
| Red | RX(B)+ | 1: RX HI | Y: TD+ | 7: D(B) | 14: D(B) | 7: D(B) | 3: OUT+ | RX(B)+ |
| Black | RX(A)- | 2: RX Lo | Z: TD- | 3: D(A) | 7: D(A) | 3: D(A) | 2: OUT- | RX(A)- |
| Bare | to ground | 5: PE | S: Shld | 4: OV | 15: 0V | 4: 0V | 1: Shld | to ground |

[1] Non-standard OMNI Center with Modbus MCC configuration

[2] Standard OMNI Center with Modbus MCC configuration

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## OMNI CENTER CABLING REPLACEMENT PARTS

**Table 15: OMNI Center Standard Cabling Assemblies Parts List**

| Part # | Description | Use |
|---|---|---|
| 3463512-1 | Female threaded cap | Unused male taps all networks (approximately 2 per MCC) |
| 3463512-3 | Male threaded cap | Unused female taps all networks (approximately 4 per section) |
| 5000129-75 | 5P MM DC male in-line plug 36 inches (stripped and tinned) | Modbus® unit taps (1 per unit) |
| 5000129-76 | 5P MM DC female-to-male in-line assy 20 inches | Extension all networks |
| 5000129-77 | 5P MM DC female-to-male in-line assy 24 inches | Extension all networks |
| 5000129-78 | 5P MM DC female-to-male in-line assy 25 inches | Extension all networks |
| 5000129-79 | 5P MM DC female-to-male in-line assy 30 inches | Extension all networks |
| 5000129-80 | 5P MM DC female-to-male in-line assy 35 inches | Extension all networks |
| 5000129-81 | 5P MM DC female-to-male in-line assy 25 feet | Field installation/special cables |
| 5000129-83 | 5P MM DC F-F-F-F-F-F-F-MIL Harness assy 16 feet 2 inches (concept 2) | Main trunk cable all networks (1 per standard section) |
| 5000129-85 | 5P MM DC male in-line plug 25 feet | Field installation/special cables |
| 5000129-86 | 5P MM DC female plug 25 feet | Field installation/special cables |
| 5000129-88 | 5P MM DC female-to-female-to-male in-line tee | Field installation/special cables |
| 5000129-91 | Female Terminator: Field attachable | Field installation/special cables |
| 5000129-93 | Male in-line plug field attachable (external thread) | Field installation/special cables |
| 5000129-121 | 5P MM DC male in-line plug 200 feet | Field installation/special cables |
| 5000129-122 | 5P MM DC male in-line terminator 121 ohms (white/blue pins) | Profibus, DeviceNet, Modbus Plus, Modbus 2 wire (1 per segment) |
| 5000129-123 | 5P MM DC female terminator 121 ohms (white/blue pins) | Profibus, DeviceNet, Modbus Plus, Modbus 2 wire (1 per segment) |
| 5000129-134 | 5P MM DC male in-line to DB-9 Modbus Plus assy 36 inches | Modbus Plus unit taps (1 per unit) |
| 5000129-135 | 5P MM DC male in-line to DB-9 assy 36 inches | Profibus unit taps (1 per unit) |
| 5000129-136 | 5P MM DC male in-line to DB-9 Altivar® 58 Modbus assy 36 inches | Modbus Altivar 58 unit taps (1 per unit) |
| 5000129-186 | 5P MM DC male in-line terminator 121 ohms (white/blue red/black pins) | Modbus 4 wire systems (1 per segment) |
| 5000129-187 | 5P MM DC female terminator 121 ohms (white/blue red/black pins) | Modbus 4 wire systems (1 per segment) |
| 5000129-230 | 5P MM DC tapping tee with shield ground wire and lug (capacitive shield break) | All networks but Seriplex® (1 per section) |
| 5000129-231 | 5P MM DC tapping tee with shield ground wire (red wire broken) (black) | Seriplex (1 per power supply) |
| 5000129-233 | 5P MM DC male in-line plug 36 inches (ferrules)* | DeviceNet/Seriplex unit taps (1 per unit) |
| 5000129-295 | 5P MM DC female drop on female-to-male in-line assy 16 feet | Main trunk cable all networks (1 per full section unit) |
| 80445-085-02 | 5P MM DC male in-line to DB-9 Modbus 4 wire assy 36 inches | Modbus 4 wire Altistart® 46 unit taps (1 per unit) |

* For two Seriplex modules, cut cable 4 inches, remove jacket, shrink tube, and splice with double ferrule # AZ5DE005.

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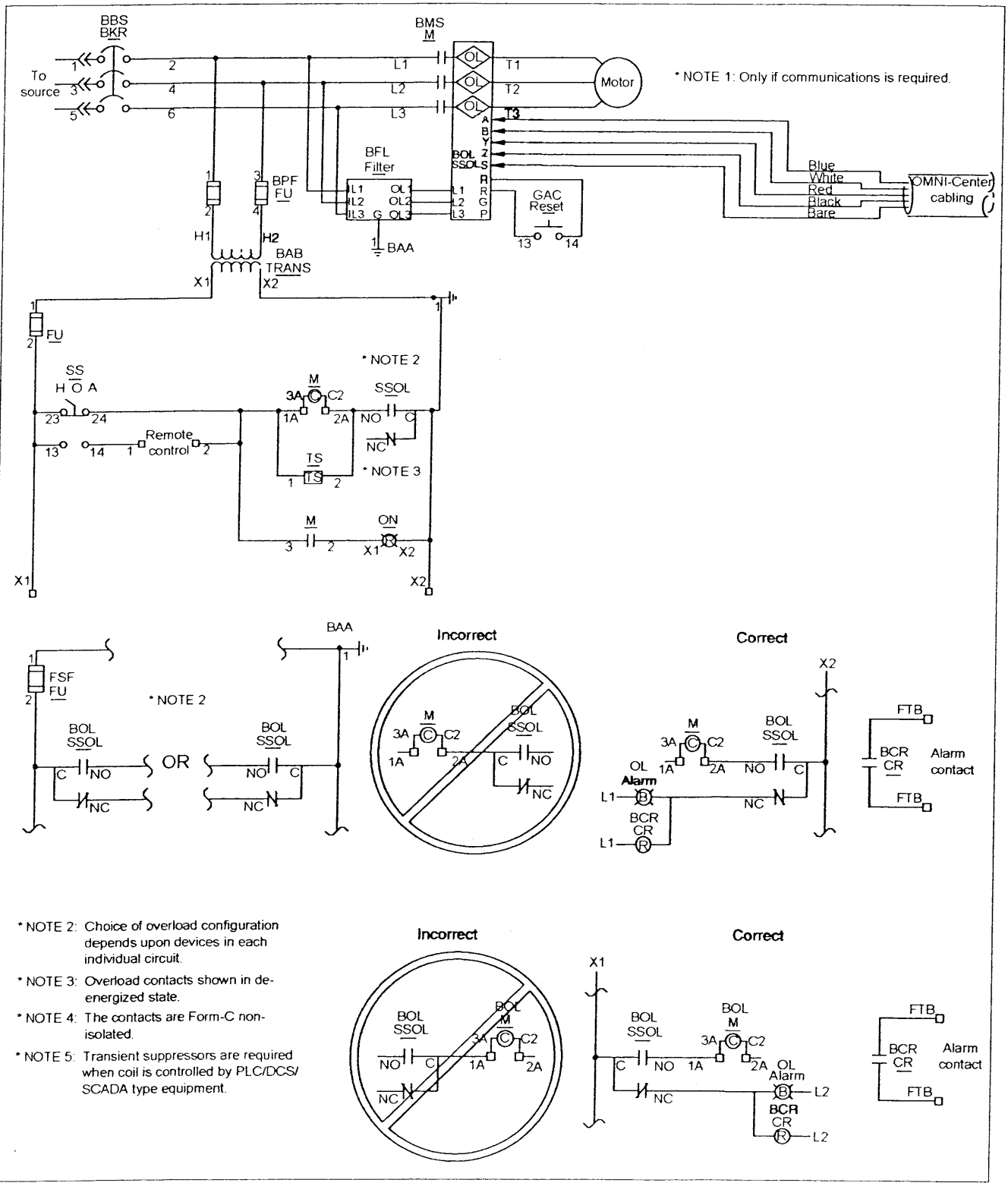
## WIRING DIAGRAM

**Figure 87: Typical OMNI Center FVNR with Modbus® Communications**

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If the unit is removable, follow the instructions below. If the unit is a fixed position unit, follow the instructions for "Modifying Fixed Units" on page 77.

Modifying Removable Units

1. De-energize equipment as outlined in "Section 2—Safety Precautions".
2. Remove the MCC unit from the structure. See the procedure for "Maintaining the Control Unit" on page 38 of this manual.
3. Perform the required modifications. Use thread-forming screws to mount devices. Do not use bolts and nuts, as they could loosen over time and cause property damage or personal injury. The hardware must not extend beyond the back of the MCC unit saddle more than 0.25 in. or beyond the sides and bottom pan by more than 0.125 in.
4. Make sure that proper electrical spacing between uninsulated live parts of opposite polarity and an exposed or uninsulated dead metal part is maintained. Electrical spacings are defined in UL 845, table 17.3. Electrical spacing within a unit (251-600V) is 0.375 in. through air and 0.50 in. over surface.
5. Use a vacuum cleaner to remove all debris left in the unit as a result of the modifications. Do not use compressed air to blow out the unit, because all debris may not be fully removed.
6. Perform the recommended maintenance procedures beginning on page 38 of this manual.
7. Ensure that vertical bus closing plugs are in place (with the exception of one plug where the MCC unit will stab on the vertical bus). If other vertical bus closing plugs are not in the proper position, ensure that all power is removed from the vertical bus and reinstall the vertical bus closing plugs.
8. Use a megohmmeter to perform an insulation test as outlined on page 46.
9. Look for and clear any obstructions that would not permit proper energization of the MCC unit.
10. Reinstall the MCC unit and follow the procedures for "Energizing the MCC" on page 36 of this manual.

Modifying Fixed Units

1. De-energize equipment as outlined above.
2. If drilling holes in the back of the MCC unit saddle is required, do not drill through the back of the saddle more than 0.1875 in. Use a drill stop device for this procedure.
3. Perform the required modifications. Use thread-forming screws to mount devices. Do not use bolts and nuts, as they could loosen over time and cause property damage or personal injury. The hardware must not extend beyond the back of the MCC unit saddle more than 0.25 in. or beyond the sides and bottom pan by more than 0.125 in.
4. Make sure that proper electrical spacing between uninsulated live parts of opposite polarity and an exposed or uninsulated dead metal part is maintained. Electrical spacings are defined in UL 845, table 17.3. Electrical spacing within a unit (251-600V) is 0.375 in. through air and 0.50 in. over surface.
5. Use a vacuum cleaner to remove all debris left in the unit as a result of the modifications. Do not use compressed air to blow out the unit, because all debris may not be fully removed.
6. Perform the recommended maintenance procedures beginning on beginning on page 38 of this manual.
7. Use a megohmmeter to perform an insulation test as outlined on page 46.
8. Follow the procedures for "Energizing the MCC" on page 36.

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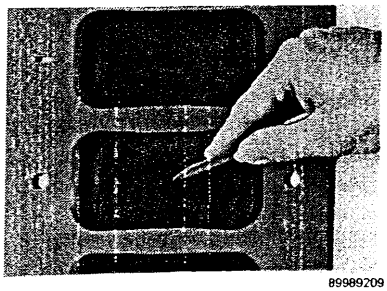
Figure 89: Cutting the Vertical Wire Trough Grommet (when supplied)




5. If a grommeted wireway barrier is supplied, locate the vertical wire trough grommet (see Figure 89) nearest the bottom of the control unit. Cut the grommet following the instructions on the grommet. See the second paragraph under "Load and Control Wiring" on page 30.
6. Remove the manual bus shutter(s) (see Figure 90) to allow insertion of the new control unit; slide out the top bus shutter. (Do not remove the tether.)

Figure 90: Removing the Manual Bus Shutter

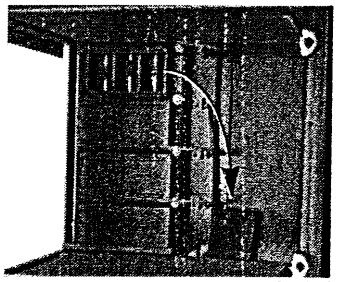
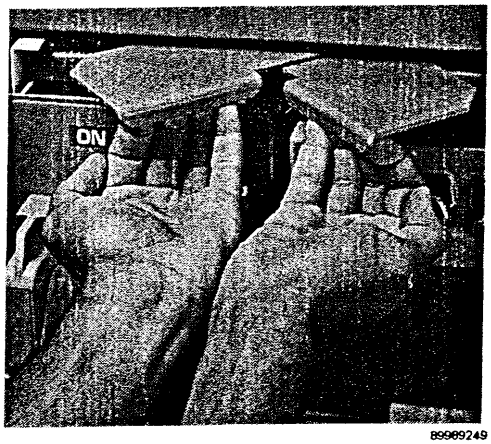



Figure 91: Pulling the Twin Handles of the Cam Mechanism Forward




7. Make certain that the twin handles of the cam mechanism unit are extended fully forward (see Figure 91). Guide the control unit onto the hanging rails and slide the unit in until the twin handles engage the cam stud located on the support shelf.
8. Press the handles inward until they are flush with the face of the MCC (see Figure 94).

   *NOTE: Compac™ 6 units do not have the twin handle cam mechanism.*

Figure 94: Handles Flush with the Front of the MCC

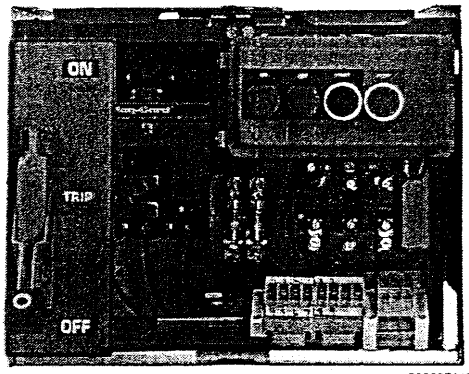
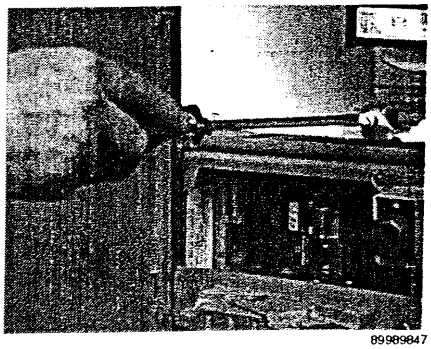



Figure 95: Tightening the Control Unit Lock-in Panel (when supplied)




9. Turn the screw on the control unit lock-in panel (when supplied) located at the bottom front of the control unit (see Figure 95), until the lock-in pawl is latched to the support shelf below the control unit.

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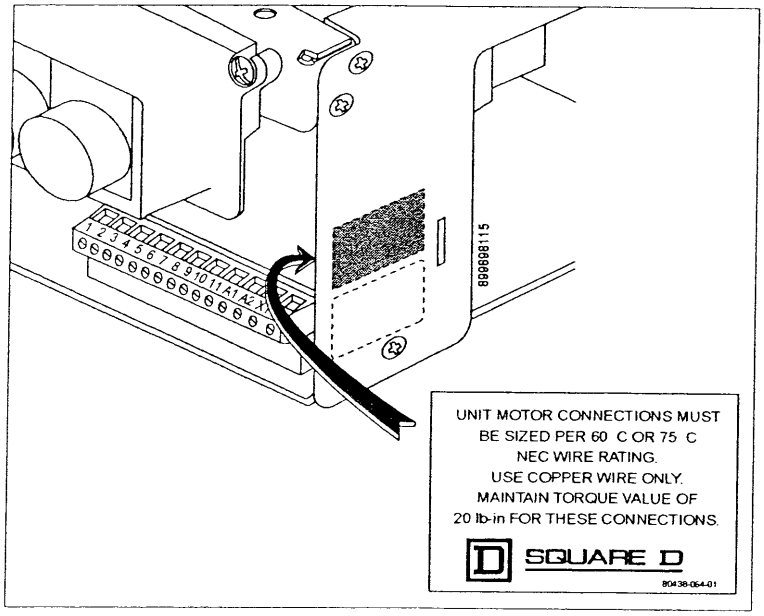
## Cable Connection Torque Values

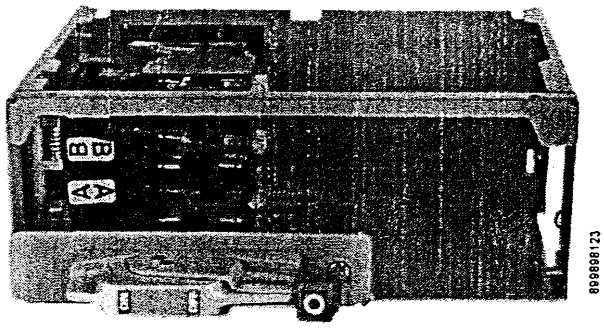
Refer to the torque label on the right inside wall of the unit for load terminal wire and torque requirements (see Figure 98).

**Figure 98: Unit Torque Label**

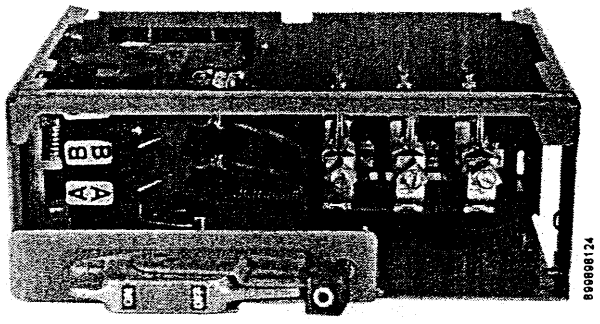



Fuse clips in six-inch units accommodate 600 V, Class J fuses only. The switch mounted fuse base (see Figure 99) is configured either for 30 A or 60 A fuses. The bottom plate mounted fuse base accepts 100 A fuses.

**Figure 99: Fuse Bases**




Switch Mounted Fuse Base




Bottom Plate Mounted Fuse Base

## Control Unit Installation

If units have been removed from the structure, reinstall them when maintenance work on them is complete. For unit replacement, follow these instructions:

1. Ensure that the operator handle of the unit is in the OFF position.
2. Place the unit into the structure in the proper location.

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# SECTION 11—TROUBLESHOOTING

**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

**Failure to follow these instructions will result in death or serious injury.**

The following table lists problems encountered with MCCs, their causes, and remedies. This table is of a general nature and covers only the main causes of problems.

Misapplication of a device can result in serious problems; however, rather than list this cause repeatedly below, note that misapplication is a major cause of motor control problems and must always be questioned when a device is not functioning properly.

Actual physical damage or broken parts can usually be quickly located and replaced. Damage caused by water or flood conditions requires special treatment. Contact your Schneider Electric field sales representative.

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## Table 18: Motor Control Center Troubleshooting Chart

| Part | Problem | Cause | Remedy |
|---|---|---|---|
| Motor Logic® Overload Relays | Overload relay trips on start-up (after more than 3 seconds). | 1. Load is too heavy for motor horsepower. | 1. Remove excessive motor load or resize motor. |
| | | 2. Wrong overload trip class selected for application. | 2. Use Trip Class 20 overload relay instead of Trip Class 10. |
| | | 3. Incorrect overload FLA setting. | 3. Set FLA adjustment according to motor full-load current. |
| | | 4. Use of electronic DC injection brake. | 4. Do not use electronic DC injection brakes with solid-state overload relay. |
| | Overload relay trips on start-up (in less than 3 seconds). | 1. Motor branch circuit fuse blown. | 1. Replace blown motor branch circuit fuse(s). |
| | | 2. Loose motor branch circuit. | 2. Tighten motor branch circuit connection. |
| | | 3. Motor circuit is not 3-phase. | 3. Select different type of overload relay for non 3-phase applications. |
| | | 4. Voltage unbalance on feeder. | 4. Correct voltage unbalance in feeder. |
| | | 5. Motor winding damage in one or more windings. | 5. Check motor winding impedance. Rewind if necessary. |
| | | 6. Phase loss in primary of wye-delta or delta-wye transformer. | 6. Replace blown fuses or tighten connections. |
| | | 7. One or more load lead(s) is not routed through relay window or is routed in opposite direction. | 7. Pass each load lead through its respective window in the same direction. |
| | | 8. Number of load lead passes are different. | 8. Each load lead must be looped the same number of passes. |
| | Overload relay trips while running normally. | 1. Load is too heavy for motor horsepower. | 1. Remove excessive motor load or resize motor. |
| | | 2. Incorrect overload FLA setting. | 2. Set FLA adjustment according to motor full-load current. |
| | | 3. Use of electronic DC injection brake. | 3. Do not use electronic DC injection brakes with solid-state overload relay. |
| | | 4. Incorrect overload FLA setting.(Multiple pass applications.) | 4. Recalculate FLA adjustment and set according to motor full-load current and number of looped passes. |
| Magnetic And Mechanical Parts | Noisy Magnet | 1. Broken shading coil. | 1. Replace the magnet and armature. |
| | | 2. Dirt or rust on magnet faces. | 2. Clean the magnet with a clean, dry cloth. |
| | | 3. Low voltage. | 3. Check the coil terminal voltage and voltage dips during starting. |
| | Failure To Pick Up and Seal | 1. No control voltage. | 1. Check the control circuit wiring for a loose connection or poor contact continuity. |
| | | 2. Low voltage. | 2. Check for the proper coil terminal voltage and voltage dips during starting. |
| | | 3. Mechanical obstruction. | 3. With the power off, check for free movement of the contact and armature assembly. |
| | | 4. Open or overheated coil. | 4. Replace the coil. |
| | | 5. Wrong coil. | 5. Replace the coil. |
| | Failure To Drop Out | 1. Gummy substance on the pole faces. | 1. Clean the pole faces with a clean, dry cloth. |
| | | 2. Voltage not removed. | 2. Check the coil terminal voltage and the control circuit. |
| | | 3. Worn or corroded parts causing binding. | 3. Replace the parts. |
| | | 4. Residual magnetism due to the lack of an air gap in the magnet path. | 4. Replace the magnet and armature. |
| | | 5. Welded contacts. | 5. See Contacts—Welding or Freezing |
| Pneumatic Timers | Erratic Timing | Foreign matter in the valve. | Replace the complete timing head, or return the timer to the factory for repair and adjustment. |
| | Contacts Do Not Operate | 1. Maladjustment of the actuating screw. | 1. Adjust according to the instructions in the service bulletin. |
| | | 2. Worn or broken parts in the snap switch. | 2. Replace the snap switch. |
| Limit Switches | Broken Parts | Overtravel of the actuator. | Use a resilient actuator, or operate within the tolerance of the device. |
| Manual Starters | Failure To Reset | Latching mechanism worn or broken. | Replace the starter. |

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## Thermal Overload Unit Selection

This section identifies the thermal overload units needed for the starters specified in an order. Tables are based on motor full-load amps and provide the catalog number for the appropriate thermal units to be used at that current rating.

### Melting Alloy Overload Selection Tables for Combination Starter Units

#### Size 1

| Motor Full-Load Current (A) | Thermal Unit Number | Motor Full-Load Current (A) | Thermal Unit Number |
|---|---|---|---|
| 0.56–0.63 | B 0.81 | 3.23–3.49 | B 4.85 |
| 0.64–0.68 | B 0.92 | 3.50–3.85 | B 5.50 |
| 0.69–0.77 | B 1.03 | 3.86–4.11 | B 6.25 |
| | | 4.12–4.70 | B 6.90 |
| 0.78–0.85 | B 1.16 | | |
| 0.86–0.97 | B 1.30 | 4.71–5.21 | B 7.70 |
| 0.98–1.09 | B 1.45 | 5.22–5.53 | B 8.20 |
| 1.10–1.21 | B 1.67 | 5.54–6.17 | B 9.10 |
| | | 6.18–7.02 | B 10.2 |
| 1.22–1.33 | B 1.88 | | |
| 1.34–1.53 | B 2.10 | 7.03–7.92 | B 11.5 |
| 1.54–1.73 | B 2.40 | 7.93–8.61 | B 12.8 |
| 1.74–1.89 | B 2.65 | 8.62–9.17 | B 14 |
| | | 9.18–10.0 | B 15.5 |
| 1.90–2.17 | B 3.00 | | |
| 2.18–2.53 | B 3.30 | 10.1–11.0 | B 17.5 |
| 2.54–2.87 | B 3.70 | 11.1–11.8 | B 19.5 |
| 2.88–3.22 | B 4.15 | 11.9–13.5 | B 22 |
| | | 13.6–15.3 | B 25 |
| | | 15.4–17.4 | B 28 |
| | | 17.5–19.4 | B 32 |
| | | 19.5–22.2 | B 36 |
| | | 22.3–25.1 | B 40 |
| | | 25.2–27.0 | B 45 |

#### Size 2

| Motor Full-Load Current (A) | Thermal Unit Number | Motor Full-Load Current (A) | Thermal Unit Number |
|---|---|---|---|
| 3.94–4.45 | B 6.90 | 11.5–12.3 | B 19.5 |
| 4.46–4.97 | B 7.70 | 12.4–13.9 | B 22 |
| | | 14.0–15.8 | B 25 |
| 4.98–5.28 | B 8.20 | 15.9–17.9 | B 28 |
| 5.29–5.97 | B 9.10 | | |
| 5.98–6.89 | B 10.2 | 18.0–19.9 | B 32 |
| 6.90–7.92 | B 11.5 | 20.0–22.8 | B 36 |
| | | 22.9–25.4 | B 40 |
| 7.93–8.71 | B 12.8 | 25.5–28.9 | B 45 |
| 8.72–9.27 | B 14.0 | | |
| 9.28–10.2 | B 15.5 | 29.0–30.8 | B 50 |
| 10.3–11.4 | B 17.5 | 30.9–32.5 | B 56 |
| | | 32.6–34.9 | B 62 |
| | | 35.0–39.7 | B 70 |
| | | 39.8–44.7 | B 79 |

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## Melting Alloy Overload Selection Tables for Combination Starter Units (cont.)

### Size 6

| Motor Full-Load Current (A) | Thermal Unit Number | Motor Full-Load Current (A) | Thermal Unit Number |
|---|---|---|---|
| 133–148 | B 1.30 | 272–308 | B 2.65 |
| 149–174 | B 1.45 | 309–348 | B 3.00 |
| 175–195 | B 1.67 | 349–397 | B 3.30 |
| 196–219 | B 1.88 | 398–429 | B 3.70 |
| 220–239 | B 2.10 | 430–495 | B 4.15 |
| 240–271 | B 2.40 | 496–520 | B 4.85 |

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## Melting Alloy Overload Selection Tables for Part Winding Combination Starter Units (cont.)

### Size 5 without CT Type Overloads

| Motor Full-Load Current (A) | Thermal Unit Number | Motor Full-Load Current (A) | Thermal Unit Number |
|---|---|---|---|
| 176–190 | DD 112 | 342–361 | DD 220 |
| 191–203 | DD 121 | 362–395 | DD 240 |
| 204–223 | DD 128 | 396–409 | DD 250 |
| 224–239 | DD 140 | 410–427 | DD 265 |
| 240–253 | DD 150 | 428–475 | DD 289 |
| 254–299 | DD 160 | 476–487 | DD 300 |
| 300–341 | DD 185 | 488–532 | DD 320 |

### Size 5 with CT Type Overloads and Circuit Breakers

| Motor Full-Load Current (A) | Thermal Unit Number | Motor Full-Load Current (A) | Thermal Unit Number |
|---|---|---|---|
| 81.6–91.1 | B 1.03 | 230–257 | B 3.00 |
| 91.2–101 | B 1.16 | 258-281 | B 3.30 |
| 102–115 | B 1.30 | 282–321 | B 3.70 |
| 116–131 | B 1.45 | 322–387 | B 4.15 |
| 132–146 | B 1.67 | 388–419 | B 4.85 |
| 147–163 | B 1.84 | 420–465 | B 5.50 |
| 164–184 | B 2.10 | 466–497 | B 6.25 |
| 185–209 | B 2.40 | 496–532 | B 6.90 |
| 210–229 | B 2.65 | | |

### Size 5 with CT Type Overloads and Fusible Switch Disconnects

| Motor Full-Load Current (A) | Thermal Unit Number | Motor Full-Load Current (A) | Thermal Unit Number |
|---|---|---|---|
| 81.6–91.1 | B 1.03 | 230–257 | B 3.00 |
| 91.2–101 | B 1.16 | 258–281 | B 3.30 |
| 102–115 | B 1.30 | 282–321 | B 3.70 |
| 116–131 | B 1.45 | 322–387 | B 4.15 |
| 132–146 | B 1.67 | 388–419 | B 4.35 |
| 147–163 | B 1.88 | 420–465 | B 5.60 |
| 164–184 | B 2.10 | 466–497 | B 6.25 |
| 185–209 | B 2.40 | 498–532 | B 6.90 |
| 210–229 | B 2.65 | | |

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## Ambient-Compensated Bimetallic Overload Selection Tables for Part Winding Combination Starter Units

### Size 1

| Motor Full-Load Current (A) | Thermal Unit Number | Motor Full-Load Current (A) | Thermal Unit Number |
|---|---|---|---|
| 1.14–1.21 | AR 1.05 | 6.92–7.63 | AR 5.8 |
| 1.22–1.33 | AR 1.15 | 7.64–8.41 | AR 6.4 |
| 1.34–1.47 | AR 1.26 | 8.42–9.31 | AR 7.0 |
| 1.48–1.63 | AR 1.39 | 9.32–10.59 | AR 7.7 |
| 1.64–1.81 | AR 1.53 | 10.60–11.69 | AR 8.5 |
| 1.82–2.11 | AR 1.68 | 11.70–12.55 | AR 9.3 |
| 2.12–2.31 | AR 1.85 | 12.56–13.95 | AR 10.2 |
| 2.32–2.51 | AR 2.04 | 13.96–15.19 | AR 11.2 |
| 2.52–2.71 | AR 2.24 | 15.20–15.79 | AR 12.4 |
| 2.72–2.95 | AR 2.46 | 15.80–17.91 | AR 13.6 |
| 2.96–3.17 | AR 2.71 | 17.92–20.7 | AR 15.4 |
| 3.18–3.49 | AR 2.98 | 20.8–23.5 | AR 17.6 |
| 3.50–3.89 | AR 3.28 | 23.6–26.7 | AR 20.5 |
| 3.90–4.41 | AR 3.62 | 26.8–30.5 | AR 23 |
| 4.42–4.95 | AR 3.98 | 30.6–34.5 | AR 27 |
| 4.96–5.53 | AR 4.37 | 34.6–39.5 | AR 30 |
| 5.54–6.15 | AR 4.80 | 39.6–44.9 | AR 35 |
| 6.16–6.91 | AR 5.30 | 45.0–52.0 | AR 40 |

### Size 2

| Motor Full-Load Current (A) | Thermal Unit Number | Motor Full-Load Current (A) | Thermal Unit Number |
|---|---|---|---|
| 8.48–9.25 | AR 8.5 | 33.0–37.9 | AR 35 |
| 9.26–10.11 | AR 9.3 | 38.0–43.3 | AR 40 |
| 10.12–11.09 | AR 10.2 | 43.4–46.7 | AR 44 |
| 11.10–12.27 | AR 11.2 | 46.8–49.9 | AR 47 |
| 12.28–12.89 | AR 12.4 | 50.0–53.9 | AR 51 |
| 12.90–14.97 | AR 13.6 | 54.0–58.3 | AR 55 |
| 14.98–17.11 | AR 15.4 | 58.4–62.7 | AR 60 |
| 17.12–19.49 | AR 17.6 | 62.8–67.1 | AR 66 |
| 19.50–22.3 | AR 20.5 | 67.2–73.8 | AR 72 |
| 22.4–25.5 | AR 23 | 74.0–78.3 | AR 79 |
| 25.6–28.9 | AR 27 | 78.4–81.9 | AR 86 |
| 29.0–32.9 | AR 30 | 82.0–90.0 | AR 94 |

### Size 3

| Motor Full-Load Current (A) | Thermal Unit Number | Motor Full-Load Current (A) | Thermal Unit Number |
|---|---|---|---|
| 54.2–60.1 | E 67 | 94.0–103.1 | E 74 |
| 60.2–66.5 | E 69 | 103.2–114.1 | E 76 |
| 66.6–71.5 | E 70 | 114.2–125.7 | E 77 |
| 71.6–78.9 | E 71 | 125.8–138.3 | E 78 |
| 79.0–86.9 | E 72 | 138.4–150.1 | E 79 |
| 87.0–93.9 | E 73 | 150.2–166.6 | E 80 |

### Size 4

| Motor Full-Load Current (A) | Thermal Unit Number | Motor Full-Load Current (A) | Thermal Unit Number |
|---|---|---|---|
| 100–111.9 | E 88 | 164–173.9 | E 96 |
| 112–121.9 | E 89 | 174–185.9 | E 97 |
| 122–131.9 | E 91 | 186–195.9 | E 98 |
| 132–139.9 | E 92 | 196–215.9 | E 99 |
| 140–151.9 | E 93 | 216–227.9 | E 101 |
| 152–163.9 | E 94 | 228–251.9 | E 102 |

### Size 5

| Motor Full-Load Current (A) | Thermal Unit Number | Motor Full-Load Current (A) | Thermal Unit Number |
|---|---|---|---|
| 210–233 | AR 3.28 | 332–369 | AR 4.8 |
| 234–265 | AR 3.62 | 370–415 | AR 5.3 |
| 266–297 | AR 3.98 | 416–459 | AR 5.8 |
| 298–331 | AR 4.37 | 460–532 | AR 6.4 |

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Replacement of the operating mechanism is not required for NEMA/EEMAC Size 5 combination starters with LA frame (400 A max.) circuit breakers, NEMA/EEMAC Size 5 combination fusible starters, NEMA/EEMAC Size 6 combination starters, main and branch circuit breakers over 250 A, or for main and branch switches over 200 A. Order a replacement circuit breaker or automatic molded case switch of the same type as the original device.

To order an FH/KH type high interrupting circuit breaker instead of the standard FA/KA type circuit breaker, add form Y532 to the disconnect assembly number.

Example: To replace an FHP36100, order an M6DSATM100M Y532.

These modifications may also be added to disconnect assemblies when required:

| | |
|---|---|
| Y74 | Single pole interlock on operating mechanism |
| Y301 | Current limiting module (for starter units Size 1–3) |
| Y303 | Current limiting module (for 15–100 A branch feeders) |
| Y312 | Class R fuse clips |
| Y532 | High interrupting circuit breaker |
| U341 | Extra high interrupting circuit breaker |

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## Installation

*NOTE: The horizontal bus barrier contains two identical panels with arrows at the top. The "handle" on the left panel faces the front of the MCC section. The "handle cavity" on the right panel faces the front of the MCC section (see Figure 102).*

1. Align the arrows on the right panel and top track as shown in Figure 103.
2. Lift the panel up into the rear groove of the top track.
3. Lower the panel into the rear groove of the bottom track.
4. Slide the panel to the far right.
5. Align the arrows on the left panel and top track.
6. Repeat Steps 2 and 3 using the left panel and front groove.
7. Slide the panel to the left until it locks (snaps) into place.
8. Verify that the barrier is completely closed by making sure that the wiring compartment is isolated from the bus compartment.

**Figure 102: Right Panel (Side View)**

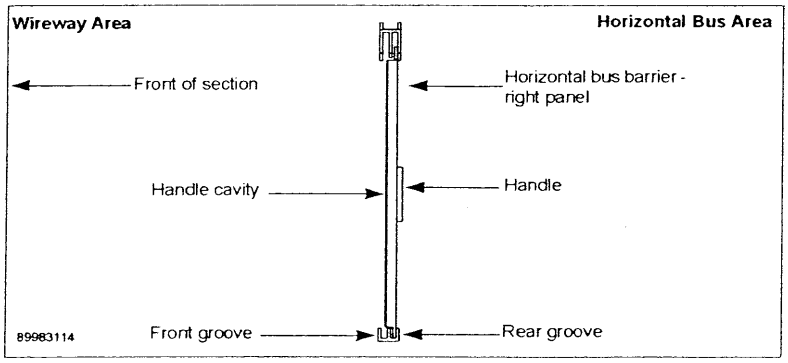
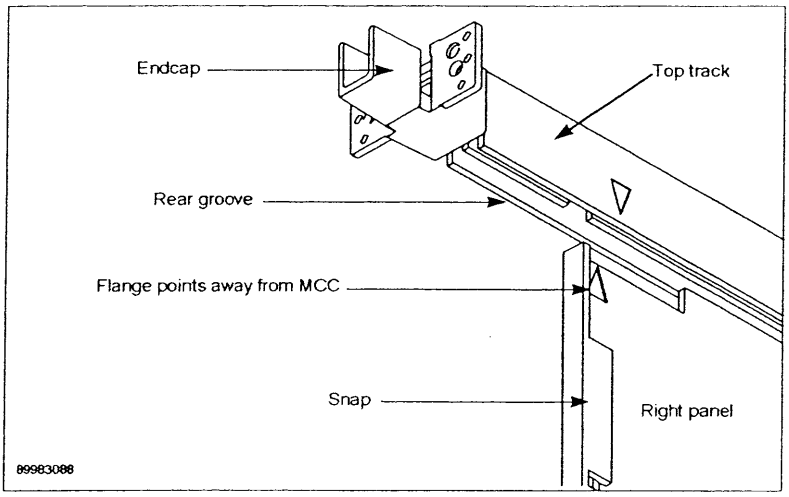



**Figure 103: Installing the Right Panel into the Rear Groove**

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## REMOVE EXISTING COMPONENTS

Follow these instructions to remove the existing top horizontal wireway cover, bus barriers, units below the topshelf, and brackets (15-inch deep MCC):

### Horizontal Wireway Cover

1. Turn off all power supplying the MCC before working on or inside it. Use a properly rated voltage sensing device to confirm that the power is off.
2. Remove the screws that secure the top horizontal wireway cover to the structure, and then remove the cover.

### Horizontal Bus Barriers

1. Remove the screw located at the top of the two-piece bus barriers.
2. Remove the screw located at the bottom of the two-piece bus barriers.
3. Pull the two metal barriers out of the MCC and discard them.

### Units Below the Topshelf

If applicable, remove the plug-in unit below the topshelf (see Figure 105).

Refer to either the Model 5 MCC Installation and Maintenance Manual (# 8998IM9101R5/92) or the Model 6 MCC Instruction Bulletin (# 80459-641-01_) for unit removal instructions. If necessary, contact your local Schneider Electric field sales representative to obtain this bulletin.

### Existing Brackets: 15-inch (381 mm) Deep MCC Only

If the MCC is 15 inches (381 mm) deep, use a 1/8-inch drill bit to remove the rivets that hold the right and left horizontal bus barrier brackets in place (see Figure 105). Discard the brackets after removal.

*NOTE: Discard all retrofit brackets if the existing bus barrier bracket "B" (see Figure 105) is present on the 15-inch deep MCC. All holes are already present for direct mounting of the horizontal bus barrier.*

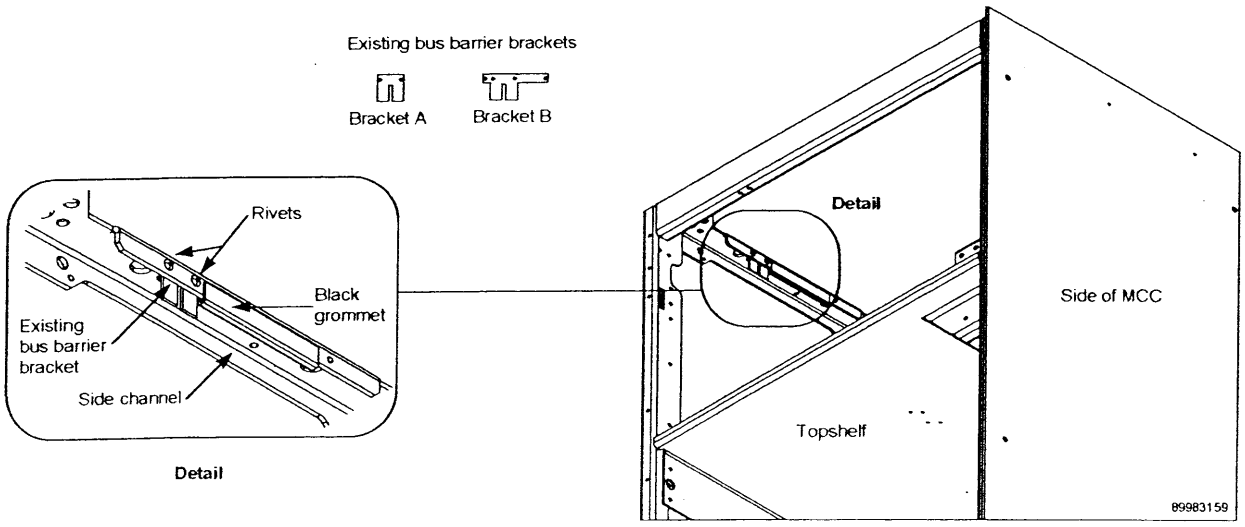
**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

Drilling increases the chance of loose particles in the MCC. Confirm that the compartment is free of loose particles before turning on power to this equipment.

**Failure to follow this instruction will result in death or serious injury.**

**Figure 105: Remove Existing Brackets on the 15-inch (381 mm) Deep MCC**

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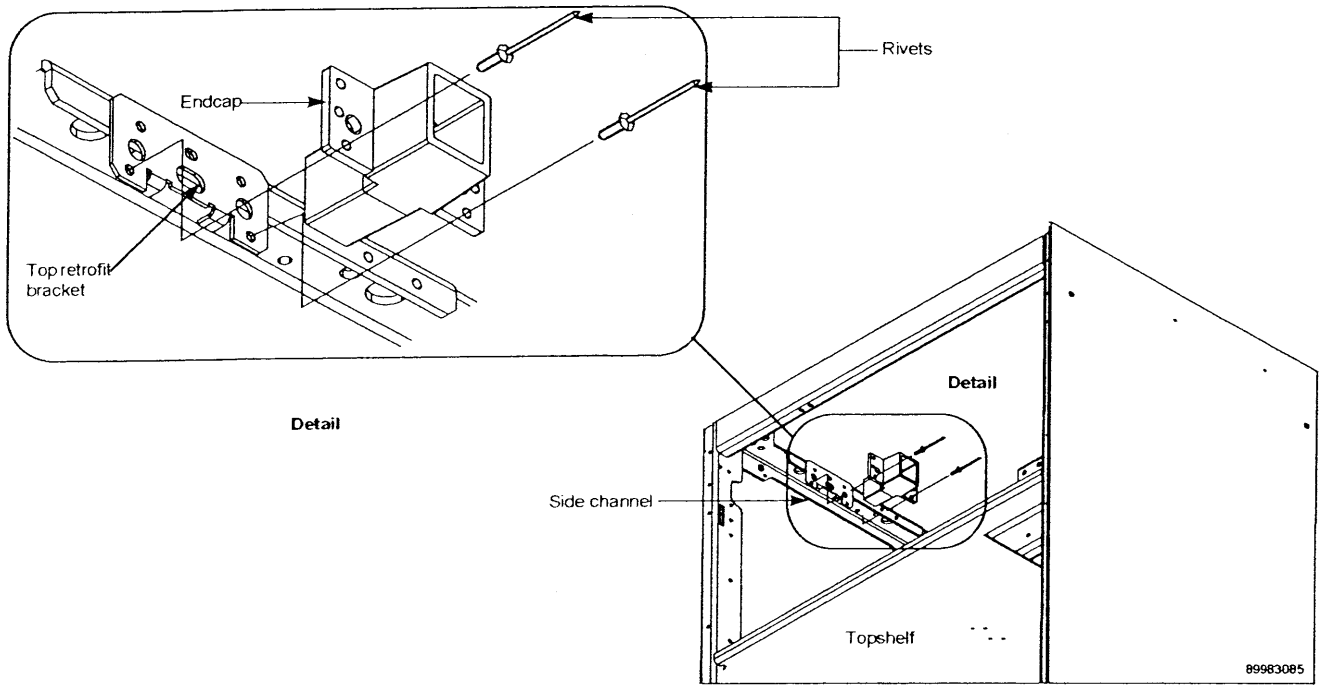
Follow the steps below to install the endcaps (see Figure 108).

1. Rivet one endcap into place on the retrofit bracket or the side channel, either to the right or left side of the structure.
2. Insert one end of the top track into the attached endcap.
3. Place the other endcap on the opposite end of the top track, and slide the top track into place.
4. Rivet the second endcap to the retrofit bracket.

**Figure 108: Endcap Placement**

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## Left and Right Panels

Installation

*NOTE: The horizontal bus barrier contains two identical panels with arrows at the top. The "handle" on the left panel faces the front of the MCC section. The "handle cavity" on the right panel faces the front of the MCC section (see Figure 111).*

1. Align the arrows on the right panel and top track as shown in Figure 112.
2. Lift the panel up into the rear groove of the top track.
3. Lower the panel into the rear groove of the bottom track.
4. Slide the panel to the far right.
5. Align the arrows on the left panel and top track.
6. Repeat Steps 2 and 3 using the left panel and front groove.
7. Slide the panel to the left until it locks (snaps) into place.
8. Verify that the barrier is completely closed by making sure that the wiring compartment is isolated from the bus compartment.

**Figure 111: Right Panel (Side View)**

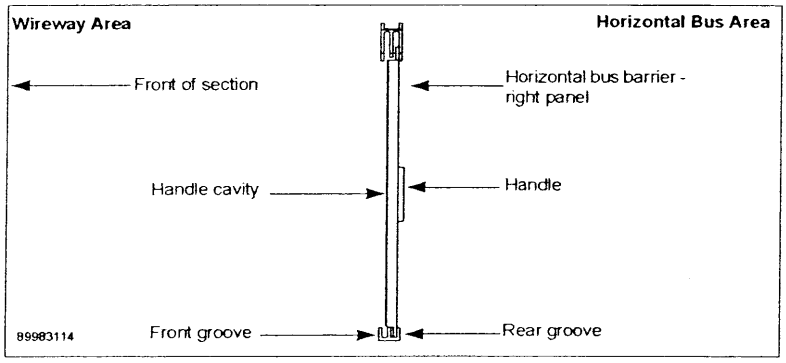
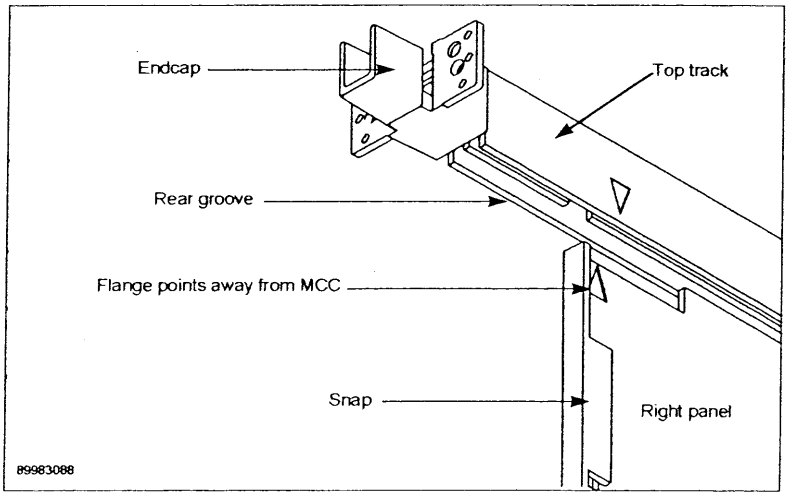



**Figure 112: Installing the Right Panel into the Rear Groove**

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# APPENDIX C—AUTOMATIC VERTICAL BUS SHUTTER

## INTRODUCTION

**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

**Failure to follow these instructions will result in death or serious injury.**

The automatic vertical bus shutter is an optional feature for the Model 6 motor control center (MCC) vertical bus. The shutters are pre-assembled and installed as part of the MCC line-up.

Automatic bus shutters open and close the vertical bus connection point when units are inserted and removed from the structure. The shutters can be located throughout the MCC and placed in 6 in. (152 mm) increments. They mount to the left edge of each midshelf.

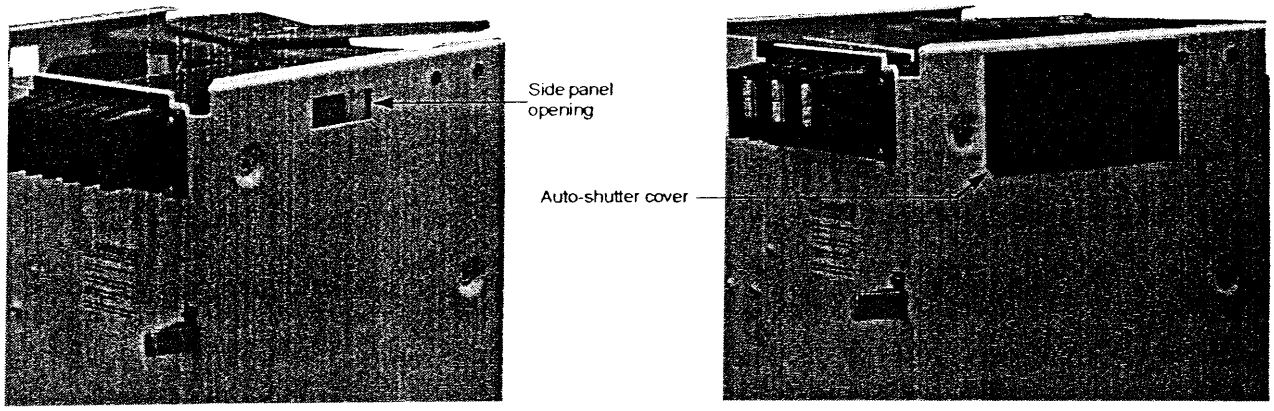
The automatic shutter assembly requires an updated midshelf to allow clearance for the shutter above the plug-in unit.

*NOTE: MCC structures shipped before January 2003 cannot use the top 3-in. (76 mm) space with the automatic vertical bus shutter option. A 3-in. (76 mm) cover plate is required to cover the opening.*

*NOTE: Compac 6 units shipped before January 2003 cannot be used with the automatic vertical bus shutter option.*

*NOTE: Variable frequency drive and soft starter units 45 in. or taller that shipped before July 2003 with a side-panel opening as shown in Figure 114A, require an auto-shutter cover (Square D Seneca part #80451-765-01). The auto-shutter cover aligns with the back edge of the center-most flat head screw as shown in Figure 114B.*

**Figure 114: Location of Auto-Shutter Cover for Side-Panel Opening**




**114A** **114B**

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Figure 116: Shelf Installation

Table 19: Shelf Installation Kit Parts

| Description | Quantity | Item |
|---|---|---|
| Midshelf | 1[1] | A |
| Flat head screws | 2 | D |
| Unit door | 1 | F |
| Hex head screws | 4[2] | H |
| Quarter turn fastener receptacle | 2[2] | J |

[1] Shelf is furnished with order, and may already be mounted in position.

[2] All necessary hardware for typical shelf installation is included. Door installation may require additional hardware.

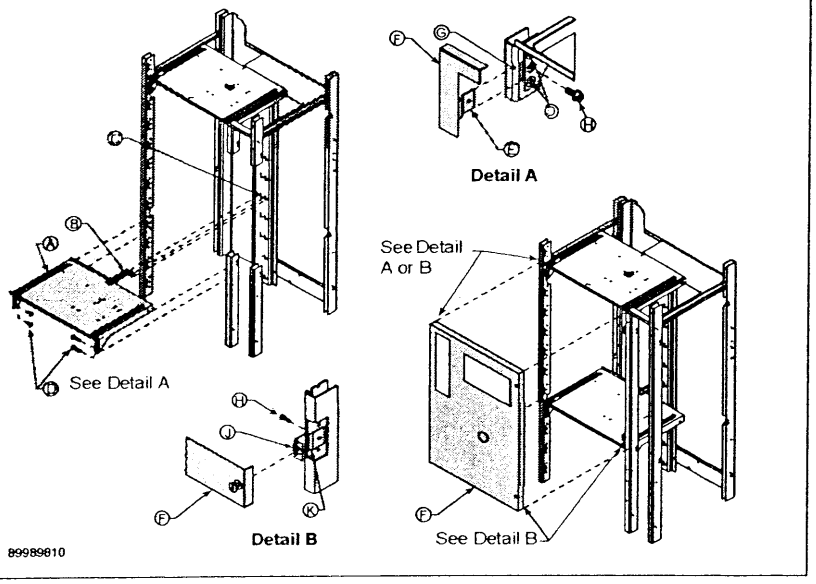
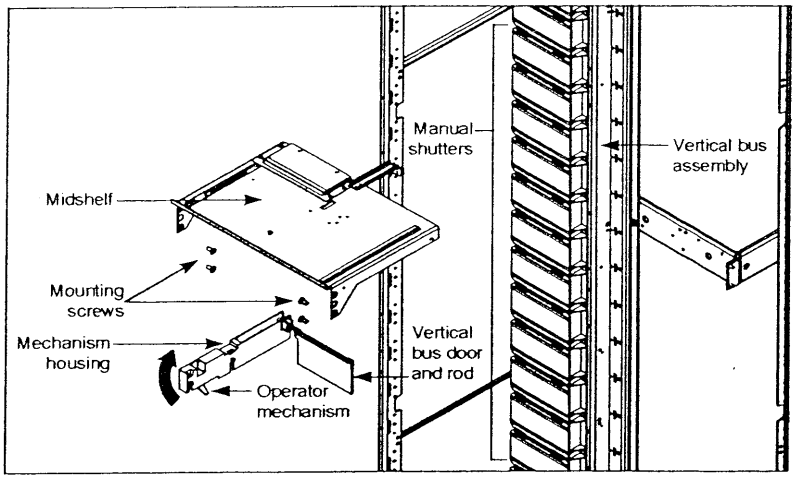



Figure 117: Automatic Vertical Bus Shutter Installation




9. Remove the manual shutter from the vertical bus assembly. Allow the manual shutter to hang next to the vertical bus assembly.
10. Snap the automatic shutter rod onto the vertical bus clip located on the front of the vertical bus assembly.
11. Tighten the two 10-32 x 3/8 in. mounting screws inserted in Step 8.
12. Push the operator mechanism to the rear, ensuring the shutter rotates upward into the pocket of the midshelf above the unit. See Figure 117.
13. Insert the unit into the MCC. Follow the procedures in "Section 4—Installing the MCC".
14. Replace all devices, doors, and covers before turning on the power to the equipment.

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# APPENDIX D—TECHNICAL SUPPORT

The Model 6 Motor Control Center incorporates many Schneider Electric products within one package. Following are the Technical Support numbers for some of these products:

| Device Name | Location | Technical Support No. |
|---|---|---|
| Motor Control Centers* | Seneca, SC: MCC Technical Assistance Group (TAG) | (800) 634-2003 |
| PowerLogic® Equipment SMS-3000 Software | LaVergne, TN: PowerLogic Technical Assistance | (615) 287-3400 |
| Variable Frequency Drives Soft Starters Starters/Contactors/Overloads | Raleigh, NC: Raleigh Help Desk | (919) 266-8600 |
| Schneider Automation Equipment & Software | North Andover, MA: Customer Central | (800) 468-5342 |
| Seriplex® | Raleigh, NC: Seriplex Technology Organization | (800) 775-9462 |
| Industrial Application Team | Raleigh, NC | (800) 468-5342 |
| Field Services Organization Support | Florence, KY | (800) 634-2003 |

* The MCC Technical Assistance Group is your first point of contact for any MCC questions. Or, contact your local distributor/Schneider Electric field sales office.

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Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

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01/2004

# Chapter 12
# CONTROL DRAWINGS

## MANUFACTURER/DISTRIBUTOR:

DEVCAR INC
368 21$^{E}$ AVENUE NORD
ST-JÉRÔME.QUE. J7Z-3W2
PHONE/FAX 450-436-3164

## 12.1 MAIN PLC DRAWINGS.

**12.1.1** PHYSICAL VIEW, AS-BUILT CONTROL DRAWINGS.

**12.1.2** POWER DISTRIBUTION , AS-BUILT CONTROL DRAWINGS.

**12.1.3** PLC SLOT 1, AS-BUILT CONTROL DRAWINGS.

**12.1.4** PLC SLOT 2, AS-BUILT CONTROL DRAWINGS.

**12.1.5** PLC SLOT 3, AS-BUILT CONTROL DRAWINGS.

**12.1.6** PLC SLOT 4, AS-BUILT CONTROL DRAWINGS.

**12.1.7** PLC SLOT 5, AS-BUILT CONTROL DRAWINGS.

**12.1.8** PLC SLOT 6, AS-BUILT CONTROL DRAWINGS.

**12.1.9** PLC SLOT 7, AS-BUILT CONTROL DRAWINGS.

**12.1.10** PLC SLOT 8, AS-BUILT CONTROL DRAWINGS.

**12.1.11** PLC SLOT 9, AS-BUILT CONTROL DRAWINGS.

**12.1.12** PLC SLOT 10, AS-BUILT CONTROL DRAWINGS.

**12.1.13** PLC SLOT 11, AS-BUILT CONTROL DRAWINGS.

**12.1.14** PLC SLOT 12, AS-BUILT CONTROL DRAWINGS.

**12.1.15** PLC SLOT 13, AS-BUILT CONTROL DRAWINGS.

**12.1.16** PLC SLOT 14, AS-BUILT CONTROL DRAWINGS.

**12.1.17** LEAK MONITOR , AHU-3 CONSOLE, AS-BUILT CONTROL DRAWINGS.

**12.1.18** FEW-P1, AS-BUILT CONTROL DRAWINGS.

**12.1.19** FEW-P2, AS-BUILT CONTROL DRAWINGS.

**12.1.20** FEW-P3, AS-BUILT CONTROL DRAWINGS.

**12.1.21** GLYCOL P-04, AS-BUILT CONTROL DRAWINGS.

**12.1.22** AHU-3 SUPPLY FAN, AS-BUILT CONTROL DRAWINGS.

**12.1.23** AHU-3 EXHAUST FAN, AS-BUILT CONTROL DRAWINGS.

## 12.2 SALSNES FILTER AS-BUILT CONTROL DRAWINGS.

**12.2.1** MAIN POWER DISTRIBUTION, AS-BUILT CONTROL DRAWINGS.

**12.2.2** INTERCONNECTION TO PROCESS PLC, AS-BUILT CONTROL DRAWINGS.

**12.2.3** PRIMARY FILTER BELT VFD, AS-BUILT SOFTWARE CONFIGURATION.

**12.2.4** PRIMARY FILTER AUGER VFD , AS-BUILT SOFTWARE CONFIGURATION.

**12.2.5** PRIMARY FILTER VFD USER MANUEL , TOSHIBA TOSVERT. TM 60 PAGES

## 12.3 BOILERS AND FEW CONTROL PANEL.

**12.3.1** FILTERED EFFLUENT AND BOILER CONTROL PANEL LAYOUT

**12.3.2** BOILER CONTROL PANEL SCHEMATIC

**12.3.3** FILTERED EFFLUENT PANEL SCHEMATIC

**12.3.4** VERY HOT FEW WATER BOOSTER PUMP P20.

**12.3.5** HOT FEW WATER RECIRCULATION PUMP.

## 12.4 RAW SEWAGE PUMP REMOTE CONTROL (P-102,P-103,P-104)

**12.4.1** REMOTE CONTROL OUTSIDE VIEW

**12.4.2** REMOTE CONTROL INSIDE VIEW

**12.4.3** REMOTE CONTROL PANEL DIAGRAM

**12.4.4** REMOTE CONTROL INTERCONNECTION P-102

**12.4.5** REMOTE CONTROL INTERCONNECTION P-103

**12.4.6** REMOTE CONTROL INTERCONNECTION P-104

## 12.5 SCREW SCREEN REVERSING STARTER SCHEMATIC.

**12.5.1** SSCR-105 INTERCONNECTION.

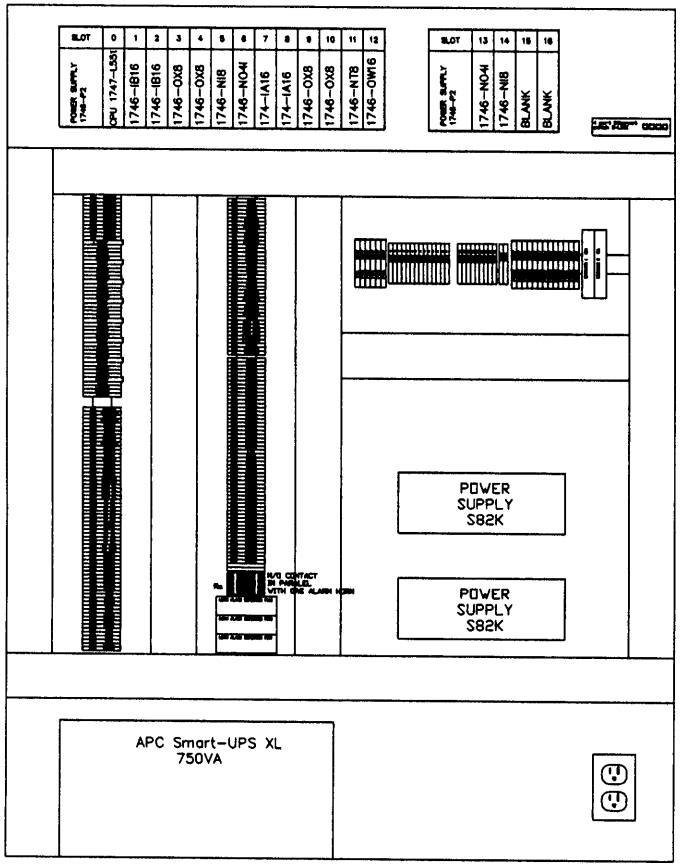
**12.5.2** SSCR-105 MCC DRAWINGS.

**12.5.3** SSCR-106 INTERCONNECTION.

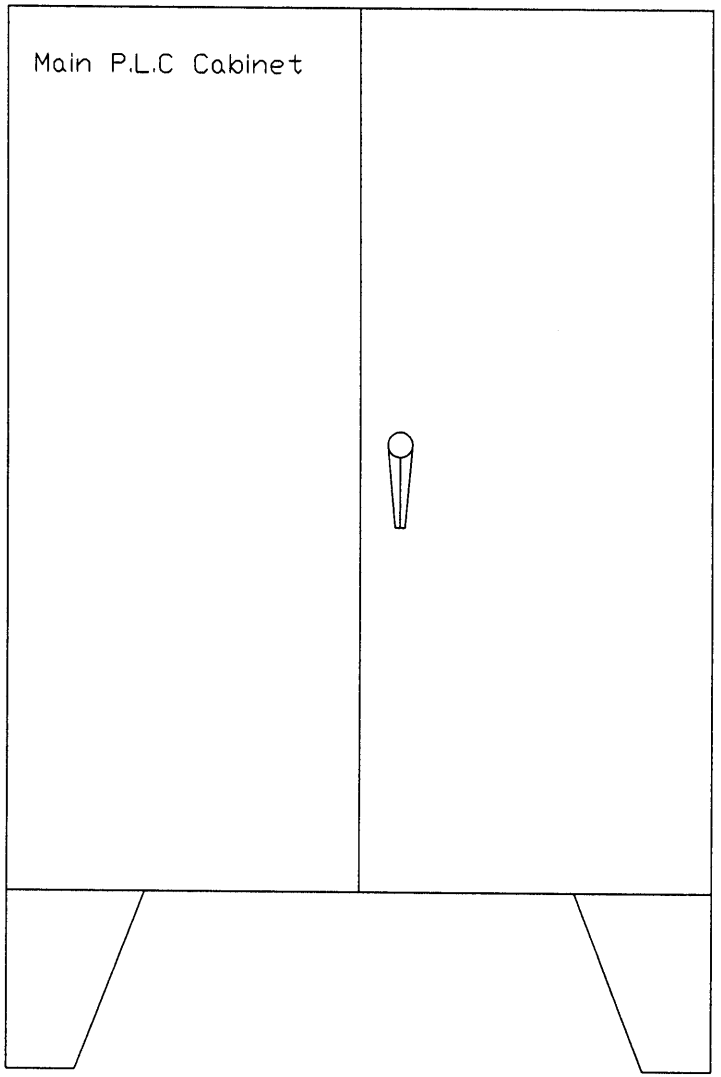
**12.5.4** SSCR-106 MCC DRAWINGS.

## 12.6 DUPLEX SUMP PUMP CONTROL PANEL SCHEMATIC (2 PAGE).

**END OF CHAPTER 12**




MAIN P.L.C LOCATED IN NEW ELECTRICAL ROOM




ENCLOSURE EUROBEX 48" X 58"
1 BACKPLANE 13 SLOTS
- 1 POWER SUPPLY 1746-P4
- 1 CPU 1747-L551
- 2 INPUT DIGITAL 1746IB16
- 4 OUTPUT DIGITAL 1746OX8
- 1 INPUT ANALOGIC 1746NI8
- 1 OUTPUT ANALOGIC 1746NO4I
- 2 INPUT ANALOGIC 1746IA16
- 1 THEMOCOUPLE 1746NT4

12' WIRING DUCT AND COVER 3"
5' TERMINAL TRACK
1 UPS XL750VA
1 POWER OUTLET
3 LEAK DETECTOR
2 POWER SUPPLY OMRON S82K
1 SWITCK D-LINK
1 BREAKER 5A
1 BREAKER 10A

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Main P.L.C Cabinet

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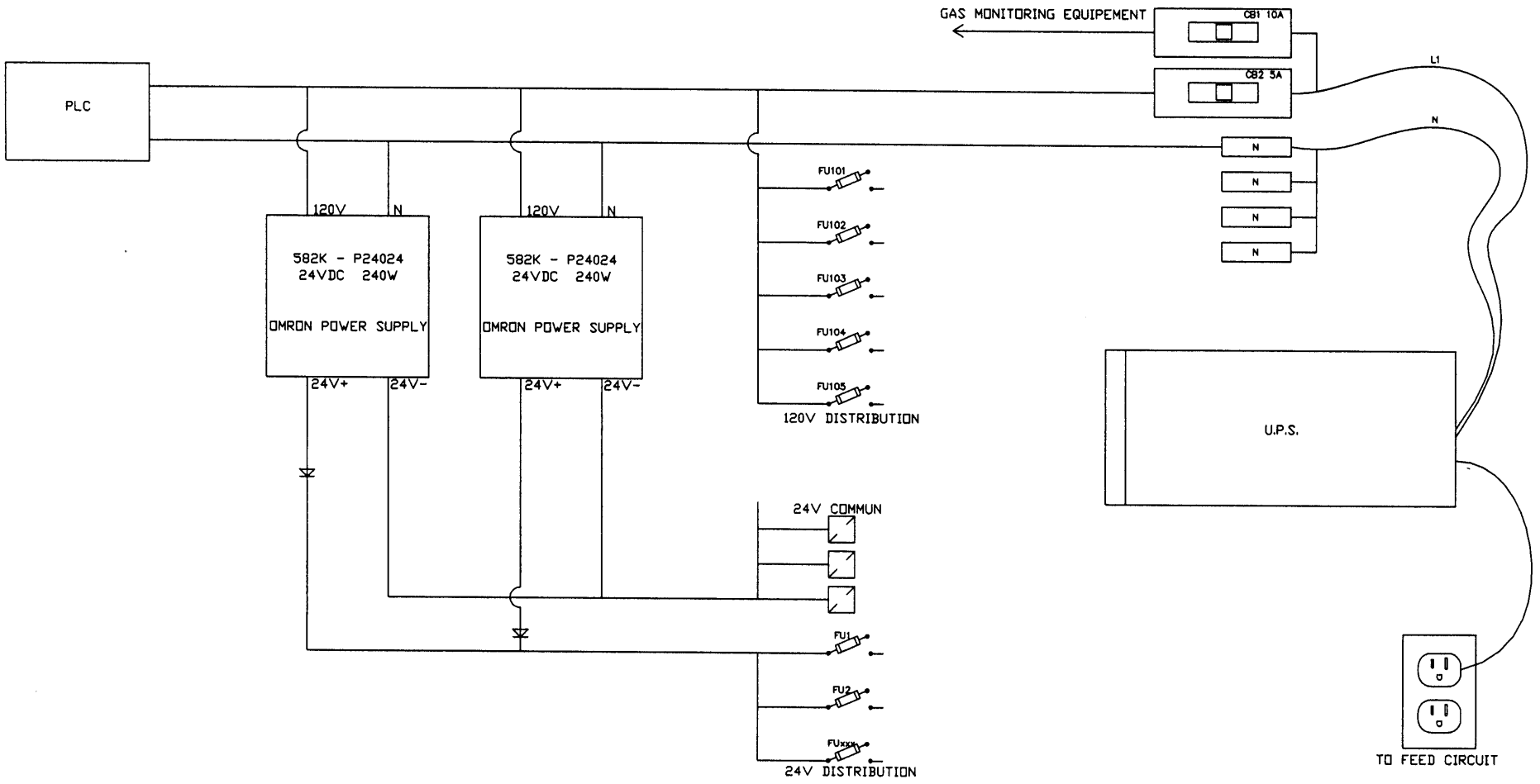
# POWER DISTRIBUTION

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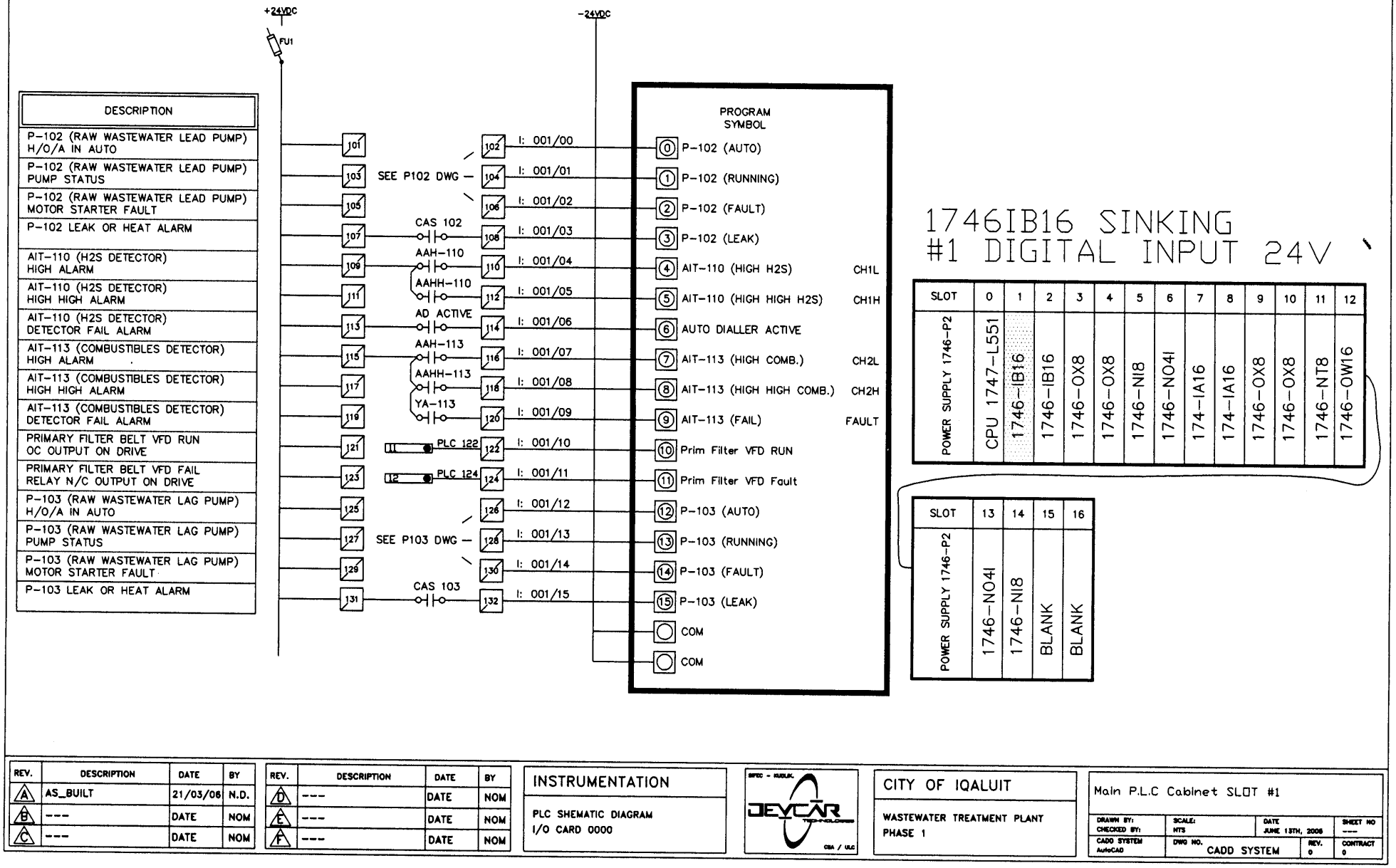


# 1746IB16 SINKING #1 DIGITAL INPUT 24V

| SLOT | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | CPU 1747-L551 | 1746-IB16 | 1746-IB16 | 1746-OX8 | 1746-OX8 | 1746-NI8 | 1746-NO4I | 174-IA16 | 174-IA16 | 1746-OX8 | 1746-OX8 | 1746-NT8 | 1746-OW16 |

| SLOT | 13 | 14 | 15 | 16 |
|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | 1746-NO4I | 1746-NI8 | BLANK | BLANK |

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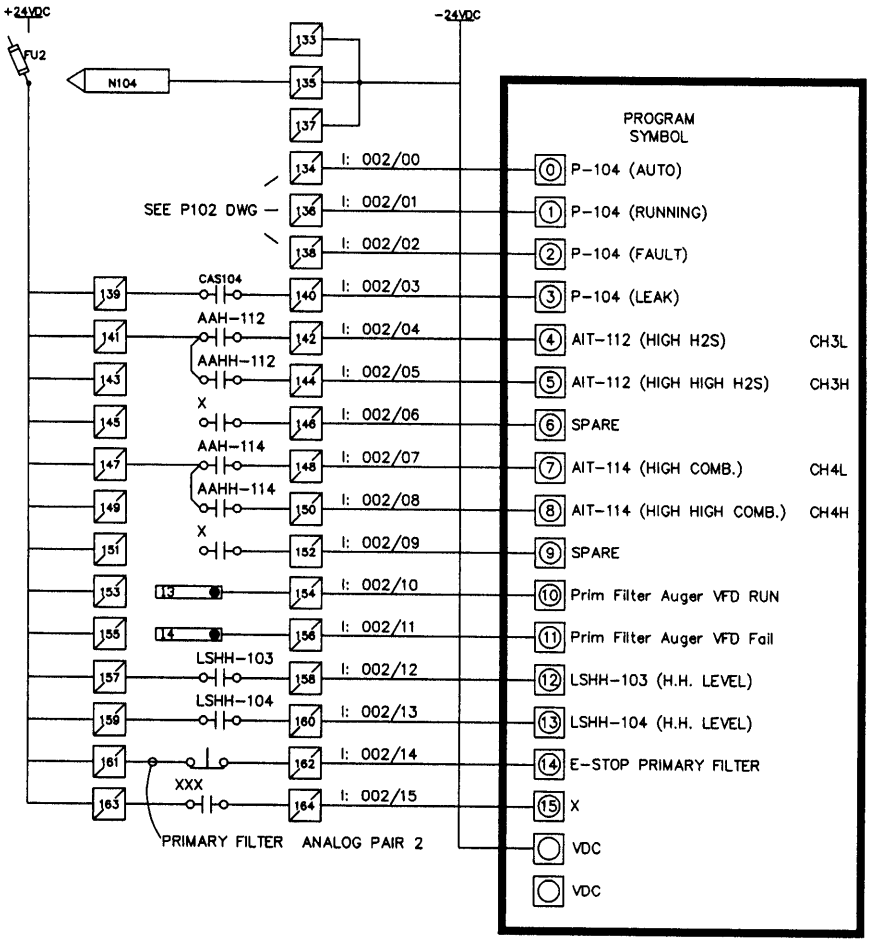
| DESCRIPTION |
|---|
| P-104 (RAW WASTEWATER STAND-BY PUMP) H/O/A IN AUTO |
| P-104 (RAW WASTEWATER STAND-BY PUMP) PUMP STATUS |
| P-104 (RAW WASTEWATER STAND-BY PUMP) MOTOR STARTER FAULT |
| P-104 LEAK OR HEAT ALARM |
| AIT-112 (H2S DETECTOR) HIGH ALARM |
| AIT-112 (H2S DETECTOR) HIGH HIGH ALARM |
| X<br>X |
| AIT-114 (COMBUSTIBLES DETECTOR) HIGH ALARM |
| AIT-114 (COMBUSTIBLES DETECTOR) HIGH HIGH ALARM |
| X<br>X |
| PRIMARY FILTERAUGER VFD RUN OC OUTPUT ON DRIVE |
| PRIMARY FILTER AUGER VFD FAIL RELAY N/C OUTPUT ON DRIVE |
| LSHH-103 (SCREENING CHAMBER LEVEL SWITCH) HIGH HIGH LEVEL ALARM |
| LSHH-104 (LIFT STATION LEVEL SWITCH) HIGH HIGH LEVEL SWITCH |
| E-STOP PRIMARY FILTER N/C WHEN PULL |
| SPARE<br>X |




NOTE : FU3 FOR LSH103 ET LSHH104

## 1746IB16 SINKING #2 DIGITAL INPUT 24V

| SLOT | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | CPU 1747-L551 | 1746-IB16 | 1746-IB16 | 1746-OX8 | 1746-OX8 | 1746-NI8 | 1746-NO4I | 174-IA16 | 174-IA16 | 1746-OX8 | 1746-OX8 | 1746-NT8 | 1746-OW16 |

| SLOT | 13 | 14 | 15 | 16 |
|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | 1746-NO4I | 1746-NI8 | BLANK | BLANK |

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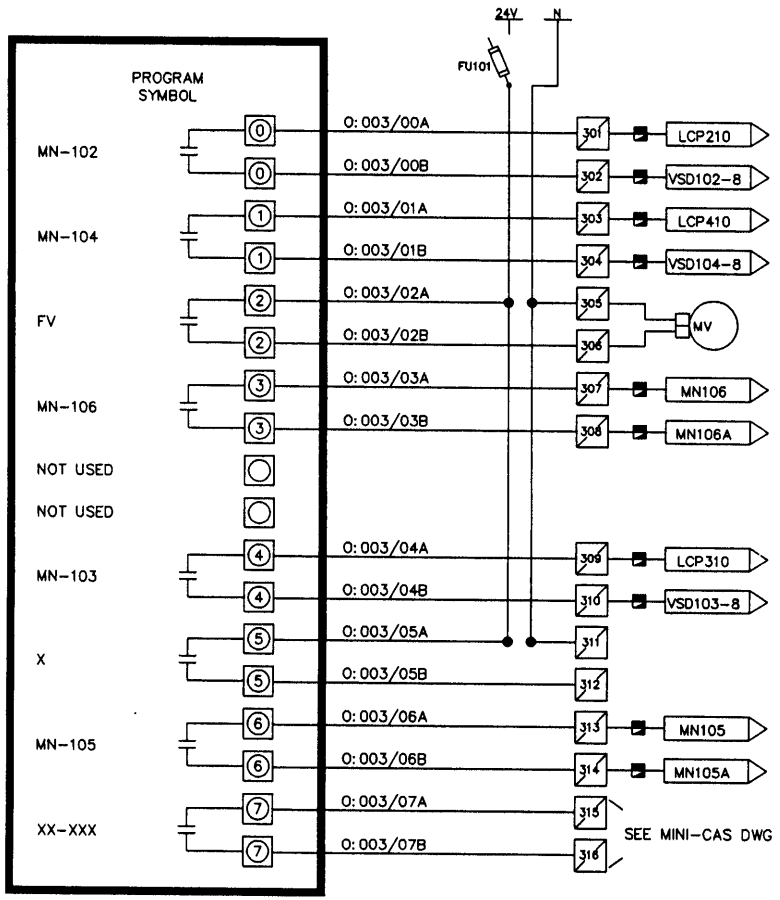


| DESCRIPTION |
|---|
| P-102<br>RAW WASTEWATER LEAD PUMP<br>PUMP START / STOP SIGNAL |
| P-104<br>RAW WASTEWATRER STAND-BY PUMP<br>PUMP START / STOP SIGNAL |
| FEW FILTER FLUSH VALVE<br>LOCATED ON MEZANINE BESIDE<br>FEW TANK (BELLIMO VALVE) |
| SSCR-106<br>SCREW SCREEN<br>MOTOR START / STOP SIGNAL |
| P-103<br>RAW WASTEWATER LAG PUMP<br>PUMP START / STOP SIGNAL |
| SPARE<br>X<br>X |
| SSCR-105<br>SCREW SCREEN<br>MOTOR START / STOP SIGNAL |
| Mni CAS Alarm Reset<br>(on leek detection)<br>X |

# 1746-□X8
# #3 DIGITAL □UTPUT

| SLOT | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | CPU 1747-L551 | 1746-IB16 | 1746-IB16 | 1746-OX8 | 1746-OX8 | 1746-NI8 | 1746-NO4I | 174-IA16 | 174-IA16 | 1746-OX8 | 1746-OX8 | 1746-NT8 | 1746-OW16 |

| SLOT | 13 | 14 | 15 | 16 |
|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | 1746-NO4I | 1746-NI8 | BLANK | BLANK |

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Main P.L.C Cabinet SLOT #3

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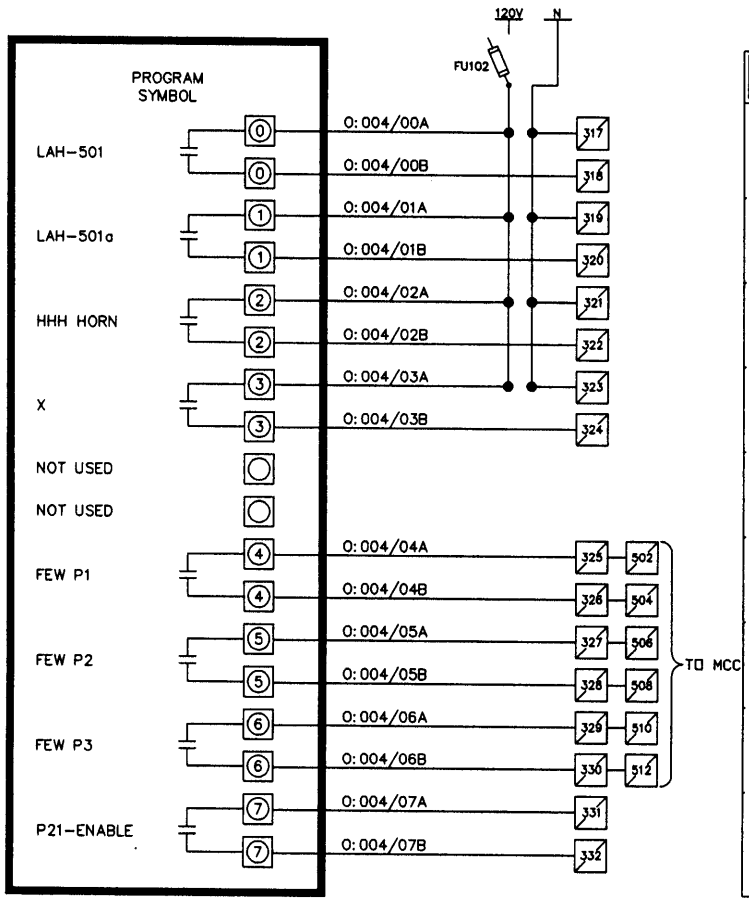



| DESCRIPTION | |
|---|---|
| LIT-501 LOW FEW LEVEL INDICATOR | RED |
| LIT-501 HIGH FEW LEVEL INDICATOR | BLUE |
| HORN (ACTIVATED BY HIGH POTABLE WATER LEVEL "I: 7/13" BLUE LAMP ) INDICATOR (HORN + SELENOID) | |
| SPARE | |
| | |
| START FEW PUMP #1 | |
| START FEW PUMP #2 | |
| START FEW PUMP #3 | |
| P21 FEW HOT WATER RECIRC PUMP (ENABLE NORMAL OPERATION) SEE P21 STARTER DWG | |

# 1746-□X8
# #4 DIGITAL □UTPUT

| SLOT | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | CPU 1747-L551 | 1746-IB16 | 1746-IB16 | 1746-OX8 | 1746-OX8 | 1746-NI8 | 1746-NO4I | 174-IA16 | 174-IA16 | 1746-OX8 | 1746-OX8 | 1746-NT8 | 1746-OW16 |

| SLOT | 13 | 14 | 15 | 16 |
|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | 1746-NO4I | 1746-NI8 | BLANK | BLANK |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | AS_BUILT | 21/03/06 | N.D. |
| B | --- | DATE | NOM |
| C | --- | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | --- | DATE | NOM |
| E | --- | DATE | NOM |
| F | --- | DATE | NOM |

**INSTRUMENTATION**

PLC SHEMATIC DIAGRAM
I/O CARD 0000

JEYCAR TECHNOLOGIES — CSA / ULC

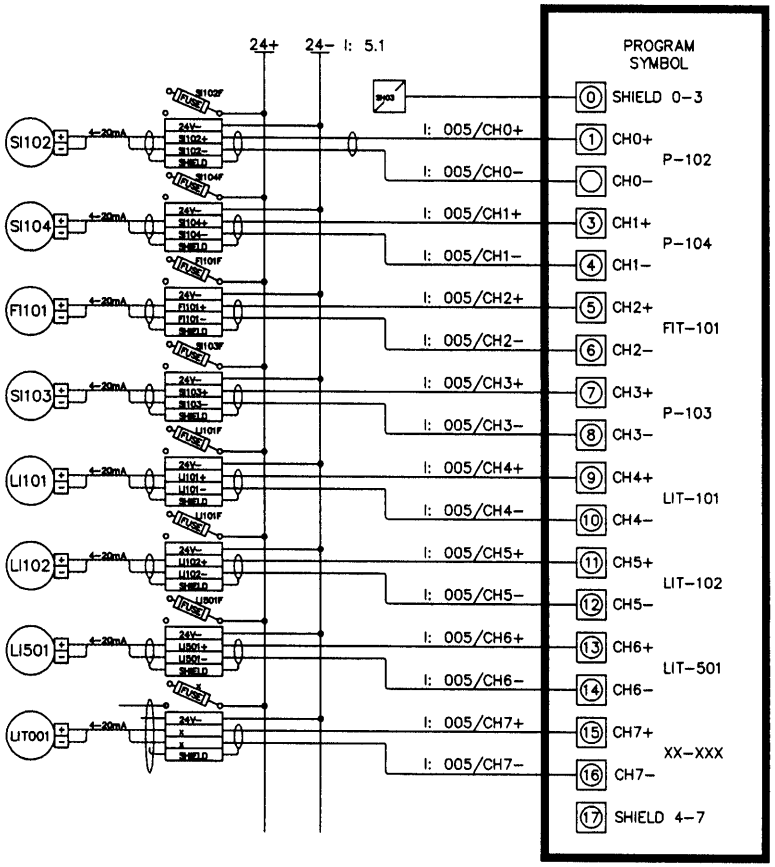
**CITY OF IQALUIT**

WASTEWATER TREATMENT PLANT
PHASE 1

Main P.L.C Cabinet SLOT #4

| DRAWN BY: CHECKED BY: | SCALE: NTS | DATE: JUNE 13TH, 2006 | SHEET NO: --- |
|---|---|---|---|
| CADD SYSTEM: AutoCAD | DWG NO.: CADD SYSTEM | REV.: 0 | CONTRACT: 0 |

| DESCRIPTION | |
|---|---|
| P-102<br>RAW WASTEWATER LEAD PUMP<br>SPEED INDICATION | 0 |
| P-104<br>RAW WASTEWATER STAND-BY PUMP<br>SPEED INDICATION | 1 |
| FIT-101<br>RAW WASTEWATER<br>FLOW INDICATION | 2 |
| P-103<br>RAW WASTEWATER LAG PUMP<br>SPEED INDICATION | 3 |
| LIT-101<br>WASTEWATER LIFT STATION<br>LEVEL INDICATION | 4 |
| LIT-102<br>SCREENINGS CHAMBER<br>LEVEL INDICATION | 5 |
| LIT-501<br>FINAL EFFLUENT WATER TANK<br>LEVEL INDICATION | 6 |
| LIT-201<br>PRIM FILTER LEVEL | 7 |




# 1746-NI8
# #5 ANALOGIC INPUT

| SLOT | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | CPU 1747-L551 | 1746-IB16 | 1746-IB16 | 1746-OX8 | 1746-OX8 | 1746-NI8 | 1746-NO4I | 174-IA16 | 174-IA16 | 1746-OX8 | 1746-OX8 | 1746-NT8 | 1746-OW16 |

| SLOT | 13 | 14 | 15 | 16 |
|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | 1746-NO4I | 1746-NI8 | BLANK | BLANK |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | AS_BUILT | 21/03/06 | N.D. |
| B | --- | DATE | NOM |
| C | --- | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | --- | DATE | NOM |
| E | --- | DATE | NOM |
| F | --- | DATE | NOM |

INSTRUMENTATION

PLC SHEMATIC DIAGRAM
I/O CARD 0000

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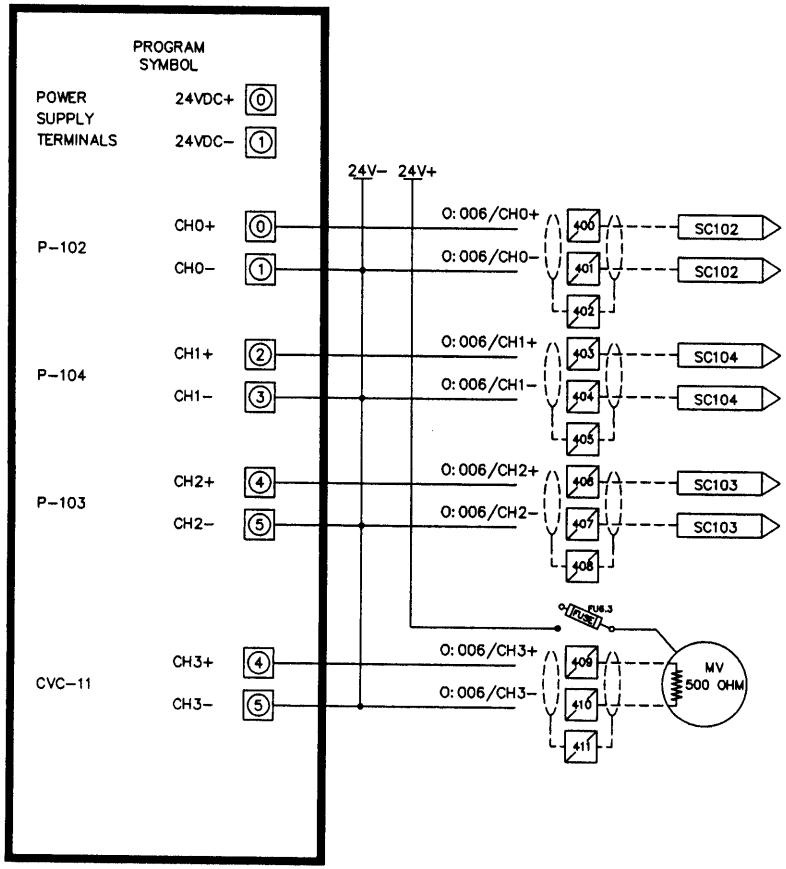
JEYCAR TECHNOLOGIES
CSA / ULC

CITY OF IQALUIT

WASTEWATER TREATMENT PLANT
PHASE 1

Main P.L.C Cabinet SLOT #5

| DRAWN BY: | SCALE: NTS | DATE JUNE 13TH, 2006 | SHEET NO --- |
|---|---|---|---|
| CHECKED BY: | | | |
| CADD SYSTEM AutoCAD | DWG NO. CADD SYSTEM | REV. 0 | CONTRACT 0 |




| DESCRIPTION |
|---|
| P-102<br>RAW WASTEWATER LEAD PUMP<br>SPEED SETPOINT |
| P-104<br>RAW WASTEWATER STAND-BY PUMP<br>SPEED SETPOINT |
| P-103<br>RAW WASTEWATER LAG PUMP<br>SPEED SETPOINT |
| AHU3 COIL CONTROL VALVE |

# 1746-NO4I
# #6 ANALOGIC OUTPUT

| SLOT | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | CPU 1747-L551 | 1746-IB16 | 1746-IB16 | 1746-OX8 | 1746-OX8 | 1746-NI8 | 1746-NO4I | 174-IA16 | 174-IA16 | 1746-OX8 | 1746-OX8 | 1746-NT8 | 1746-OW16 |

| SLOT | 13 | 14 | 15 | 16 |
|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | 1746-NO4I | 1746-NI8 | BLANK | BLANK |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | AS_BUILT | 21/03/06 | N.D. |
| B | --- | DATE | NOM |
| C | --- | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | --- | DATE | NOM |
| E | --- | DATE | NOM |
| F | --- | DATE | NOM |

INSTRUMENTATION

PLC SHEMATIC DIAGRAM
I/O CARD 0000

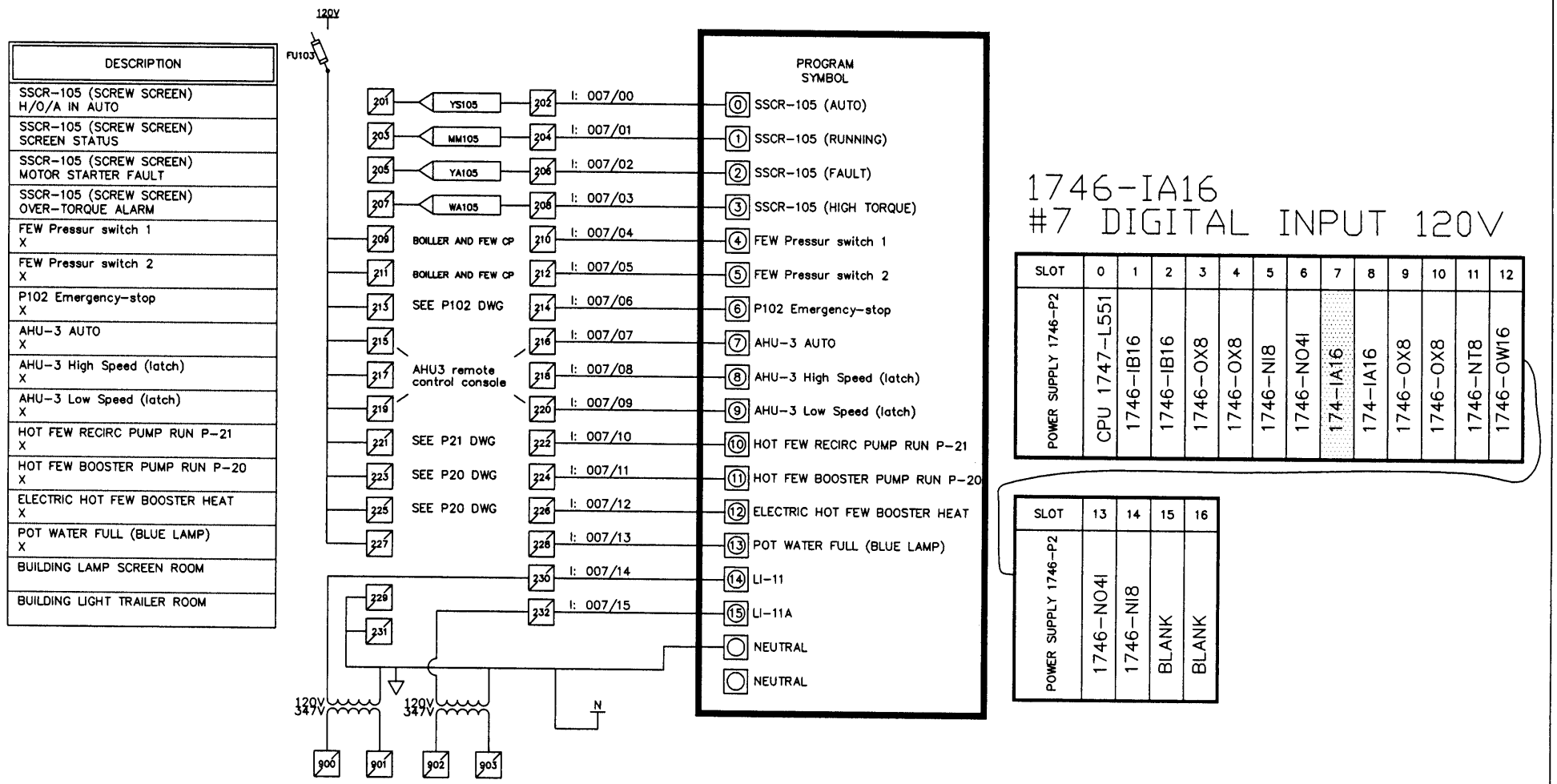
JEYCAR

CITY OF IQALUIT

WASTEWATER TREATMENT PLANT
PHASE 1

Main P.L.C Cabinet SLOT #6

| DRAWN BY: | SCALE: NTS | DATE JUNE 13TH, 2006 | SHEET NO --- |
|---|---|---|---|
| CHECKED BY: | | | |
| CADD SYSTEM AutoCAD | DWG NO. CADD SYSTEM | REV. 0 | CONTRACT 0 |




| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | AS_BUILT | 21/03/06 | N.D. |
| B | --- | DATE | NOM |
| C | --- | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | --- | DATE | NOM |
| E | --- | DATE | NOM |
| F | --- | DATE | NOM |

INSTRUMENTATION

PLC SHEMATIC DIAGRAM
I/O CARD 0000

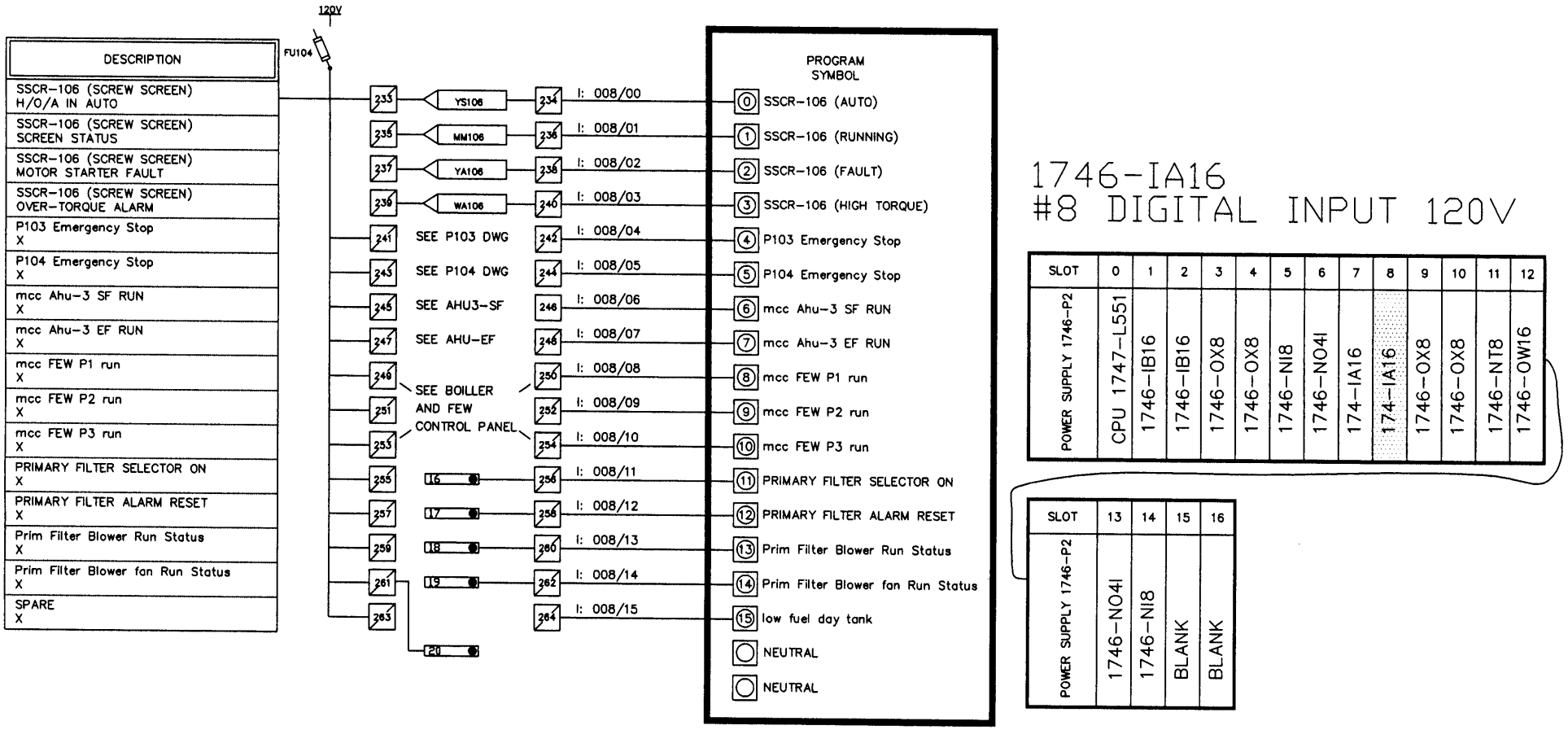
JEYCAR TECHNOLOGIES

CITY OF IQALUIT

WASTEWATER TREATMENT PLANT
PHASE 1

Main P.L.C Cabinet SLOT #7

| | | | |
|---|---|---|---|
| DRAWN BY: CHECKED BY: | SCALE: NTS | DATE JUNE 13TH, 2006 | SHEET NO --- |
| CADD SYSTEM AutoCAD | DWG NO. CADD SYSTEM | REV. 0 | CONTRACT 0 |




# 1746-IA16
# #8 DIGITAL INPUT 120V

| SLOT | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | CPU 1747-L551 | 1746-IB16 | 1746-IB16 | 1746-OX8 | 1746-OX8 | 1746-NI8 | 1746-NO4I | 174-IA16 | 174-IA16 | 1746-OX8 | 1746-OX8 | 1746-NT8 | 1746-OW16 |

| SLOT | 13 | 14 | 15 | 16 |
|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | 1746-NO4I | 1746-NI8 | BLANK | BLANK |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | AS_BUILT | 21/03/06 | N.D. |
| B | --- | DATE | NOM |
| C | --- | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | --- | DATE | NOM |
| E | --- | DATE | NOM |
| F | --- | DATE | NOM |

**INSTRUMENTATION**

PLC SHEMATIC DIAGRAM
I/O CARD 0000

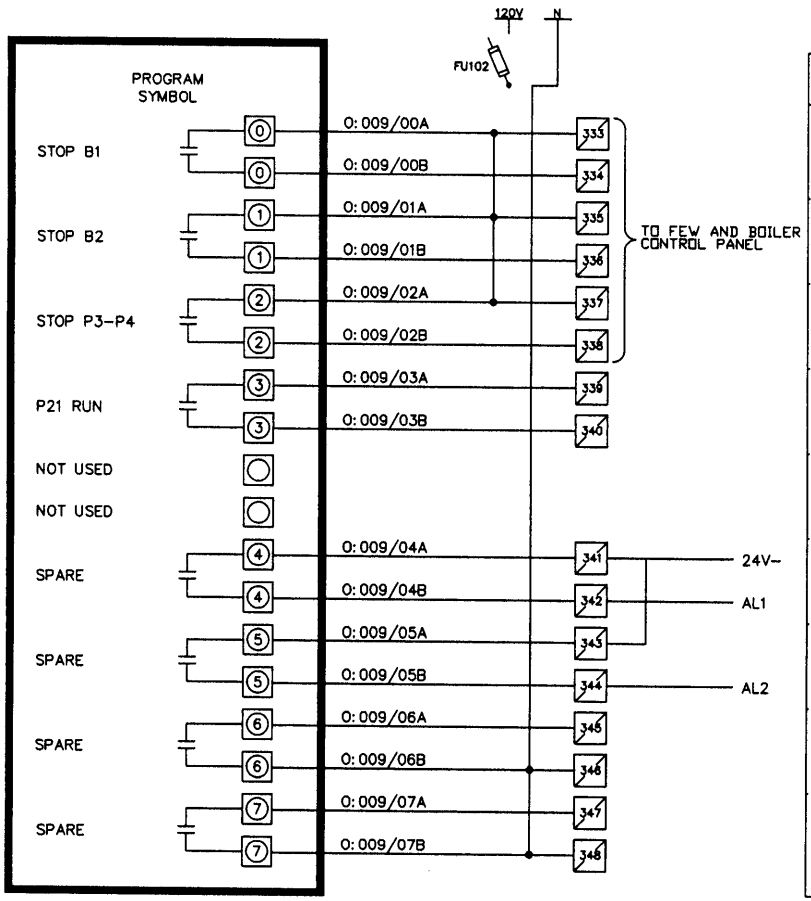
JEYCAR TECHNOLOGIES

**CITY OF IQALUIT**

WASTEWATER TREATMENT PLANT
PHASE 1

Main P.L.C Cabinet SLOT #8

| DRAWN BY: | SCALE: NTS | DATE JUNE 13TH, 2006 | SHEET NO --- |
|---|---|---|---|
| CHECKED BY: | | | |
| CADD SYSTEM AutoCAD | DWG NO. CADD SYSTEM | REV. 0 | CONTRACT 0 |




| DESCRIPTION |
|---|
| STOP BOILER 1 ON DEMAND |
| STOP BOILER 2 ON DEMAND |
| STOP CIRCULATOR P3 AND P4 |
| HOT FEW BOOSTER PUMP<br>P21 RUN DIGNAL |
| |
| AUTO DIALER 1 |
| AUTO DIALER 2 |
| Return air Damper |
| Defrost Damper |

# #9 1746-□X8
# DIGITAL □UTPUT

| SLOT | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | CPU 1747-L551 | 1746-IB16 | 1746-IB16 | 1746-OX8 | 1746-OX8 | 1746-NI8 | 1746-NO4I | 174-IA16 | 174-IA16 | 1746-OX8 | 1746-OX8 | 1746-NT8 | 1746-OW16 |

| SLOT | 13 | 14 | 15 | 16 |
|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | 1746-NO4I | 1746-NI8 | BLANK | BLANK |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | AS_BUILT | 21/03/06 | N.D. |
| B | --- | DATE | NOM |
| C | --- | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | --- | DATE | NOM |
| E | --- | DATE | NOM |
| F | --- | DATE | NOM |

**INSTRUMENTATION**

PLC SHEMATIC DIAGRAM
I/O CARD 0000

JEYCAR TECHNOLOGIES

**CITY OF IQALUIT**

WASTEWATER TREATMENT PLANT
PHASE 1

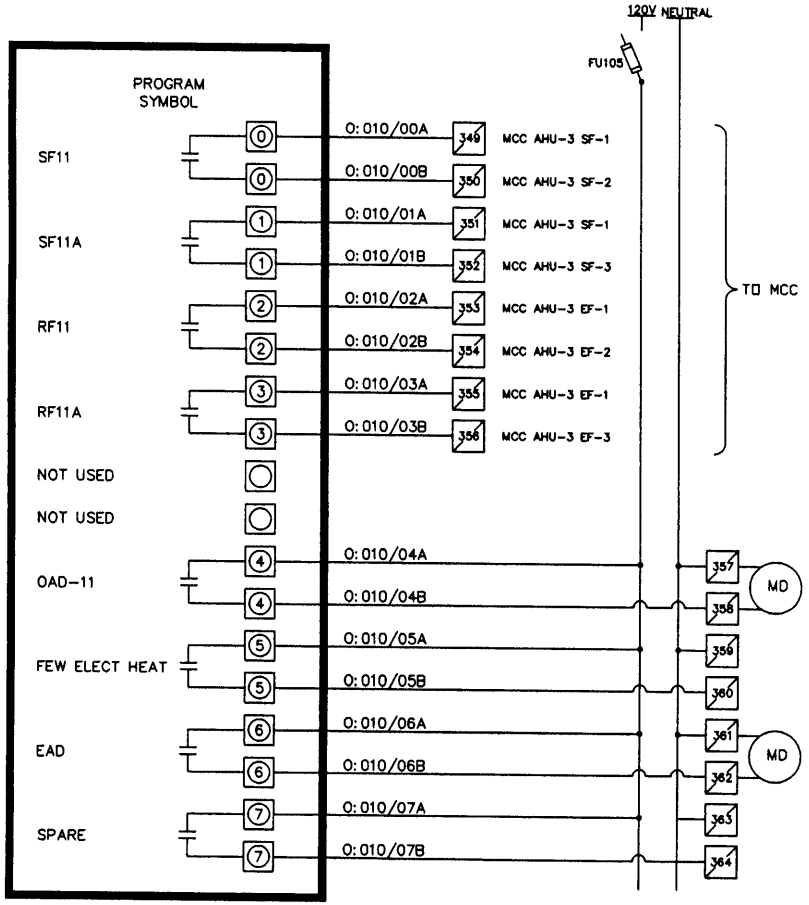
Main P.L.C Cabinet SLOT #9

| | | | |
|---|---|---|---|
| DRAWN BY: | SCALE: NTS | DATE JUNE 13TH, 2006 | SHEET NO --- |
| CHECKED BY: | | | |
| CADD SYSTEM AutoCAD | DWG NO. CADD SYSTEM | REV. 0 | CONTRACT 0 |

HOT FEW RECIRC PUMP RUN P-21

HOT FEW BOOSTER PUMP RUN P-20

ELECTRIC HOT FEW BOOSTER HEAT




| DESCRIPTION |
|---|
| SUPPLY FAN LOW SPEED |
| SUPPLY FAN HIGH SPEED |
| EXHAUST FAN LOW SPEED |
| EXHAUST FAN HIGH SPEED |
| OUTDOOR AIR DAMPER (AHUD01) |
| ELECTRIC HOT FEW BOOSTER HEAT SIGNAL |
| EXHAUST AIR DAMPER (AHUD02) |
| SPARE |

## #10 1746-OX8 DIGITAL OUTPUT

| SLOT | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | CPU 1747-L551 | 1746-IB16 | 1746-IB16 | 1746-OX8 | 1746-OX8 | 1746-NI8 | 1746-NO4I | 1746-IA16 | 1746-IA16 | 1746-OX8 | 1746-OX8 | 1746-NT8 | 1746-OW16 |

| SLOT | 13 | 14 | 15 | 16 |
|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | 1746-NO4I | 1746-NI8 | BLANK | BLANK |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | AS_BUILT | 21/03/06 | N.D. |
| B | --- | DATE | NOM |
| C | --- | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | --- | DATE | NOM |
| E | --- | DATE | NOM |
| F | --- | DATE | NOM |

**INSTRUMENTATION**

PLC SHEMATIC DIAGRAM
I/O CARD 0000

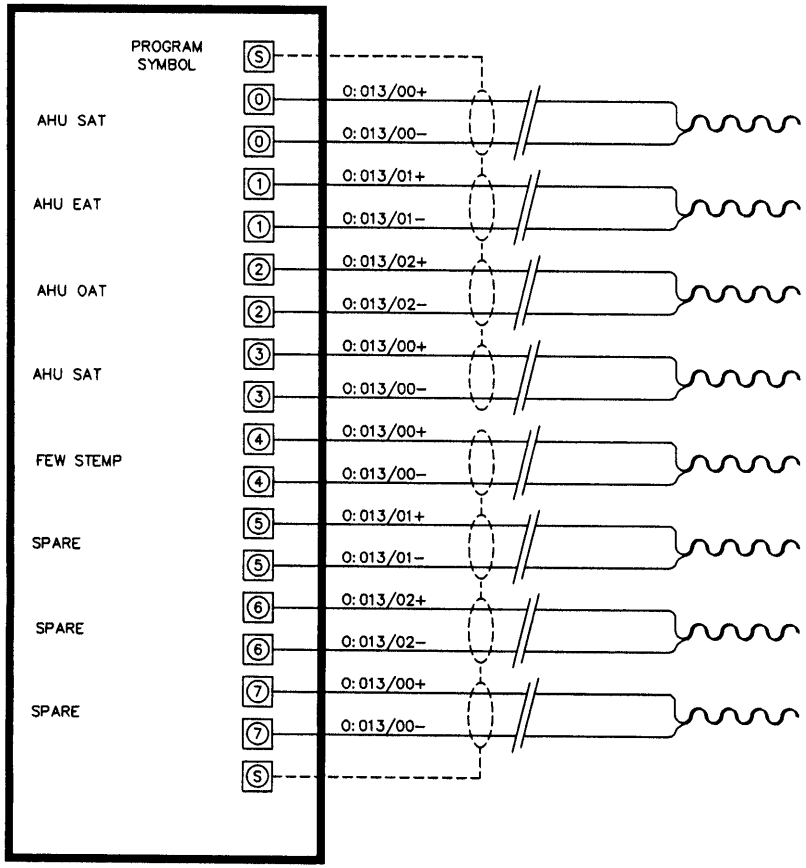
JEYCAR TECHNOLOGIES

**CITY OF IQALUIT**

WASTEWATER TREATMENT PLANT
PHASE 1

Main P.L.C Cabinet SLOT #10

| | | | |
|---|---|---|---|
| DRAWN BY: / CHECKED BY: | SCALE: NTS | DATE: JUNE 15TH, 2006 | SHEET NO: --- |
| CADD SYSTEM: AutoCAD | DWG NO.: CADD SYSTEM | REV.: 0 | CONTRACT: 0 |




| DESCRIPTION |
|---|
| AHU3 SUPPLY AIR TEMPERATURE |
| AHU3 EXHAUST AIR TEMPERATURE |
| OUTSIDE AIR TEMPERATURE |
| BOILLER |
| FEW HOT WATER SUPPLY TEMP |
| SPARE |
| SPARE |
| SPARE |

# 1746-NT8
# #11 THERMOCOUPLES

| SLOT | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | CPU 1747-L551 | 1746-IB16 | 1746-IB16 | 1746-OX8 | 1746-OX8 | 1746-NI8 | 1746-NO4I | 174-IA16 | 174-IA16 | 1746-OX8 | 1746-OX8 | 1746-NT8 | 1746-OW16 |

| SLOT | 13 | 14 | 15 | 16 |
|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | 1746-NO4I | 1746-NI8 | BLANK | BLANK |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | AS_BUILT | 21/03/06 | N.D. |
| B | --- | DATE | NOM |
| C | --- | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | --- | DATE | NOM |
| E | --- | DATE | NOM |
| F | --- | DATE | NOM |

INSTRUMENTATION

PLC SHEMATIC DIAGRAM
I/O CARD 0000

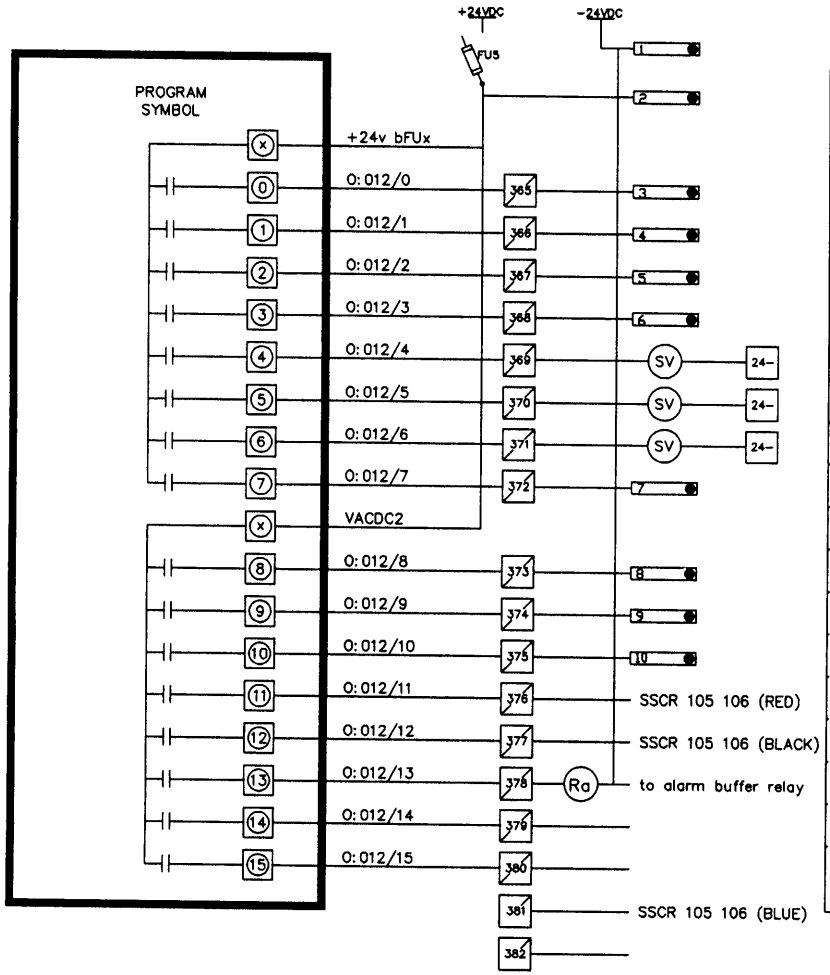
JEVCAR TECHNOLOGIES

CITY OF IQALUIT

WASTEWATER TREATMENT PLANT
PHASE 1

Main P.L.C Cabinet SLOT #11

| DRAWN BY: / CHECKED BY: | SCALE: NTS | DATE: JUNE 13TH, 2008 | SHEET NO: --- |
|---|---|---|---|
| CADD SYSTEM: AutoCAD | DWG NO.: CADD SYSTEM | REV.: 0 | CONTRACT: 0 |




| DESCRIPTION | |
|---|---|
| Prim Filter Auger start VFD | |
| Prim Filter Auger reset VFD | |
| Prim Filter Filter start VFD | |
| Prim Filter Filter reset VFD | |
| Prim Filter Hot Water Flush Valve | 3 |
| Prim Filter Cold Water Flush Valve | 1 |
| Prim Filter bottom Flush Valve | 5 |
| Prim Filter Blower start | |
| | |
| Prim Filter Blower Fan Start | |
| Prim Filter Run Lamp | |
| Prim Filter Fail Lamp | |
| SC105 Belimo Wash Valve | |
| SV106 Belimo Wash Valve | |
| alarm notify relay paralell with gas horn | |
| spare | |
| spare | |

# 1746-OW16 SINKING #12 DIGITAL OUTPUT

| SLOT | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | CPU 1747-L551 | 1746-IB16 | 1746-IB16 | 1746-OX8 | 1746-OX8 | 1746-NI8 | 1746-NO4I | 174-IA16 | 174-IA16 | 1746-OX8 | 1746-OX8 | 1746-NT8 | 1746-OW16 |

| SLOT | 13 | 14 | 15 | 16 |
|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | 1746-NO4I | 1746-NI8 | BLANK | BLANK |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | AS_BUILT | 21/03/06 | N.D. |
| B | --- | DATE | NOM |
| C | --- | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | --- | DATE | NOM |
| E | --- | DATE | NOM |
| F | --- | DATE | NOM |

**INSTRUMENTATION**

PLC SHEMATIC DIAGRAM
I/O CARD 0000

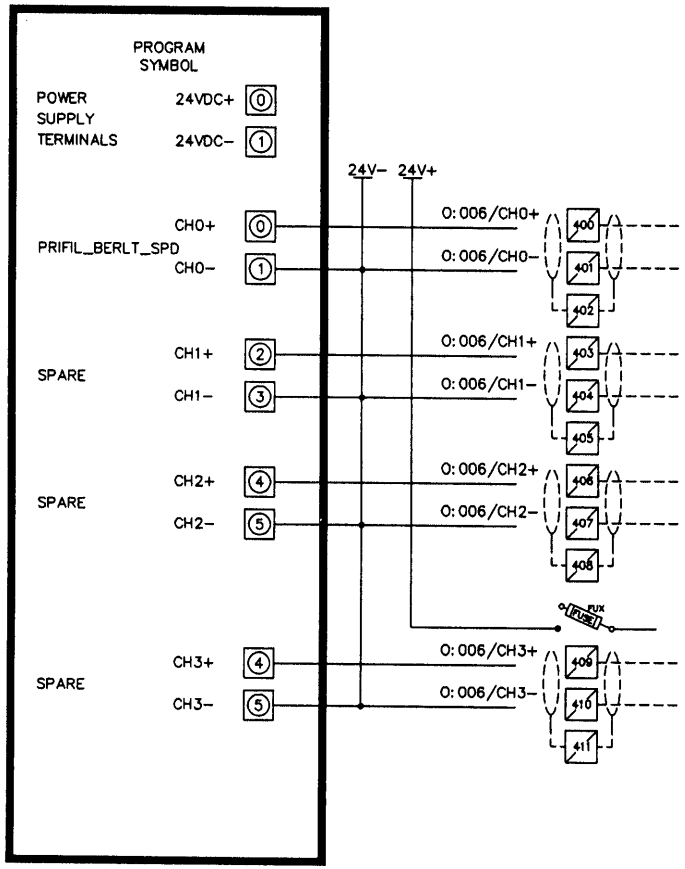
JEYCAR

**CITY OF IQALUIT**

WASTEWATER TREATMENT PLANT
PHASE 1

Main P.L.C Cabinet SLOT #12

| | | | |
|---|---|---|---|
| DRAWN BY: CHECKED BY: | SCALE: NTS | DATE: JUNE 13TH, 2006 | SHEET NO: --- |
| CADD SYSTEM: AutoCAD | DWG NO.: CADD SYSTEM | REV.: 0 | CONTRACT: 0 |




| DESCRIPTION |
|---|
| PRIFIL_BELTSPD<br>PRIMARY FILTER BELT SPEED<br>SETPOINT |
| SPARE<br>X<br>X |
| SPARE<br>X<br>X |
| SPARE |

# 1746-NO4I
# #13 ANALOGIC OUTPUT

| SLOT | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | CPU 1747-L551 | 1746-IB16 | 1746-IB16 | 1746-OX8 | 1746-OX8 | 1746-NI8 | 1746-NO4I | 174-IA16 | 174-IA16 | 1746-OX8 | 1746-OX8 | 1746-NT8 | 1746-OW16 |

| SLOT | 13 | 14 | 15 | 16 |
|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | 1746-NO4I | 1746-NI8 | BLANK | BLANK |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | AS_BUILT | 21/03/06 | N.D. |
| B | --- | DATE | NOM |
| C | --- | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | --- | DATE | NOM |
| E | --- | DATE | NOM |
| F | --- | DATE | NOM |

**INSTRUMENTATION**

PLC SHEMATIC DIAGRAM
I/O CARD 0000

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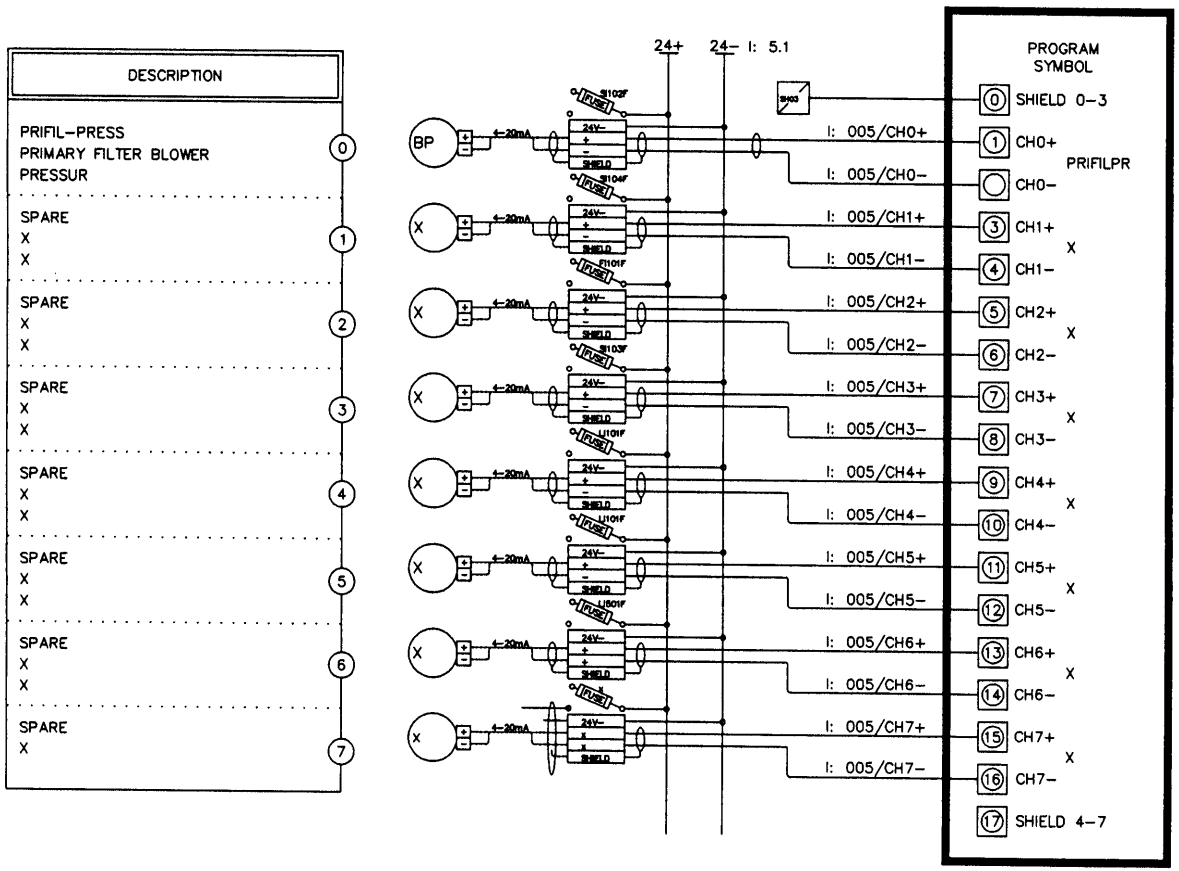
**CITY OF IQALUIT**

WASTEWATER TREATMENT PLANT
PHASE 1

Main P.L.C Cabinet SLOT #13

| DRAWN BY: | SCALE: NTS | DATE JUNE 12TH, 2006 | SHEET NO --- |
|---|---|---|---|
| CHECKED BY: | | | |
| CADD SYSTEM AutoCAD | DWG NO. CADD SYSTEM | REV. 0 | CONTRACT 0 |




# 1746-NI8
# #14 ANALOGIC INPUT

| SLOT | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | CPU 1747-L551 | 1746-IB16 | 1746-IB16 | 1746-OX8 | 1746-OX8 | 1746-NI8 | 1746-NO4I | 174-IA16 | 174-IA16 | 1746-OX8 | 1746-OX8 | 1746-NT8 | 1746-OW16 |

| SLOT | 13 | 14 | 15 | 16 |
|---|---|---|---|---|
| POWER SUPPLY 1746-P2 | 1746-NO4I | 1746-NI8 | BLANK | BLANK |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | AS_BUILT | 21/03/06 | N.D. |
| B | --- | DATE | NOM |
| C | --- | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | --- | DATE | NOM |
| E | --- | DATE | NOM |
| F | --- | DATE | NOM |

**INSTRUMENTATION**

PLC SHEMATIC DIAGRAM
I/O CARD 0000

SPEC - BUILT

JEYCAR TECHNOLOGIES
CSA / ULC

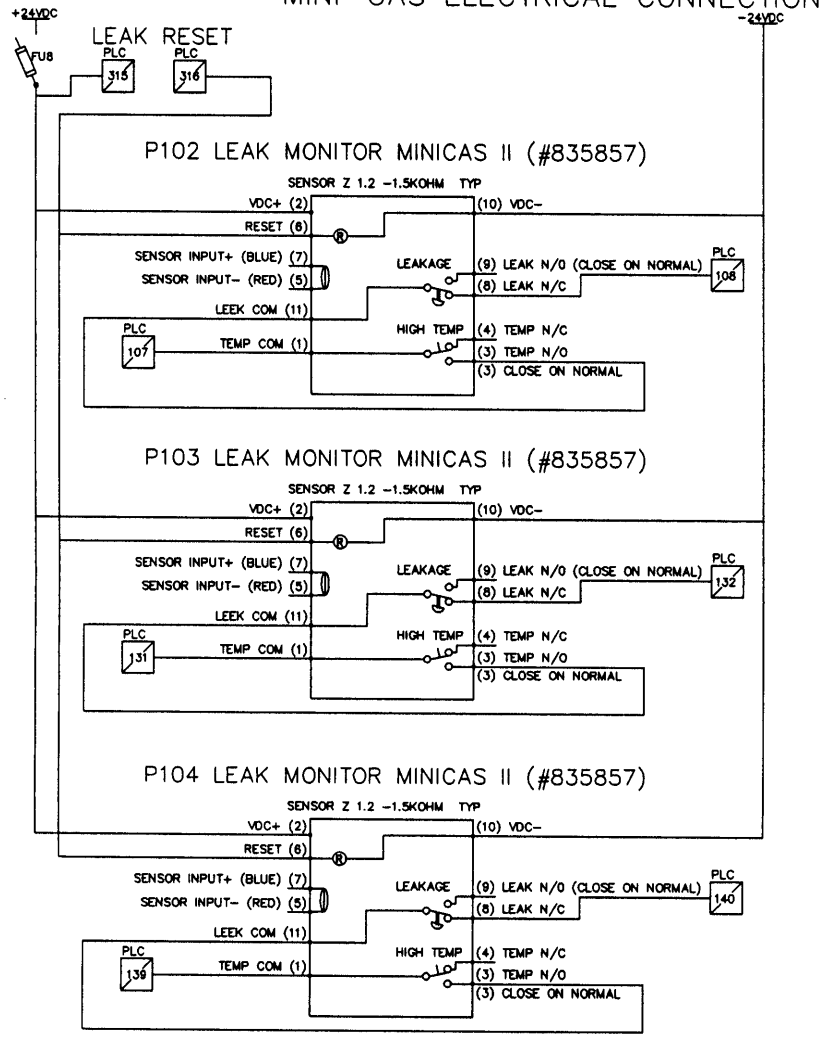
**CITY OF IQALUIT**

WASTEWATER TREATMENT PLANT
PHASE 1

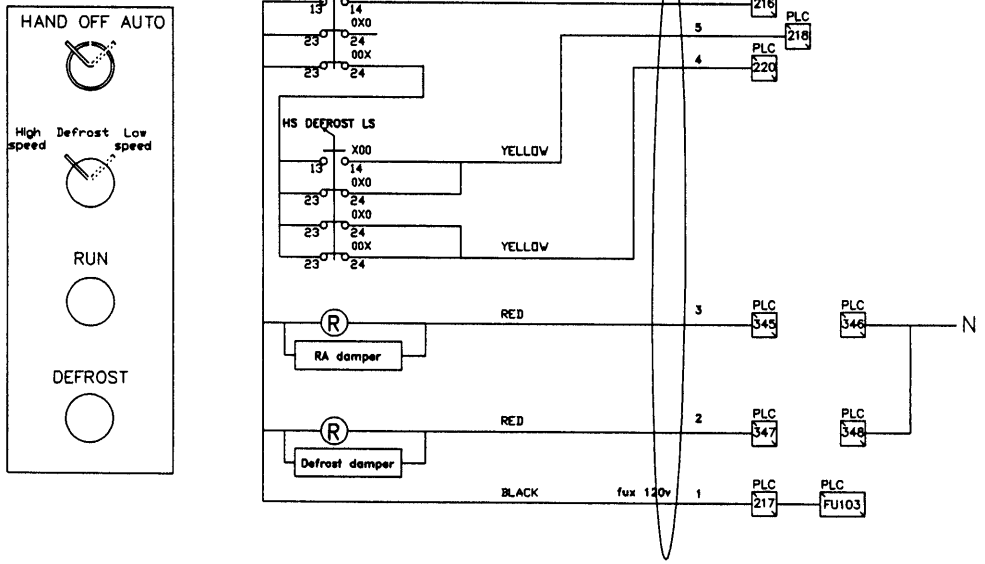
Main P.L.C Cabinet SLOT #14

| | | | |
|---|---|---|---|
| DRAWN BY: / CHECKED BY: | SCALE: NTS | DATE JUNE 15TH, 2006 | SHEET NO ---- |
| CADD SYSTEM AutoCAD | DWG NO. CADD SYSTEM | REV. 0 | CONTRACT 0 |

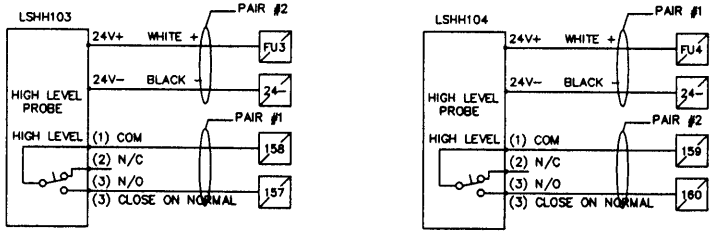
# MINI-CAS ELECTRICAL CONNECTION




# AHU3 remote control console




# LSHH 103 -104 ELECTRICAL CONNECTION




| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | AS_BUILT | 21/03/06 | N.D. |
| B | --- | DATE | NOM |
| C | --- | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | --- | DATE | NOM |
| E | --- | DATE | NOM |
| F | --- | DATE | NOM |

**INSTRUMENTATION**

PLC SHEMATIC DIAGRAM
I/O CARD 0000

JEYCAR TECHNOLOGIES

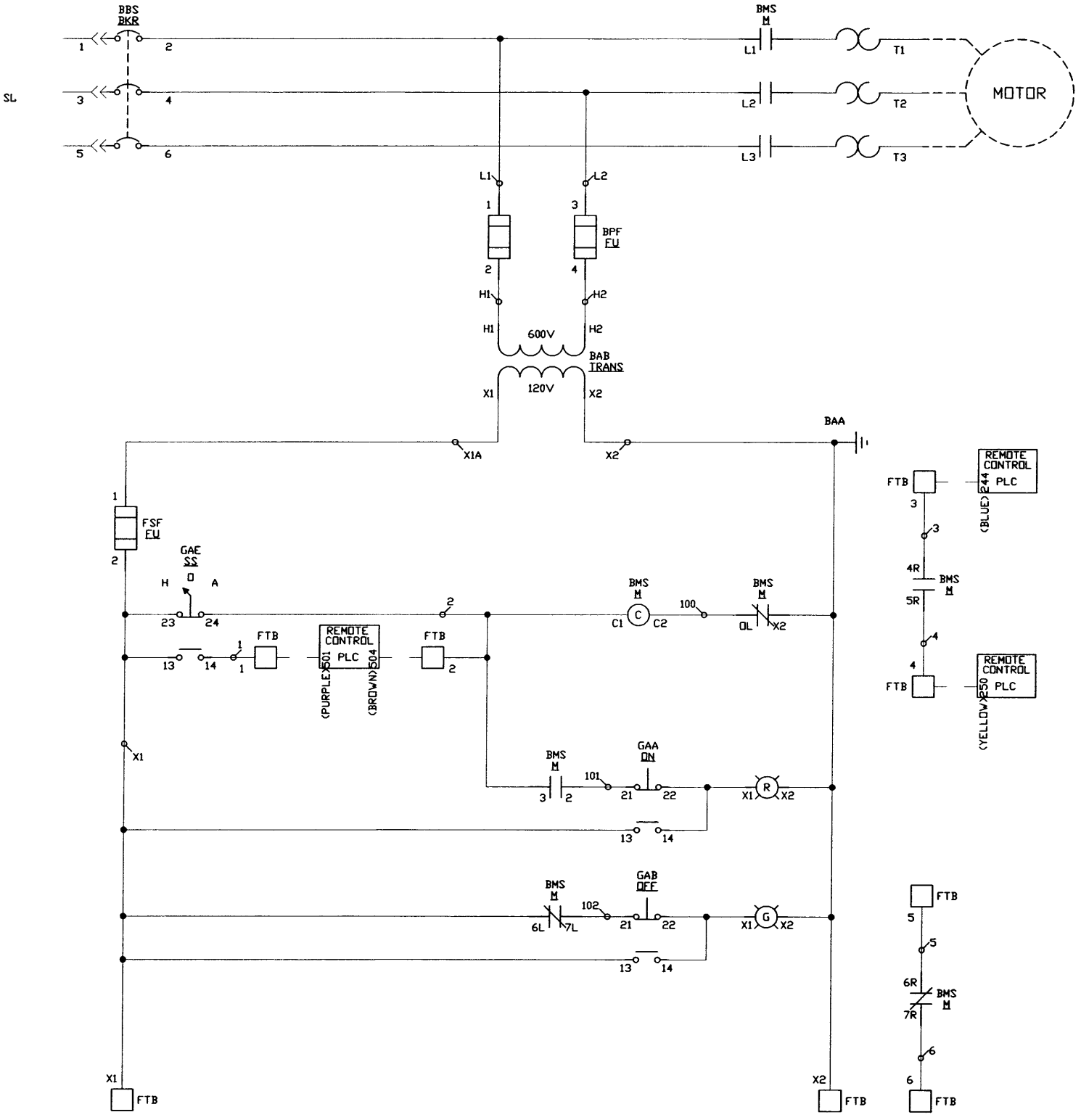
**CITY OF IQALUIT**

WASTEWATER TREATMENT PLANT
PHASE 1

Main P.L.C Cabinet ACCESORY

| | | | |
|---|---|---|---|
| DRAWN BY: / CHECKED BY: | SCALE: NTS | DATE: JUNE 13TH, 2006 | SHEET NO: --- |
| CADD SYSTEM: AutoCAD | DWG NO.: CADD SYSTEM | REV.: 0 | CONTRACT: 0 |

# FEW P1

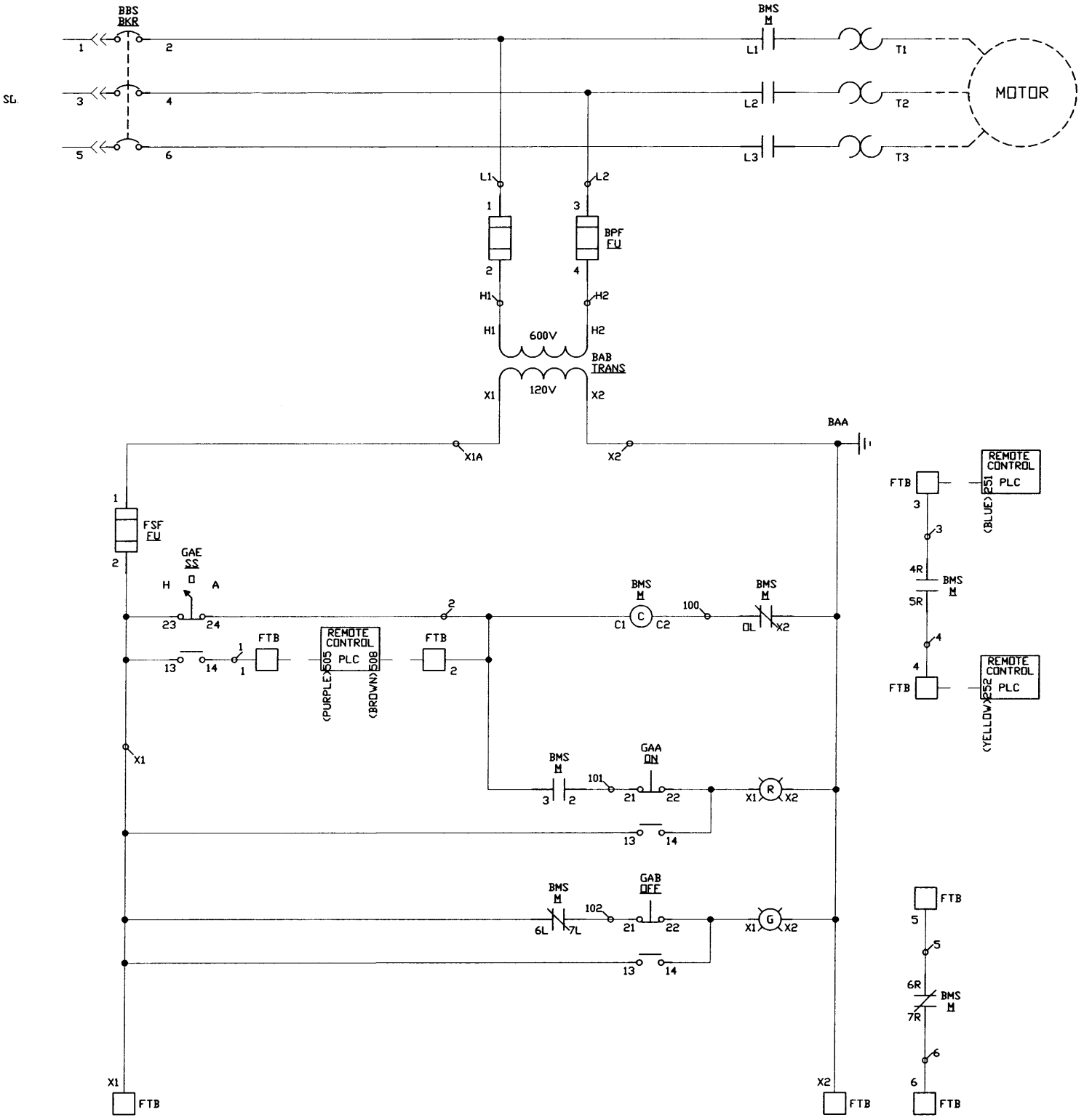



T' L UNITS INCLUDED

H. NK WIRE MARKERS

| | | | |
|---|---|---|---|
| JOB [illegible] | IQUALUIT SEWAGE WATER STATION | MOTOR CONTROL CENTER<br>FEW PUMP #1 connection | EQUIPMENT DESIGNATION : MCC-2 |
| JOB LOCATION : | MIRABEL, QC. | | EQUIPMENT TYPE : MODEL 6 MOTOR CONTROL CENTER |
| DRAWN BY : | CAD | | DRAWING TYPE : ELEMENTARY DIAGRAM |
| ENGR : | STEPH USES | | DRAWING # : E20507290-001-02 |
| DATE : | JUNE 15, 2005 | | REVISION : AS BUILT MARCH 2006 |
| DRAWING STATUS : | RECORD | | PAGE : - - - |

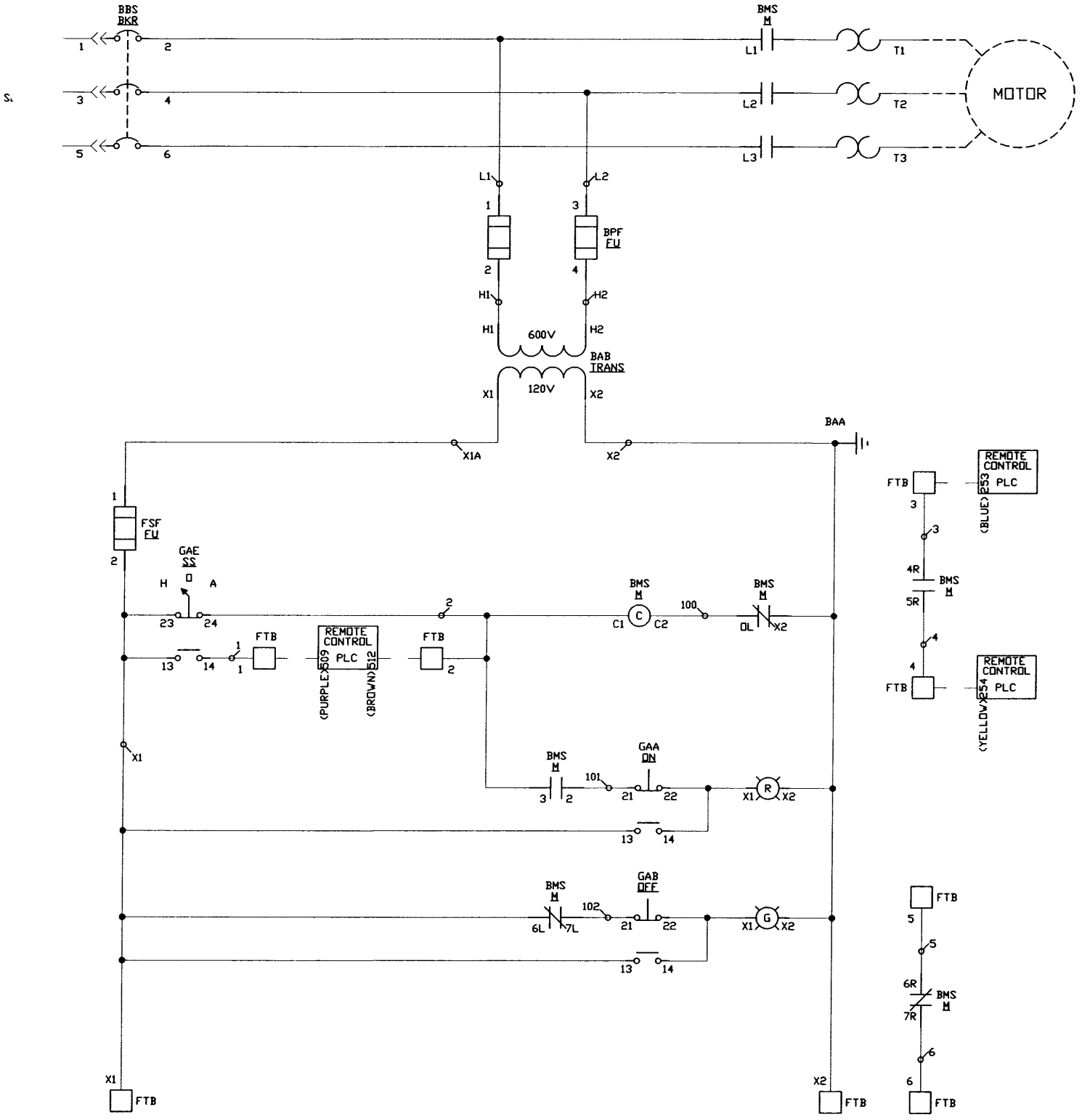
# FEW P2




T' \ UNITS INCLUDED
H. 4K WIRE MARKERS

| | | | |
|---|---|---|---|
| JOB .C : | IQUALUIT SEWAGE WATER STATION | MOTOR CONTROL CENTER FEW PUMP #2 connection | EQUIPMENT DESIGNATION : MCC-2 |
| JOB LOCATION : | MIRABEL, QC. | | EQUIPMENT TYPE : MODEL 6 MOTOR CONTROL CENTER |
| DRAWN BY : | CAD | | DRAWING TYPE : ELEMENTARY DIAGRAM |
| ENGR : | STEPH USES | | DRAWING # : E20507290-001-03 |
| DATE : | JUNE 15, 2005 | | REVISION : AS BUILT MARCH 2006 |
| DRAWING STATUS : | RECORD | | PAGE : - - - |

# FEW P3

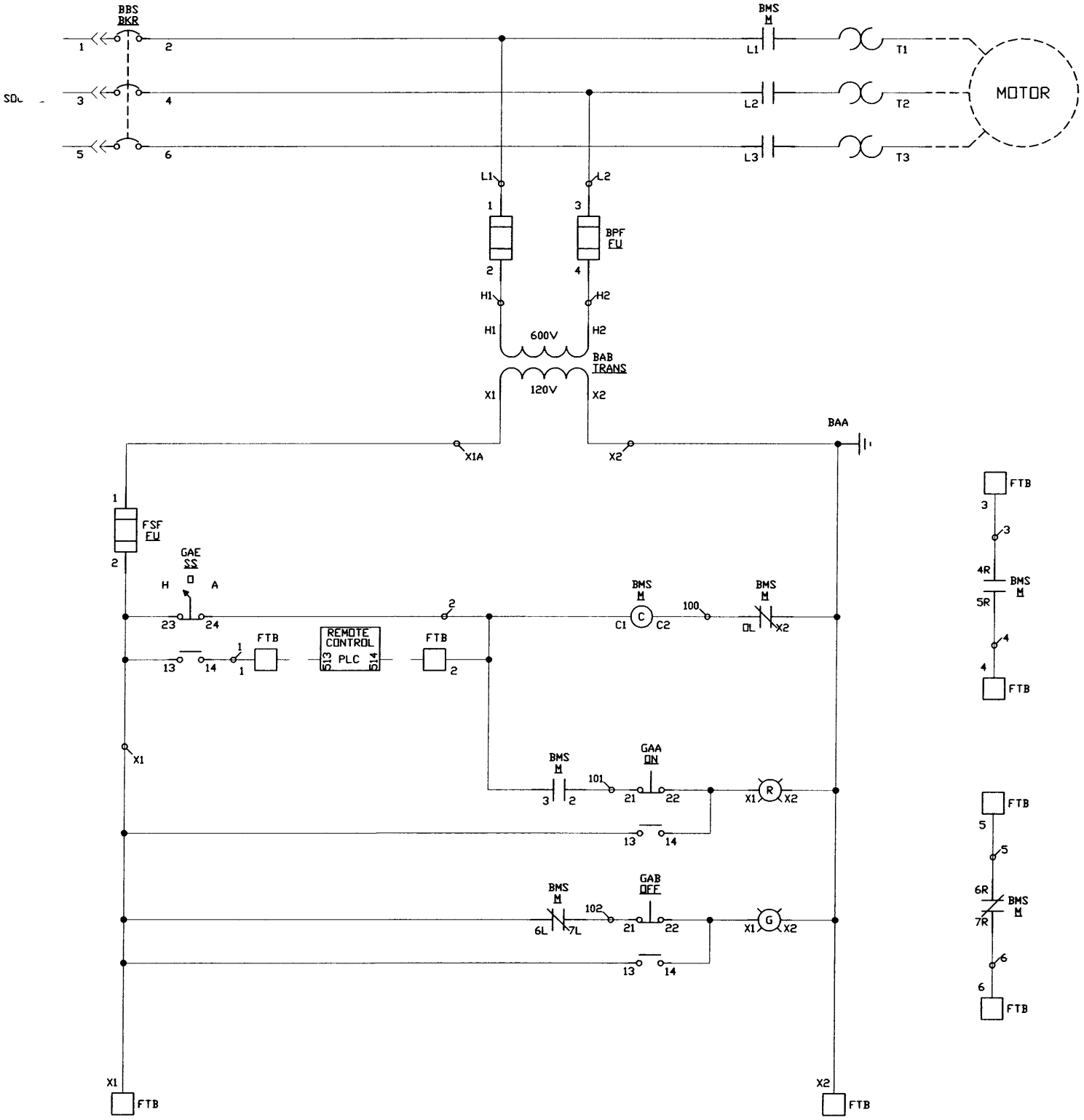



T' L UNITS INCLUDED

H. 'K WIRE MARKERS

| | | | |
|---|---|---|---|
| JOB : | IQUALUIT SEWAGE WATER STATION | MOTOR CONTROL CENTER<br>FEW PUMP #3 connection | EQUIPMENT DESIGNATION : MCC-2 |
| JOB LOCATION : | MIRABEL, QC. | | EQUIPMENT TYPE : MODEL 6 MOTOR CONTROL CENTER |
| DRAWN BY : | CAD | | DRAWING TYPE : ELEMENTARY DIAGRAM |
| ENGR : | STEPH USES | | DRAWING # : E20507290-001-04 |
| DATE : | JUNE 15, 2005 | | REVISION : AS BUILT MARCH 2006 |
| DRAWING STATUS : | RECORD | | PAGE : - - - |

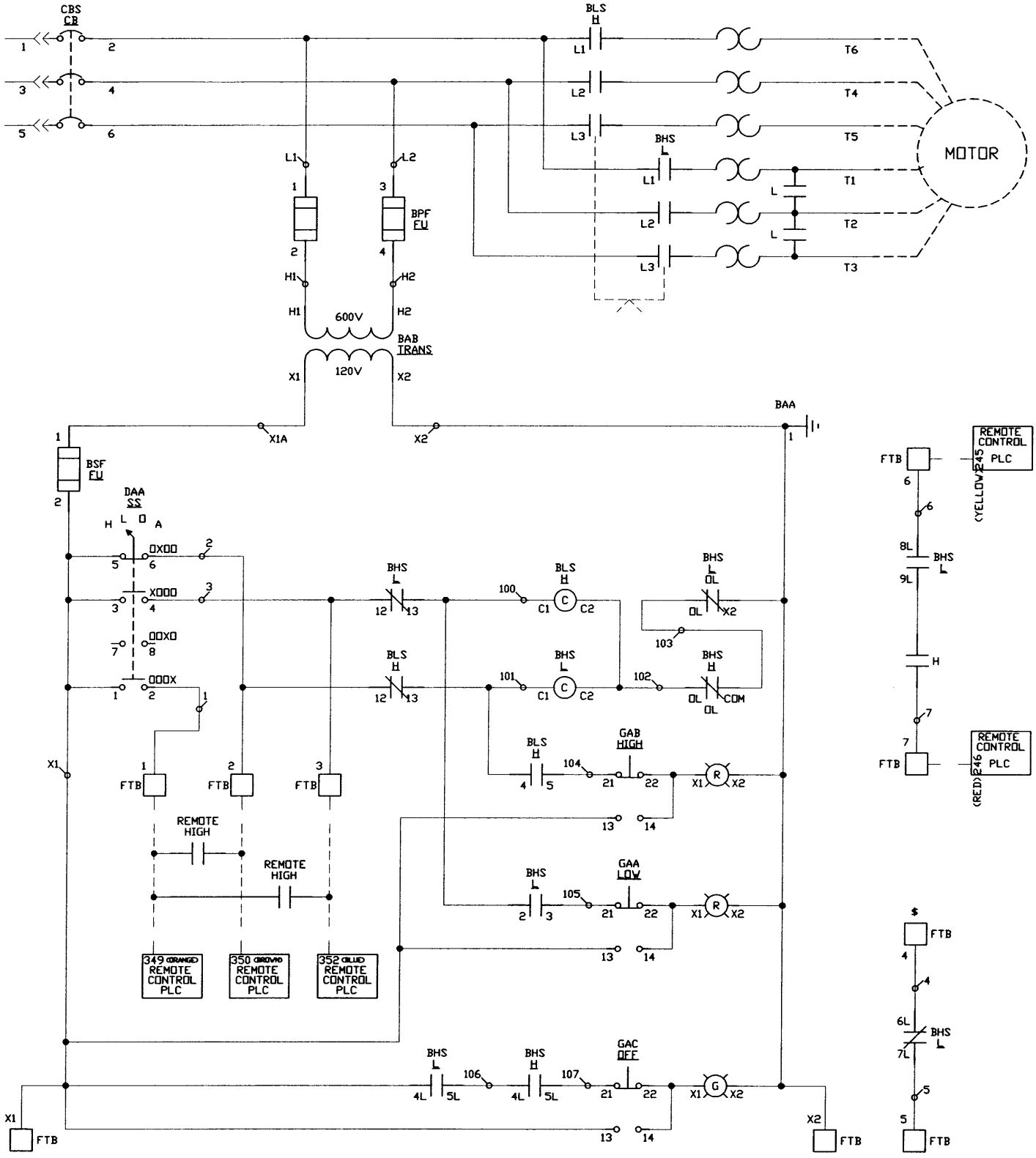
# WASTE WATER GLYCOL P-04




T L UNITS INCLUDED
H\ NK WIRE MARKERS

| | | | | | |
|---|---|---|---|---|---|
| JOB ...ME : | IQUALUIT SEWAGE WATER STATION | MOTOR CONTROL CENTER GLYCOL PUMP #4 connection | EQUIPMENT DESIGNATION : | MCC-2 |
| JOB LOCATION : | MIRABEL, QC. | | EQUIPMENT TYPE : | MODEL 6 MOTOR CONTROL CENTER |
| DRAWN BY : | CAD | | DRAWING TYPE : | ELEMENTARY DIAGRAM |
| ENGR : | STEPH USES | | DRAWING # : | E20507290-001-03 |
| DATE : | JUNE 15, 2005 | | REVISION : | AS BUILT MARCH 2006 |
| DRAWING STATUS : | RECORD | | PAGE : | - - - |

# AHU 3 : SUPPLY FAN



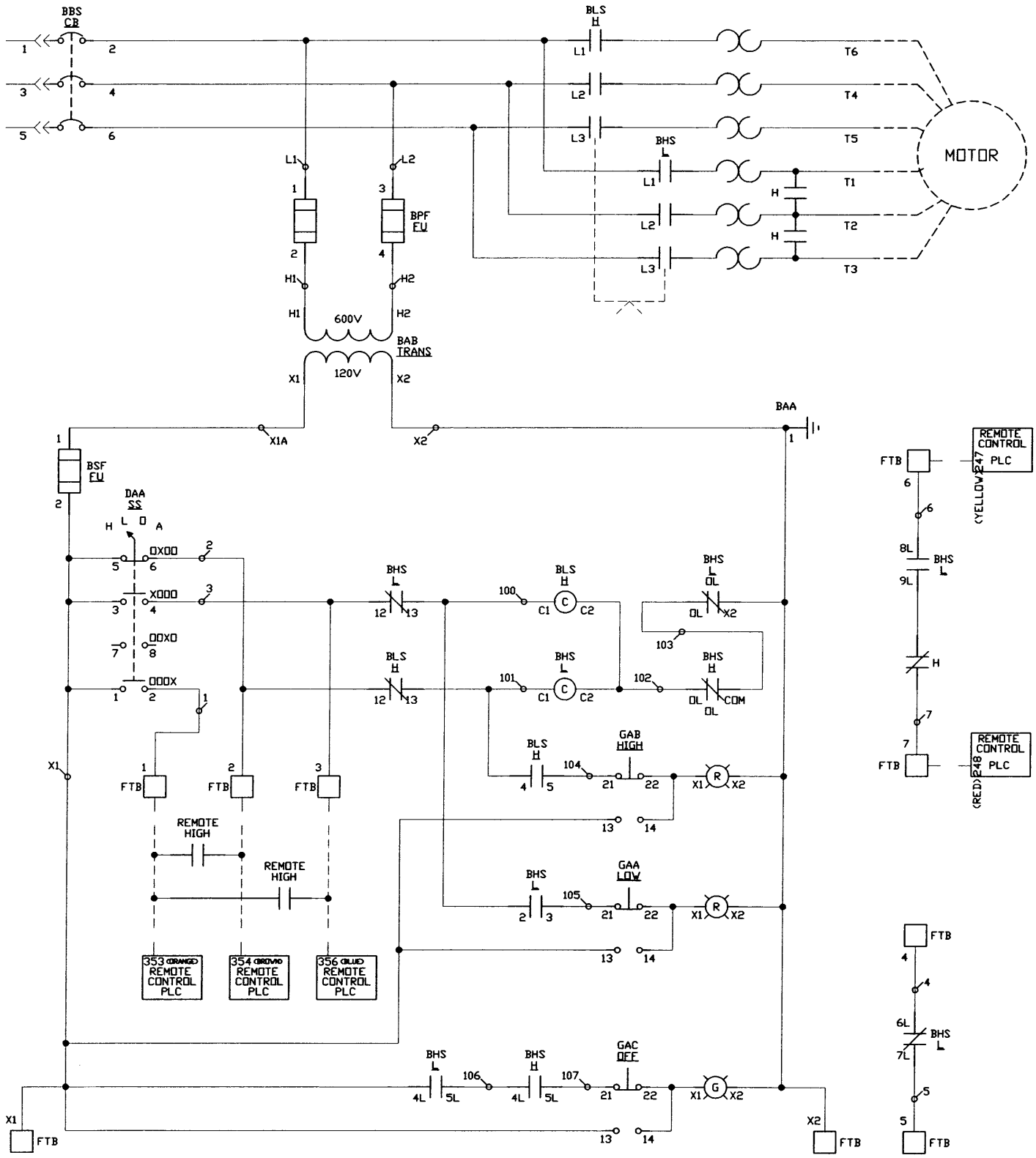

T' L UNITS INCLUDED

H 'NK WIRE MARKERS

| | | | |
|---|---|---|---|
| JOB NAME : | IQUALUIT SEWAGE WATER STATION | EQUIPMENT DESIGNATION : | MCC-2 |
| JOB LOCATION : | MIRABEL, QC. | EQUIPMENT TYPE : | MODEL 6 MOTOR CONTROL CENTER |
| DRAWN BY : | CAD | DRAWING TYPE : | ELEMENTARY DIAGRAM |
| ENGR : | STEPH USES | DRAWING # : | E20507290-001-01 |
| DATE : | JUNE 15, 2005 | REVISION : | AS BUILT MARCH 2006 |
| DRAWING STATUS : | RECORD | PAGE : | - - - |

MOTOR CONTROL CENTER
AHU-3 SUPPLY FAN

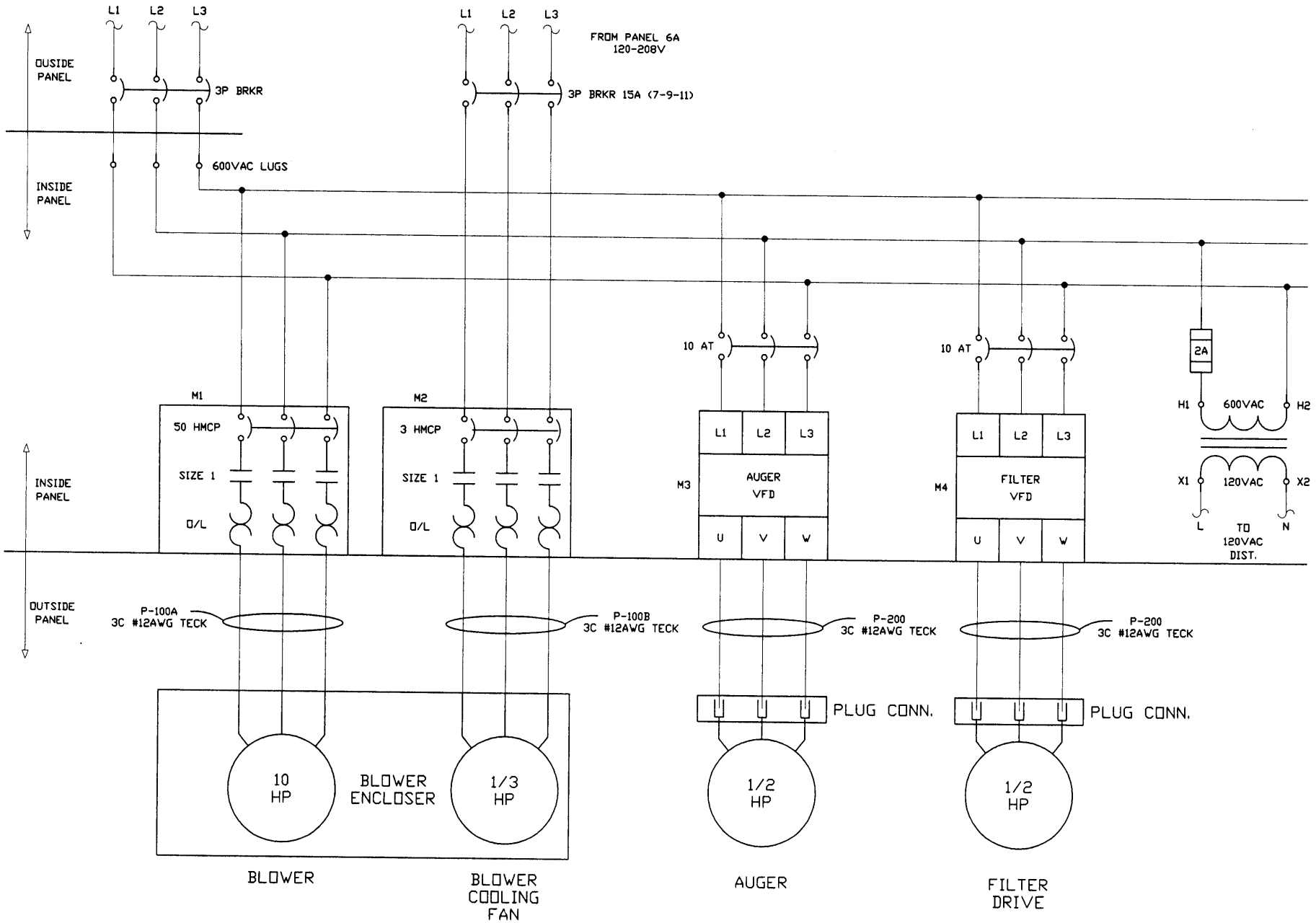
# AHU 3 : EXHAUST FAN




T L UNITS INCLUDED
H. NK WIRE MARKERS

| | | | | | |
|---|---|---|---|---|---|
| JOB : | IQUALUIT SEWAGE WATER STATION | MOTOR CONTROL CENTER AHU-3 EXHAUST FAN | EQUIPMENT DESIGNATION : | MCC-2 |
| JOB LOCATION : | MIRABEL, QC. | | EQUIPMENT TYPE : | MODEL 6 MOTOR CONTROL CENTER |
| DRAWN BY : | CAD | | DRAWING TYPE : | ELEMENTARY DIAGRAM |
| ENGR : | STEPH USES | | DRAWING # : | E20507290-001-01 |
| DATE : | JUNE 15, 2005 | | REVISION : | AS BUILT MARCH 2006 |
| DRAWING STATUS : | RECORD | | PAGE : | - - - |

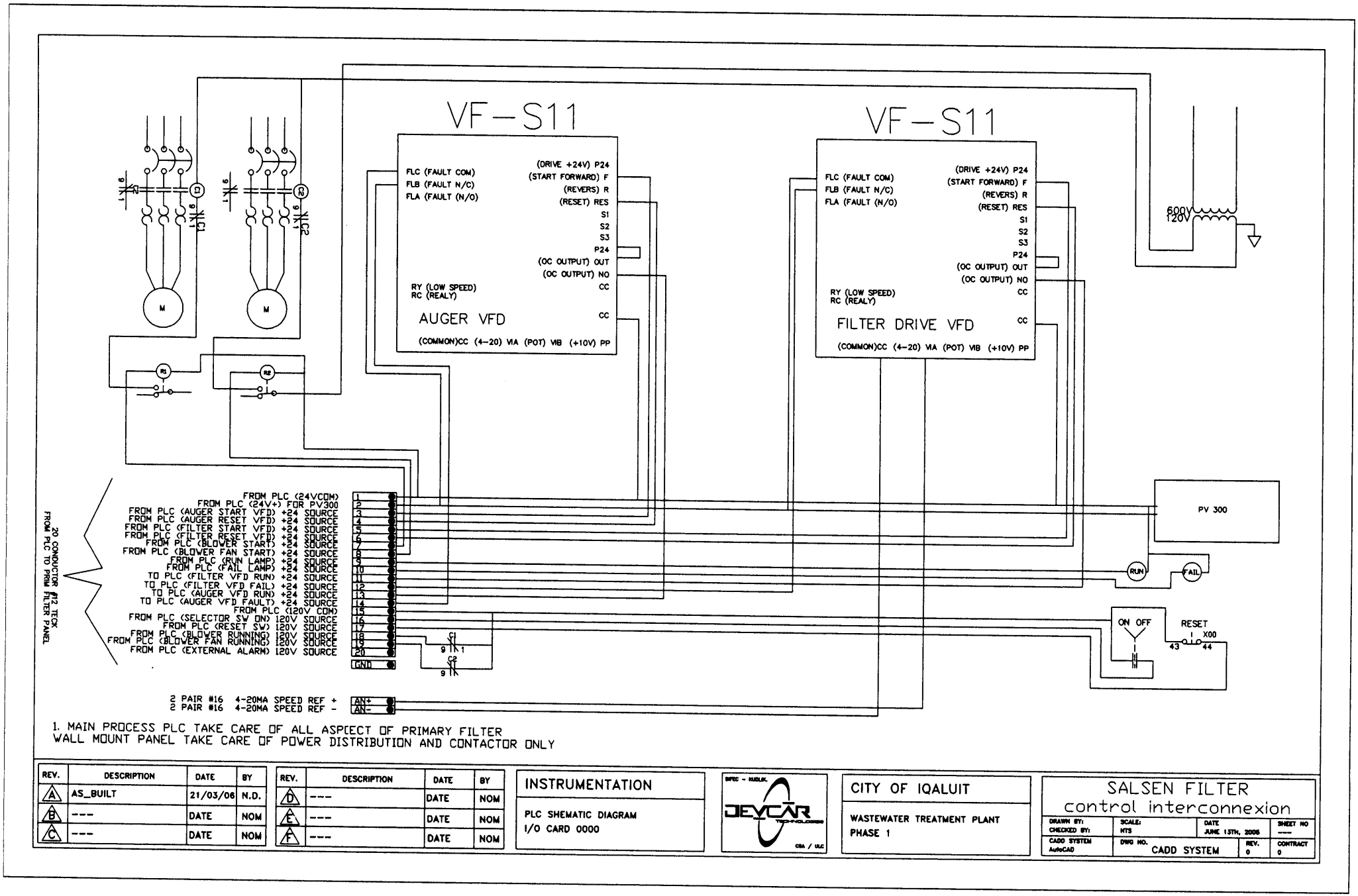
# SALSEN FILTER




| | |
|---|---|
| JOB NAME : | WWTP UPGRADE |
| JOB LOCATION : | IQALUIT |
| DRAWN BY : | B.H. |
| ENGR : | B.H. |
| DATE : | MARCH 22, 2004 |
| DRAWING STATUS : | RECORD |

SALSEN FILTER
power connection

| | |
|---|---|
| EQUIPMENT DESIGNATION : | --- |
| EQUIPMENT TYPE : | --- |
| DRAWING TYPE : | LINE DIAGRAM |
| DRAWING # : | SF-WD02 |
| REVISION : | AS BUILT MARCH 2006 |
| PAGE : | - - - |




1. MAIN PROCESS PLC TAKE CARE OF ALL ASPECT OF PRIMARY FILTER
WALL MOUNT PANEL TAKE CARE OF POWER DISTRIBUTION AND CONTACTOR ONLY

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | AS_BUILT | 21/03/06 | N.D. |
| B | --- | DATE | NOM |
| C | --- | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | --- | DATE | NOM |
| E | --- | DATE | NOM |
| F | --- | DATE | NOM |

INSTRUMENTATION

PLC SHEMATIC DIAGRAM
I/O CARD 0000

JEYCAR TECHNOLOGIES CSA / ULC

CITY OF IQALUIT

WASTEWATER TREATMENT PLANT
PHASE 1

SALSEN FILTER
control interconnexion

| | | | |
|---|---|---|---|
| DRAWN BY: CHECKED BY: | SCALE: NTS | DATE JUNE 13TH, 2006 | SHEET NO — |
| CADD SYSTEM AutoCAD | DWG NO. CADD SYSTEM | REV. 0 | CONTRACT 0 |

FILTER VFD
AS-BUILT MAY 28 2006



# 11. Table of parameters and data

## 11.1 User parameters

| Title | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|
| FC | Operation frequency of operation panel | Hz | 0.1/0.01 | LL-UL | 0.0 | 1.6 | 3.2 |

## 11.2 Basic parameters

- Four navigation functions

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| RUH | - | History function | - | - | Displays parameters in groups of five in the reverse order to that in which their settings were changed.<br>* (Possible to edit) | - | | 4.1.4 |
| RU1 | 0000 | Automatic acceleration/ deceleration | - | - | 0: Disabled (manual)<br>1: Automatic<br>2: Automatic (only at acceleration) | 0 | | 5.1.1 |
| RU2 | 0001 | Torque boost setting macro function | - | - | 0: Disabled<br>1: Automatic torque boost + auto-tuning<br>2: Vector control + auto-tuning<br>3: Energy saving + auto-tuning | 0 | | 5.2 |
| RU4 | 0040 | Parameter setting macro function | - | - | 0: Disabled<br>1: Coast stop<br>2: 3-wire operation<br>3: External input UP/DOWN setting<br>4: 4-20 mA current input operation | 0 | | 5.3 |

- Basic parameters

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| CNOd | 0003 | Command mode selection | - | - | 0: Terminal board<br>1: Operation panel | 1 | 0 | 5.4<br>7.2 |
| FNOd | 0004 | Frequency setting mode selection 1 | - | - | 0: Built-in potentiometer<br>1: VIA<br>2: VIB<br>3: Operation panel<br>4: Serial communication<br>5: UP/DOWN from external contact<br>6: VIA + VIB (Override) | 0 | 1 | 5.4<br>6.5.1<br>7.1 |

11



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12.2.3

FILTER



| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| FMSL | 0005 | Meter selection | - | - | 0: Output frequency<br>1: Output current<br>2: Set frequency<br>3: DC voltage<br>4: Output voltage command value<br>5: Input power<br>6: Output power<br>7: Torque<br>8: Torque current<br>9: Motor cumulative load factor<br>10: Inverter cumulative load factor<br>11: PBR (braking reactor) cumulative load factor<br>12: Frequency setting value (after PID)<br>13: VIA Input value<br>14: VIB Input value<br>15: Fixed output 1 (Output current: 100%)<br>16: Fixed output 2 (Output current: 50%)<br>17: Fixed output 3 (Other than the output current: 100%)<br>18: Serial communication data<br>19: For adjustments (FM set value is displayed.) | 0 | 0 | 5.5 |
| FM | 0006 | Meter adjustment | - | - | - | - | | 5.5 |
| TYP | 0007 | Default setting | - | - | 0: -<br>1: 50Hz default setting<br>2: 60Hz default setting<br>3: Default setting (Initialization)<br>4: Trip record clear<br>5: Cumulative operation time clear<br>6: Initialization of type information<br>7: Save user setting parameters<br>8. Load user setting parameters<br>9. Cumulative fan operation time record clears | 0 | | 4.2.6<br>4.2.7<br>5.6 |
| Fr | 0008 | Forward/reverse run selection (Operation panel) | - | - | 0: Forward run<br>1: Reverse run<br>2: Forward run (F/R switching possible)<br>3: Reverse run (F/R switching possible) | 0 | | 5.7 |
| ACC | 0009 | Acceleration time 1 | S | 0.1/0.1 | 0.0-3200 | 10.0 | 10 | 5.1.2 |
| dEC | 0010 | Deceleration time 1 | S | 0.1/0.1 | 0.0-3200 | 10.0 | | 5.1.2 |
| FH | 0011 | Maximum frequency | Hz | 0.1/0.01 | 30.0-500.0 | 80.0 | 80 | 5.8 |
| UL | 0012 | Upper limit frequency | Hz | 0.1/0.01 | 0.5- FH | 50.0 (WP)<br>60.0 (WN, AN) | 80 | 5.9 |
| LL | 0013 | Lower limit frequency | Hz | 0.1/0.01 | 0.0- UL | 0.0 | 0.0 | 5.9 |
| UL | 0014 | Base frequency 1 | Hz | 0.1/0.01 | 25-500.0 | 50.0 (WP)<br>60.0 (WN, AN) | 60 | 5.10 |
| ULV | 0409 | Base frequency voltage 1 | V | 1/0.1 | 50-330 (240V class)<br>50-660 (500/600V class) | *3 | 575 | 5.10<br>6.13.6 |

*3 : 230 (240V class), 460 (500V class), 575V (600V class)



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12.2.3

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| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| PE | 0015 | V/F control mode selection | - | - | 0: V/F constant<br>1: Variable torque<br>2: Automatic torque boost control<br>3: Vector control<br>4: Energy-saving<br>5: Dynamic energy-saving (for fans and pumps)<br>6: PM motor control | 2 | | 5.11 |
| ub | 0016 | Torque boost value 1 | % | 0.1/0.1 | 0.0-30.0 | *1 | 3.0 | 5.12 |
| EHr | 0600 | Motor electronic-thermal protection level 1 | % (A) | 1/1 | 10-100 | 100 | 100 | 5.13<br>6.19.1 |
| OLn | 0017 | Electronic-thermal protection characteristic selection *2 | - | - | Setting / Overload protection / OL stall<br>0 (Standard motor): O / ×<br>1 (Standard motor): O / O<br>2 (Standard motor): × / ×<br>3 (Standard motor): × / O<br>4 (VF motor): O / ×<br>5 (VF motor): O / O<br>6 (VF motor): × / ×<br>7 (VF motor): × / O | 0 | | 5.13 |
| Sr1 | 0018 | Preset-speed operation frequency 1 | Hz | 0.1/0.01 | LL-UL | 0.0 | 72 | 5.14 |
| Sr2 | 0019 | Preset-speed operation frequency 2 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| Sr3 | 0020 | Preset-speed operation frequency 3 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| Sr4 | 0021 | Preset-speed operation frequency 4 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| Sr5 | 0022 | Preset-speed operation frequency 5 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| Sr6 | 0023 | Preset-speed operation frequency 6 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| Sr7 | 0024 | Preset-speed operation frequency 7 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F--- | - | Extended parameters | - | - | - | - | - | 4.1.2 |
| Gr.U | - | Automatic edit function | - | - | - | - | - | 4.1.3 |

HAND SPEED SELECT

11

*1 : Default values vary depending on the capacity. See the table of the page K-15.

*2 : O : valid, × : invalid



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12.2.3

FILTER



# 11.3 Extended parameters

- Input/output parameters 1

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F100 | 0100 | Low-speed signal output frequency | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | 6.1.1 |
| F101 | 0101 | Speed reach setting frequency | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | 6.1.3 |
| F102 | 0102 | Speed reach detection band | Hz | 0.1/0.01 | 0.0-FH | 2.5 | | 6.1.2 |
| F105 | 0105 | Priority selection (Both F-CC and R-CC are ON) | - | - | 0: Reverse<br>1: Slowdown Stop | 1 | | 6.2.1 |
| F108 | 0108 | Always active function selection 1 | - | - | 0-65 (No function) | 0 | | 6.3.1 |
| F109 | 0109 | Analog/contact input function selection (VIA/VIB terminal) | - | - | 0: Analog input for communications<br>VIB - analog input<br>1: VIA - analog input<br>VIB - contact input (Sink)<br>2: VIA - analog input<br>VIB - contact input (Source)<br>3: VIA - contact input (Sink)<br>VIB - contact input (Sink)<br>4: VIA - contact input (Source)<br>VIB - contact input (Source) | 0 | | 6.2.2 |
| F110 | 0110 | Always-active function selection 2 | - | - | 0-65 (ST) | 1 | | 6.3.1 |
| F111 | 0111 | Input terminal selection 1 (F) | - | - | 0-65 (F) | 2 | | 6.3.2 |
| F112 | 0112 | Input terminal selection 2 (R) | - | - | 0-65 (R) | 3 | | |
| F113 | 0113 | Input terminal selection 3 (RES) | - | - | 0-65 (RES) | 10 | | |
| F114 | 0114 | Input terminal selection 4 (S1) | - | - | 0-65 (SS1) | 6 | | |
| F115 | 0115 | Input terminal selection 5 (S2) | - | - | 0-65 (SS2) | 7 | | |
| F116 | 0116 | Input terminal selection 6 (S3) | - | - | 0-65 (SS3) | 8 | | |
| F117 | 0117 | Input terminal selection 7 (VIB) | - | - | 5-17 (SS4) | 9 | | |
| F118 | 0118 | Input terminal selection 8 (VIA) | - | - | 5-17 (AD2) | 5 | | |
| F130 | 0130 | Output terminal selection 1A (RY-RC) | - | - | 0-255 (LOW) | 4 | | 6.3.3 |
| F131 | 0131 | Output terminal selection 2A (OUT-NO) | - | - | 0-255 (RCH) | 6 | 14 | |
| F132 | 0132 | Output terminal selection 3 (FL) | - | - | 0-255 (FL) | 10 | 11 | |
| F137 | 0137 | Output terminal selection 1B (RY-RC) | - | - | 0-255 (always ON) | 255 | | 6.3.4 |
| F138 | 0138 | Output terminal selection 2B (OUT-NO) | - | - | 0-255 (always ON) | 255 | | |



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12.2.3

FILTER



| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F139 | 0139 | Output terminal logic selection (RY-RC, OUT-NO) | - | - | 0: F130 and F137 F131 and F138<br>1: F130 or F137 F131 and F138<br>2: F130 and F137 F131 or F138<br>3: F130 or F137 F131 or F138 | 0 | | 6.3.4 |
| F167 | 0167 | Frequency command agreement detection range | Hz | 0.1/0.01 | 0.0-FH | 2.5 | | 6.3.5 |
| F170 | 0170 | Base frequency 2 | Hz | 0.1/0.01 | 25.0-500.0 | 50.0 (WP) 60.0 (WN, AN) | | 6.4.1 |
| F171 | 0171 | Base frequency voltage 2 | V | 1/0.1 | 50-330 (240V class) 50-660 (500/600V class) | *3 | | |
| F172 | 0172 | Torque boost value 2 | % | 0.1/0.1 | 0.0-30.0 | *1 | | |
| F173 | 0173 | Motor electronic-thermal protection level 2 | % (A) | 1/1 | 10-100 | 100 | | 5.13 6.4.1 |
| F185 | 0185 | Stall prevention level 2 | % (A) | 1/1 | 10-199, 200 (disabled) | 150 | | 6.4.1 6.19.2 |

*1 : Default values vary depending on the capacity. See the table of page K-15.

*3 : 230 (240V class), 460 (500V class), 575 (600V class)

- Frequency parameters

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F200 | 0200 | Frequency priority selection | - | - | 0: FNOd (Switchable to F207 by terminal input)<br>1: FNOd (Switchable to F207 at less than 1.0Hz of designated frequency) | 0 | | 6.5.1 7.1 |
| F201 | 0201 | VIA input point 1 setting | % | 1/1 | 0-100 | 0 | 12 | 6.5.2 |
| F202 | 0202 | VIA input point 1 frequency | Hz | 0.1/0.01 | 0.0-500.0 | 0.0 | | |
| F203 | 0203 | VIA input point 2 setting | % | 1/1 | 0-100 | 100 | | |
| F204 | 0204 | VIA input point 2 frequency | Hz | 0.1/0.01 | 0.0-500.0 | 50.0 (WP) 60.0 (WN, AN) | 80 | |
| F207 | 0207 | Frequency setting mode selection 2 | - | - | 0: Built-in potentiometer<br>1: VIA<br>2: VIB<br>3: Operation panel<br>4: Serial communication<br>5: UP/DOWN from external contact<br>6: VIA + VIB (Override) | 1 | | 6.3.5 6.5.1 7.1 |

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12.2.3

FILTER



| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F210 | 0210 | VIB input point 1 setting | % | 1/1 | 0-100 | 0 | | 6.5.2 |
| F211 | 0211 | VIB input point 1 frequency | Hz | 0.1/0.01 | 0.0-500.0 | 0.0 | | |
| F212 | 0212 | VIB input point 2 setting | % | 1/1 | 0-100 | 100 | | |
| F213 | 0213 | VIB input point 2 frequency | Hz | 0.1/0.01 | 0.0-500.0 | 50.0 (WP) 60.0 (WN, AN) | | |
| F240 | 0240 | Starting frequency setting | Hz | 0.1/0.01 | 0.5-10.0 | 0.5 | | 6.6.1 |
| F241 | 0241 | Operation starting frequency | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | 6.6.2 |
| F242 | 0242 | Operation starting frequency hysteresis | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | 6.6.2 |
| F250 | 0250 | DC braking starting frequency | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | 6.7.1 |
| F251 | 0251 | DC braking current | %(A) | 1/1 | 0-100 | 50 | | |
| F252 | 0252 | DC braking time | s | 0.1/0.1 | 0.0-20.0 | 1.0 | | |
| F254 | 0254 | Motor shaft fixing control | - | - | 0: Disabled<br>1: Enabled (after DC braking) | 0 | | 6.7.2 |
| F256 | 0256 | Time limit for lower-limit frequency operation | s | 0.1/0.1 | 0: Disabled<br>0.1-600.0 | 0.0 | | 6.8 |
| F260 | 0260 | Jog run frequency | Hz | 0.1/0.01 | F240 – 20.0 | 5.0 | | 6.9 |
| F261 | 0261 | Jog run stopping pattern | - | - | 0: Slowdown stop<br>1: Coast stop<br>2: DC braking | 0 | | |
| F262 | 0262 | Panel jog run operation mode | - | - | 0: Invalid<br>1: Valid | 0 | | |
| F264 | 0264 | Input from external contacts - UP response time | s | 0.1/0.1 | 0.0-10.0 | 0.1 | | 6.5.2 |
| F265 | 0265 | Input from external contacts - UP frequency step width | Hz | 0.1/0.01 | 0.0-FH | 0.1 | | |
| F266 | 0266 | Input from external contacts - DOWN response time | s | 0.1/0.1 | 0.0-10.0 | 0.1 | | |
| F267 | 0267 | Input from external contacts - DOWN frequency step width | Hz | 0.1/0.01 | 0.0-FH | 0.1 | | |
| F268 | 0268 | Initial value of UP/DOWN frequency | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F269 | 0269 | Saving of changed value of UP/DOWN frequency | - | - | 0: Not changed<br>1: Setting of F268 changed when power is turned off | 1 | | |
| F270 | 0270 | Jump frequency 1 | Hz | 0.1/0.01 | 0.0-FH | 0.0 | 0.1 | 6.10 |
| F271 | 0271 | Jumping width 1 | Hz | 0.1/0.01 | 0.0-30.0 | 0.0 | 10 | |
| F272 | 0272 | Jump frequency 2 | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | |

F307 =2



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# 11. Table of parameters and data

## 11.1 User parameters

| Title | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|
| FC | Operation frequency of operation panel | Hz | 0.1/0.01 | LL-UL | 0.0 | 123 | 3.2 |

## 11.2 Basic parameters

- Four navigation functions

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| AUH | - | History function | - | - | Displays parameters in groups of five in the reverse order to that in which their settings were changed.<br>* (Possible to edit) | - | | 4.1.4 |
| AU1 | 0000 | Automatic acceleration/ deceleration | - | - | 0: Disabled (manual)<br>1: Automatic<br>2: Automatic (only at acceleration) | 0 | | 5.1.1 |
| AU2 | 0001 | Torque boost setting macro function | - | - | 0: Disabled<br>1: Automatic torque boost + auto-tuning<br>2: Vector control + auto-tuning<br>3: Energy saving + auto-tuning | 0 | | 5.2 |
| AU4 | 0040 | Parameter setting macro function | - | - | 0: Disabled<br>1: Coast stop<br>2: 3-wire operation<br>3: External input UP/DOWN setting<br>4: 4-20 mA current input operation | 0 | | 5.3 |

- Basic parameters

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| CMOd | 0003 | Command mode selection | - | - | 0: Terminal board<br>1: Operation panel | 1 | 0 | 5.4<br>7.2 |
| FMOd | 0004 | Frequency setting mode selection 1 | - | - | 0: Built-in potentiometer<br>1: VIA<br>2: VIB<br>3: Operation panel<br>4: Serial communication<br>5: UP/DOWN from external contact<br>6: VIA + VIB (Override) | 0 | 0 | 5.4<br>6.5.1<br>7.1 |

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| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| FMSL | 0005 | Meter selection | - | - | 0: Output frequency<br>1: Output current<br>2: Set frequency<br>3: DC voltage<br>4: Output voltage command value<br>5: Input power<br>6: Output power<br>7: Torque<br>8: Torque current<br>9: Motor cumulative load factor<br>10: Inverter cumulative load factor<br>11: PBR (braking reactor) cumulative load factor<br>12: Frequency setting value (after PID)<br>13: VIA Input value<br>14: VIB Input value<br>15: Fixed output 1 (Output current: 100%)<br>16: Fixed output 2 (Output current: 50%)<br>17: Fixed output 3 (Other than the output current: 100%)<br>18: Serial communication data<br>19: For adjustments (FM set value is displayed.) | 0 | | 5.5 |
| FM | 0006 | Meter adjustment | - | - | - | - | | 5.5 |
| TYP | 0007 | Default setting | - | - | 0: -<br>1: 50Hz default setting<br>2: 60Hz default setting<br>3: Default setting (Initialization)<br>4: Trip record clear<br>5: Cumulative operation time clear<br>6: Initialization of type information<br>7: Save user setting parameters<br>8. Load user setting parameters<br>9. Cumulative fan operation time record clears | 0 | | 4.2.6<br>4.2.7<br>5.6 |
| Fr | 0008 | Forward/reverse run selection (Operation panel) | - | - | 0: Forward run<br>1: Reverse run<br>2: Forward run (F/R switching possible)<br>3: Reverse run (F/R switching possible) | 0 | | 5.7 |
| ACC | 0009 | Acceleration time 1 | S | 0.1/0.1 | 0.0-3200 | 10.0 | | 5.1.2 |
| dEC | 0010 | Deceleration time 1 | S | 0.1/0.1 | 0.0-3200 | 10.0 | 15 | 5.1.2 |
| FH | 0011 | Maximum frequency | Hz | 0.1/0.01 | 30.0-500.0 | 80.0 | | 5.8 |
| UL | 0012 | Upper limit frequency | Hz | 0.1/0.01 | 0.5- FH | 50.0 (WP)<br>60.0 (WN, AN) | 80 | 5.9 |
| LL | 0013 | Lower limit frequency | Hz | 0.1/0.01 | 0.0- UL | 0.0 | | 5.9 |
| UL | 0014 | Base frequency 1 | Hz | 0.1/0.01 | 25-500.0 | 50.0 (WP)<br>60.0 (WN, AN) | | 5.10 |
| ULV | 0409 | Base frequency voltage 1 | V | 1/0.1 | 50-330 (240V class)<br>50-660 (500/600V class) | *3 | | 5.10<br>6.13.6 |

*3 : 230 (240V class), 460 (500V class), 575V (600V class)



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| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| PE | 0015 | V/F control mode selection | - | - | 0: V/F constant<br>1: Variable torque<br>2: Automatic torque boost control<br>3: Vector control<br>4: Energy-saving<br>5: Dynamic energy-saving (for fans and pumps)<br>6: PM motor control | 2 | | 5.11 |
| ub | 0016 | Torque boost value 1 | % | 0.1/0.1 | 0.0-30.0 | *1 | | 5.12 |
| tHr | 0600 | Motor electronic-thermal protection level 1 | % (A) | 1/1 | 10-100 | 100 | | 5.13<br>6.19.1 |
| OLn | 0017 | Electronic-thermal protection characteristic selection *2 | - | - | Setting / Overload protection / OL stall<br>0 Standard motor: O / ×<br>1 Standard motor: O / O<br>2 Standard motor: × / ×<br>3 Standard motor: × / O<br>4 VF motor: O / ×<br>5 VF motor: O / O<br>6 VF motor: × / ×<br>7 VF motor: × / O | 0 | | 5.13 |
| Sr1 | 0018 | Preset-speed operation frequency 1 | Hz | 0.1/0.01 | LL-UL | 0.0 | | 5.14 |
| Sr2 | 0019 | Preset-speed operation frequency 2 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| Sr3 | 0020 | Preset-speed operation frequency 3 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| Sr4 | 0021 | Preset-speed operation frequency 4 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| Sr5 | 0022 | Preset-speed operation frequency 5 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| Sr6 | 0023 | Preset-speed operation frequency 6 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| Sr7 | 0024 | Preset-speed operation frequency 7 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F--- | - | Extended parameters | - | - | - | - | - | 4.1.2 |
| Gr.U | - | Automatic edit function | - | - | - | - | - | 4.1.3 |

*1 : Default values vary depending on the capacity. See the table of the page K-15.

*2 : O : valid, × : invalid

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# 11.3 Extended parameters

- Input/output parameters 1

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F100 | 0100 | Low-speed signal output frequency | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | 6.1.1 |
| F101 | 0101 | Speed reach setting frequency | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | 6.1.3 |
| F102 | 0102 | Speed reach detection band | Hz | 0.1/0.01 | 0.0-FH | 2.5 | | 6.1.2 |
| F105 | 0105 | Priority selection (Both F-CC and R-CC are ON) | - | - | 0: Reverse<br>1: Slowdown Stop | 1 | | 6.2.1 |
| F108 | 0108 | Always active function selection 1 | - | - | 0-65 (No function) | 0 | | 6.3.1 |
| F109 | 0109 | Analog/contact input function selection (VIA/VIB terminal) | - | - | 0: Analog input for communications<br>VIB - analog input<br>1: VIA - analog input<br>VIB - contact input (Sink)<br>2: VIA - analog input<br>VIB - contact input (Source)<br>3: VIA - contact input (Sink)<br>VIB - contact input (Sink)<br>4: VIA - contact input (Source)<br>VIB - contact input (Source) | 0 | | 6.2.2 |
| F110 | 0110 | Always-active function selection 2 | - | - | 0-65 (ST) | 1 | | 6.3.1 |
| F111 | 0111 | Input terminal selection 1 (F) | - | - | 0-65 (F) | 2 | | 6.3.2 |
| F112 | 0112 | Input terminal selection 2 (R) | - | - | 0-65 (R) | 3 | | |
| F113 | 0113 | Input terminal selection 3 (RES) | - | - | 0-65 (RES) | 10 | | |
| F114 | 0114 | Input terminal selection 4 (S1) | - | - | 0-65 (SS1) | 6 | | |
| F115 | 0115 | Input terminal selection 5 (S2) | - | - | 0-65 (SS2) | 7 | | |
| F116 | 0116 | Input terminal selection 6 (S3) | - | - | 0-65 (SS3) | 8 | | |
| F117 | 0117 | Input terminal selection 7 (VIB) | - | - | 5-17 (SS4) | 9 | | |
| F118 | 0118 | Input terminal selection 8 (VIA) | - | - | 5-17 (AD2) | 5 | | |
| F130 | 0130 | Output terminal selection 1A (RY-RC) | - | - | 0-255 (LOW) | 4 | | 6.3.3 |
| F131 | 0131 | Output terminal selection 2A (OUT-NO) | - | - | 0-255 (RCH) | 6 | 14 | |
| F132 | 0132 | Output terminal selection 3 (FL) | - | - | 0-255 (FL) | 10 | 11 | |
| F137 | 0137 | Output terminal selection 1B (RY-RC) | - | - | 0-255 (always ON) | 255 | | 6.3.4 |
| F138 | 0138 | Output terminal selection 2B (OUT-NO) | - | - | 0-255 (always ON) | 255 | | |

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| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F139 | 0139 | Output terminal logic selection (RY-RC, OUT-NO) | - | - | 0: F130 and F137 F131 and F138<br>1: F130 or F137 F131 and F138<br>2: F130 and F137 F131 or F138<br>3: F130 or F137 F131 or F138 | 0 | | 6.3.4 |
| F167 | 0167 | Frequency command agreement detection range | Hz | 0.1/0.01 | 0.0-FH | 2.5 | | 6.3.5 |
| F170 | 0170 | Base frequency 2 | Hz | 0.1/0.01 | 25.0-500.0 | 50.0 (WP) 60.0 (WN, AN) | | 6.4.1 |
| F171 | 0171 | Base frequency voltage 2 | V | 1/0.1 | 50-330 (240V class) 50-660 (500/600V class) | *3 | | |
| F172 | 0172 | Torque boost value 2 | % | 0.1/0.1 | 0.0-30.0 | *1 | | |
| F173 | 0173 | Motor electronic-thermal protection level 2 | % (A) | 1/1 | 10-100 | 100 | | 5.13 6.4.1 |
| F185 | 0185 | Stall prevention level 2 | % (A) | 1/1 | 10-199, 200 (disabled) | 150 | | 6.4.1 6.19.2 |

*1 : Default values vary depending on the capacity. See the table of page K-15.

*3 : 230 (240V class), 460 (500V class), 575 (600V class)

- Frequency parameters

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F200 | 0200 | Frequency priority selection | - | - | 0: FMOd (Switchable to F207 by terminal input)<br>1: FMOd (Switchable to F207 at less than 1.0Hz of designated frequency) | 0 | | 6.5.1 7.1 |
| F201 | 0201 | VIA input point 1 setting | % | 1/1 | 0-100 | 0 | | 6.5.2 |
| F202 | 0202 | VIA input point 1 frequency | Hz | 0.1/0.01 | 0.0-500.0 | 0.0 | | |
| F203 | 0203 | VIA input point 2 setting | % | 1/1 | 0-100 | 100 | | |
| F204 | 0204 | VIA input point 2 frequency | Hz | 0.1/0.01 | 0.0-500.0 | 50.0 (WP) 60.0 (WN, AN) | | |
| F207 | 0207 | Frequency setting mode selection 2 | - | - | 0: Built-in potentiometer<br>1: VIA<br>2: VIB<br>3: Operation panel<br>4: Serial communication<br>5: UP/DOWN from external contact<br>6: VIA + VIB (Override) | 1 | | 6.3.5 6.5.1 7.1 |

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| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F273 | 0273 | Jumping width 2 | Hz | 0.1/0.01 | 0.0-30.0 | 0.0 | | 6.10 |
| F274 | 0274 | Jump frequency 3 | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | |
| F275 | 0275 | Jumping width 3 | Hz | 0.1/0.01 | 0.0-30.0 | 0.0 | | |
| F287 | 0287 | Preset-speed operation frequency 8 | Hz | 0.1/0.01 | LL-UL | 0.0 | | 5.14 |
| F288 | 0288 | Preset-speed operation frequency 9 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F289 | 0289 | Preset-speed operation frequency 10 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F290 | 0290 | Preset-speed operation frequency 11 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F291 | 0291 | Preset-speed operation frequency 12 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F292 | 0292 | Preset-speed operation frequency 13 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F293 | 0293 | Preset-speed operation frequency 14 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F294 | 0294 | Preset-speed operation frequency 15 (Fire-speed) | Hz | 0.1/0.01 | LL-UL | 0.0 | | 5.14 6.11.2 |

- Operation mode parameters

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F300 | 0300 | PWM carrier frequency | kHz | 0.1/0.1 | 2.0 - 16.0 | 12.0 | | 6.12 |
| F301 | 0301 | Auto-restart control selection | - | - | 0: Disabled<br>1: At auto-restart after momentary stop<br>2: ST terminal on or off<br>3: At auto-restart or when turning ST-CC on or off<br>4: At start-up | 0 | | 6.13.1 |
| F302 | 0302 | Regenerative power ride-through control (Deceleration stop) | - | - | 0: Disabled<br>1: Automatic setting<br>2: Slowdown stop | 0 | | 6.13.2 |
| F303 | 0303 | Retry selection (number of times) | Times | 1/1 | 0: Disabled<br>1-10 | 0 | | 6.13.3 |
| F304 | 0304 | Dynamic braking selection | - | - | 0: Disabled<br>1: Enabled (Resistor overload protection enabled) | 0 | | 6.13.4 |
| F305 | 0305 | Overvoltage limit operation (Slowdown stop mode selection) | - | - | 0: Enabled<br>1: Disabled<br>2: Enabled (Quick deceleration)<br>3: Enabled (Dynamic quick deceleration) | 2 | | 6.13.5 |

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| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F307 | 0307 | Supply voltage correction (limitation of output voltage) | - | - | 0: Supply voltage uncorrected, output voltage limited<br>1: Supply voltage corrected, output voltage limited<br>2: Supply voltage uncorrected, output voltage unlimited<br>3: Supply voltage corrected, output voltage unlimited | 2 (WP, WN)<br>3 (AN) | 2 | 6.13.6 |
| F308 | 0308 | Dynamic braking resistance | Ω | 0.1/0.1 | 1.0-1000 | *1 | | 6.13.4 |
| F309 | 0309 | Dynamic braking resistor capacity | kW | 0.01/0.01 | 0.01-30.00 | *1 | | 6.13.4 |
| F311 | 0311 | Reverse-run prohibition | - | - | 0: Forward/reverse run permitted<br>1: Reverse run prohibited<br>2: Forward run prohibited | 0 | | 6.13.7 |
| F312 | 0312 | Random mode | - | - | 0: Disabled<br>1: Automatic setting | 0 | | 6.12 |
| F316 | 0316 | Carrier frequency control mode selection | - | - | 0: Carrier frequency not reduced automatically<br>1: Carrier frequency reduced automatically<br>2: Carrier frequency not reduced automatically Support for 500V/600V models<br>3: Carrier frequency reduced automatically Support for 500V/600V models | 1 | | 6.12 |
| F320 | 0320 | Droop gain | % | 1/1 | 0-100 | 0 | | 6.14 |
| F323 | 0323 | Droop insensitive torque band | % | 1/1 | 0-100 | 10 | | 6.14 |
| F342 | 0342 | Braking mode selection | - | - | 0: Disabled<br>1: Enabled (forward run)<br>2: Enabled (reverse run)<br>3: Enabled (operating direction) | 0 | | 6.15 |
| F343 | 0343 | Release frequency | Hz | 0.1/0.01 | F240-20.0 | 3.0 | | |
| F344 | 0344 | Release time | s | 0.01/0.01 | 0.00-2.50 | 0.05 | | |
| F345 | 0345 | Creeping frequency | Hz | 0.1/0.01 | F240-20.0 | 3.0 | | |
| F346 | 0346 | Creeping time | s | 0.01/0.01 | 0.00-2.50 | 0.10 | | |
| F359 | 0359 | PID control waiting time | s | 1/1 | 0-2400 | 0 | | 6.16 |
| F360 | 0360 | PID control | - | - | 0: Disabled, 1: Enabled | 0 | | |
| F362 | 0362 | Proportional gain | - | 0.01/0.01 | 0.01-100.0 | 0.30 | | |
| F363 | 0363 | Integral gain | - | 0.01/0.01 | 0.01-100.0 | 0.20 | | |
| F366 | 0366 | Differential gain | - | 0.01/0.01 | 0.00-2.5 | 0.00 | | |

*1 : Default values vary depending on the capacity. See the table of K-15.



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TOSHIBA

E6581158②

# Industrial Inverter
(For 3-phase induction motors)

## Instruction Manual

## TOSVERT™ VF-S11

| | |
|---|---|
| 1-phase 240V class | 0.2 to 2.2kW |
| 3-phase 240V class | 0.4 to 15kW |
| 3-phase 500V class | 0.4 to 15kW |
| 3-phase 600V class | 0.75 to 15kW |

NOTICE

1. Make sure that this instruction manual is delivered to the end user of the inverter unit.
2. Read this manual before installing or operating the inverter unit, and store it in a safe place for reference.


Safety precautions I
Introduction II
Contents
Read first 1
Connection 2
Operations 3
Basic VF-S11 operations 4
Basic parameters 5
Extended parameters 6
Applied operation 7
Monitoring the operation status 8
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# I. Safety precautions



The items described in these instructions and on the inverter itself are very important so that you can use the inverter safely, prevent injury to yourself and other people around you as well as to prevent damage to property in the area. Thoroughly familiarize yourself with the symbols and indications shown below and then continue to read the manual. Make sure that you observe all warnings given.

## Explanation of markings

| Marking | Meaning of marking |
|---|---|
| ⚠ Danger | Indicates that errors in operation may lead to death or serious injury. |
| ⚠ Warning | Indicates that errors in operation may lead to injury (*1) to people or that these errors may cause damage to physical property. (*2) |

(*1) Such things as injury, burns or shock that will not require hospitalization or long periods of outpatient treatment.

(*2) Physical property damage refers to wide-ranging damage to assets and materials.

## Meanings of symbols

| Marking | Meaning of marking |
|---|---|
| ⊘ | Indicates prohibition (Don't do it).<br>What is prohibited will be described in or near the symbol in either text or picture form. |
| ● | Indicates something mandatory (must be done).<br>What is mandatory will be described in or near the symbol in either text or picture form. |
| ◇ | Indicates danger.<br>What is dangerous will be described in or near the symbol in either text or picture form. |
| △ | Indicates warning.<br>What the warning should be applied to will be described in or near the symbol in either text or picture form. |

## ■ Limits in purpose

This inverter is used for controlling speeds of three-phase induction motors in general industrial use.

### ⚠ Safety precautions

- The inverter cannot be used in any device that would present danger to the human body or from which malfunction or error in operation would present a direct threat to human life (nuclear power control device, aviation and space flight control device, traffic device, life support or operation system, safety device, etc.). If the inverter is to be used for any special purpose, first get in touch with the supplier.
- This product was manufactured under the strictest quality controls but if it is to be used in critical equipment, for example, equipment in which errors in malfunctioning signal output system would cause a major accident, safety devices must be installed on the equipment.
- Do not use the inverter for loads other than those of properly applied three-phase induction motors in general industrial use. (Use in other than properly applied three-phase induction motors may cause an accident.)

I

## ■ General Operation

| Danger | | See item |
|---|---|---|
| Disassembly prohibited | • Never disassemble, modify or repair.<br>This can result in electric shock, fire and injury. For repairs, call your sales distributor. | 2. |
| Prohibited | • Never remove the front cover when power is on or open door if enclosed in a cabinet.<br>The unit contains many high voltage parts and contact with them will result in electric shock. | 2.1 |
| | • Don't stick your fingers into openings such as cable wiring hole and cooling fan covers.<br>This can result in electric shock or other injury. | 2. |
| | • Don't place or insert any kind of object into the inverter (electrical wire cuttings, rods, wires etc.).<br>This can result in electric shock or fire. | 2. |
| | • Do not allow water or any other fluid to come in contact with the inverter.<br>This can result in electric shock or fire. | 2. |
| Mandatory | • Turn power on only after attaching the front cover or closing door if enclosed in a cabinet.<br>If power is turned on without the front cover attached or closing door if enclosed in a cabinet, this can result in electric shock or other injury. | 2.1 |
| | • If the inverter begins to emit smoke or an unusual odor, or unusual sounds, immediately turn power off.<br>If the equipment is continued in operation in such a state, the result may be fire. Call your local sales agency for repairs. | 3. |
| | • Always turn power off if the inverter is not used for long periods of time since there is a possibility of malfunction caused by leaks, dust and other material. If power is left on with the inverter in that state, it may result in fire. | 3. |

| Warning | | See item |
|---|---|---|
| Prohibited contact | • Do not touch heat radiating fins or discharge resistors.<br>These device are hot, and you'll get burned if you touch them. | 3. |
| Prohibited | • Avoid operation in any location where there is direct spraying of the following solvents or other chemicals.<br>The plastic parts may be damaged to a certain degree depending on their shape, and there is a possibility of the plastic covers coming off.<br>If the chemical or solvent is anything other than those shown below, please contact us in advance. | 1.4.4 |

(Table 1) Examples of applicable chemicals and solvents

| |
|---|
| Acetic acid (density of 10% or less) |
| Hydrochloric acid (density of 10% or less) |
| Sulfuric acid (density of 10% or less) |
| Sodium chloride |
| Hexane |
| Tnethylene glycol |

(Table 2) Examples of unapplicable chemicals and solvents

| |
|---|
| Acetone |
| Benzene |
| Chloroform |
| Ethylene chloride |
| Ethyl acetate |
| Glycerin |
| Tetrachloroethylene |
| Trichloroethylene |
| Xylene |





I

## ■ Transportation & installation

| Danger | | See item |
|---|---|---|
| Prohibited | • Do not install or operate the inverter if it is damaged or any component is missing.<br>This can result in electric shock or fire. Please consult your local sales agency for repairs.<br>Call your local sales agency for repairs. | 1.4.4 |
| | • Do not place any inflammable objects nearby.<br>If a flame is emitted due to malfunction, it may result in a fire. | 1.4.4 |
| | • Do not install in any location where the inverter could come into contact with water or other fluids.<br>This can result in electric shock or fire. | 2. |
| Mandatory | • Must be used in the environmental conditions prescribed in the instruction manual.<br>Use under any other conditions may result in malfunction. | 1.4.4 |
| | • Mount the inverter on a metal plate.<br>The rear panel gets very hot. Do not install in an inflammable object, this can result in fire. | 1.4.4 |
| | • Do not operate with the front panel cover removed. This can result in electric shock.<br>Failure to do so can lead to risk of electric shock and can result in death or serious injury. | 1.4.4 |
| | • An emergency stop device must be installed that fits with system specifications (e.g. shut off input power then engage mechanical brake). Operation cannot be stopped immediately by the inverter alone, thus risking an accident or injury. | 1.4.4 |
| | • All options used must be those specified by Toshiba.<br>The use of any other option may result in an accident. | 1.4.4 |

| Warning | | See item |
|---|---|---|
| Prohibited | • When transporting or carrying, do not hold by the front panel covers.<br>The covers may come off and the unit will drop out resulting in injury. | 2. |
| | • Do not install in any area where the unit would be subject to large amounts of vibration.<br>That could result in the unit falling, resulting in injury. | 1.4.4 |
| Mandatory | • The main unit must be installed on a base that can bear the unit's weight.<br>If the unit is installed on a base that cannot withstand that weight, the unit may fall resulting in injury. | 1.4.4 |
| | • If braking is necessary (to hold motor shaft), install a mechanical brake.<br>The brake on the inverter will not function as a mechanical hold, and if used for that purpose, injury may result. | 1.4.4 |

## ■ Wiring

| Danger | | See item |
|---|---|---|
| Prohibited | • Do not connect input power to the output (motor side) terminals (U/T1,V/T2,W/T3).<br>That will destroy the inverter and may result in fire. | 2.2 |
| | • Do not connect resistors to the DC terminals (across PA-PC or PO-PC).<br>That may cause a fire.<br>Connect a resistor in accordance with 6.13.4. | 2.2 |
| | • Within ten minutes after turning off input power, do not touch wires of devices (MCCB) connected to the input side of the inverter.<br>That could result in electric shock. | 2.2 |



12.2.5

(2)

I

| Danger | | See item |
|---|---|---|
| Mandatory | • Electrical installation work must be done by a qualified expert.<br>Connection of input power by someone who does not have that expert knowledge may result in fire or electric shock. | 2.1 |
| | • Connect output terminals (motor side) correctly.<br>If the phase sequence is incorrect, the motor will operate in reverse and that may result in injury. | 2.1 |
| | • Wiring must be done after installation.<br>If wiring is done prior to installation that may result in injury or electric shock | 2.1 |
| | • The following steps must be performed before wiring.<br>(1) Turn off all input power.<br>(2) Wait at least ten minutes and check to make sure that the charge lamp is no longer lit.<br>(3) Use a tester that can measure DC voltage (800VDC or more), and check to make sure that the voltage to the DC main circuits (across PA-PC) is 45V or less.<br>If these steps are not properly performed, the wiring will cause electric shock. | 2.1 |
| | • Tighten the screws on the terminal board to specified torque.<br>If the screws are not tightened to the specified torque, it may lead to fire. | 2.1 |
| | • Check to make sure that the input power voltage is +10%, -15% of the rated power voltage written on the rating label (±10% when the load is 100% in continuous operation).<br>If the input power voltage is not +10%, -15% of the rated power voltage (±10% when the load is 100% in continuous operation) this may result in fire. | 1.4.4 |
| Be Grounded | • Ground must be connected securely.<br>If the ground is not securely connected, it could lead to electric shock or fire when a malfunction or current leak occurs. | 2.1<br>2.2 |

| Warning | | See item |
|---|---|---|
| Prohibited | • Do not attach equipment (such as noise filters or surge absorbers) that have built-in capacitors to the output (motor side) terminals.<br>That could result in a fire. | 2.1 |

## ■ Operations

| Danger | | See item |
|---|---|---|
| Prohibited | • Do not touch inverter terminals when electrical power is going to the inverter even if the motor is stopped.<br>Touching the inverter terminals while power is connected to it may result in electric shock. | 3. |
| | • Do not touch switches when the hands are wet and do not try to clean the inverter with a damp cloth.<br>Such practices may result in electric shock. | 3. |
| | • Do not go near the motor in alarm-stop status when the retry function is selected.<br>The motor may suddenly restart and that could result in injury.<br>Take measures for safety, e.g. attaching a cover to the motor, against accidents when the motor unexpectedly restarts. | 3. |
| Mandatory | • Turn input power on after attaching the front cover.<br>When installed inside a cabinet and using with the front cover removed, always close the cabinet doors first and then turn power on. If the power is turned on with the front cover or the cabinet doors open, it may result in electric shock. | 3. |
| | • Make sure that operation signals are off before resetting the inverter after malfunction.<br>If the inverter is reset before turning off the operating signal, the motor may restart suddenly causing injury. | 3. |





I

| Warning | | See item |
|---|---|---|
| Prohibited | • Observe all permissible operating ranges of motors and mechanical equipment. (Refer to the motor's instruction manual.)<br>Not observing these ranges may result in injury. | 3. |

When sequence for restart after a momentary failure is selected (inverter)

| Warning | | See item |
|---|---|---|
| Mandatory | • Stand clear of motors and mechanical equipment.<br>If the motor stops due to a momentary power failure, the equipment will start suddenly after power recovers. This could result in unexpected injury. | 6.12.1 |
| | • Attach warnings about sudden restart after a momentary power failure on inverters, motors and equipment for prevention of accidents in advance. | 6.12.1 |

When retry function is selected (inverter)

| Warning | | See Item |
|---|---|---|
| Mandatory | • Stand clear of motors and equipment.<br>If the motor and equipment stop when the alarm is given, selection of the retry function will restart them suddenly after the specified time has elapsed. This could result in unexpected injury. | 6.12.3 |
| | • Attach warnings about sudden restart in retry function on inverters, motors and equipment for prevention of accidents in advance. | 6.12.3 |

Maintenance and inspection

| Danger | | See item |
|---|---|---|
| Prohibited | • Do not replace parts.<br>This could be a cause of electric shock, fire and bodily injury. To replace parts, call the local sales agency. | 14.2 |
| Mandatory | • The equipment must be inspected every day.<br>If the equipment is not inspected and maintained, errors and malfunctions may not be discovered and that could result in accidents. | 14. |
| | • Before inspection, perform the following steps.<br>(1) Turn off all input power to the inverter.<br>(2) Wait at least ten minutes and check to make sure that the charge lamp is no longer lit.<br>(3) Use a tester that can measure DC voltages (800VDC or more), and check to make sure that the voltage to the DC main circuits (across PA-PC) is 45V or less.<br>If inspection is performed without performing these steps first, it could lead to electric shock. | 14. |



19.2.5 (3)

I

## Disposal

| ⚠ Warning | | See item |
|---|---|---|
| Mandatory | • If you throw away the inverter, have it done by a specialist in industry waste disposal(*). If you throw away the inverter by yourself, this can result in explosion of capacitor or produce noxious gases, resulting in injury.<br>(*) Persons who specialize in the processing of waste and known as "industrial waste product collectors and transporters" or "industrial waste disposal persons. "If the collection, transport and disposal of industrial waste is done by someone who is not licensed for that job, it is a punishable violation of the law. (Laws in regard to cleaning and processing of waste materials) | 16 |

## Attach warning labels

Shown here are examples of warning labels to prevent, in advance, accidents in relation to inverters, motors and other equipment.

Be sure to affix the caution label where it is easily visible when selecting the auto-restart function (6.13.1) or the retry function (6.13.3).

If the inverter has been programmed for restart sequence of momentary power failure, place warning labels in a place where they can be easily seen and read.

(Example of warning label)

⚠ Warning (Functions programmed for restart)

Do not go near motors and equipment.
Motors and equipment that have stopped temporarily after momentary power failure will restart suddenly after recovery.

If the retry function has been selected, place warning labels in a location where they can be easily seen and read.

(Example of warning label)

⚠ Warning (Functions programmed for retry)

Do not go near motors and equipment.
Motors and equipment that have stopped temporarily after an alarm will restart suddenly after the specified time has elapsed.





# II. Introduction

II

Thank you for your purchase of the Toshiba "TOSVERT VF-S11" industrial inverter.

This is the Ver.108 / Ver.109 CPU version inverter.
Please be informed that CPU version will be frequently upgraded.

## ■ Features

### 1. Built-in noise filter

1) All models in both the 240V and 500V series have a noise filter inside. (Except 600V series)
2) Can be compliant with European CE marking standard
3) Reduces space requirements and cuts down on time and labor needed in wiring.

### 2. Simple operation

1) Automatic functions (torque boost acceleration/deceleration time, function programming)
   Just by wiring the motor to the power supply allows instant operation without the need to program parameters.
2) The potentiometer dial and the RUN/STOP button allow easy operation.

### 3. Superior basic performance

1) 200% or more starting torque
2) Smooth operation : Reduced rotation ripple through the use of Toshiba's unique waveform formation.
3) Built-in current surge suppression circuit : Can be safely connected even if power load is low.
4) Maximum 500Hz high frequency output : Optimum for use with high speed motors such as those in lumber machinery and milling machines.
5) Maximum carrier frequency : 16kHz quiet operation
   Toshiba's unique PWM control reduces noise at low carrier.

### 4. Globally compatible

1) Compatible with 240V, 500V and 600V power supplies
2) Conforms to CE marking and with UL, CSA.
3) Sink/source switching of control input/output.

### 5. Options allow use with a wide variety of applications

- Internal communications devices (RS485, Modbus RTU, DeviceNET, LonWorks etc.)
- Extension panel/Parameter writer
- DIN rail kit
- EMC noise reduction filter (Foot mount and side mount installation)
- Other options are common to all models

### 6. Extended power range

- Wide range of powers up to 15kW for this class of inverter.
- Totally enclosed box type.

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12.2.5



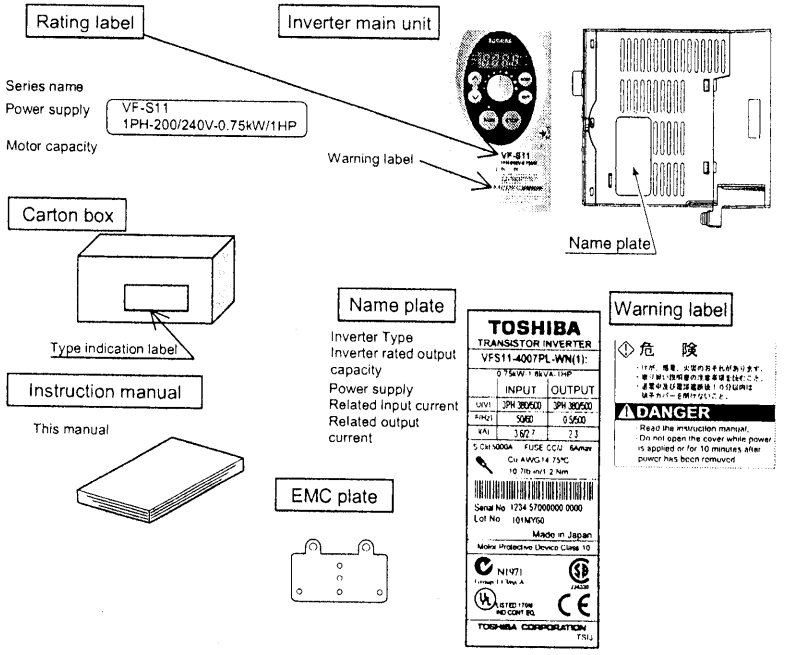
# 1. Read first

## 1.1 Check product purchase

Before using the product you have purchased, check to make sure that it is exactly what you ordered.

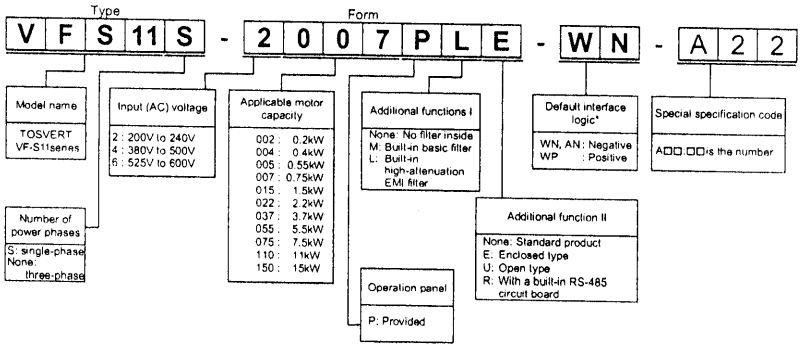
**⚠ Warning**

| | |
|---|---|
| Mandatory | Use an inverter that conforms to the specifications of power supply and three-phase induction motor being used. If the inverter being used does not conform to those specifications, not only will the three-phase induction motor not rotate correctly, it may also cause serious accidents through overheating and fire. |



## 1.2 Contents of the product

Explanation of the name plate label.




* This code represents the factory default logic setting. You can switch from one input/output logic to the other using slide switch SW1. (See 2.3.2)

Warning: Always shut power off first then check the ratings label of inverter held in a cabinet.

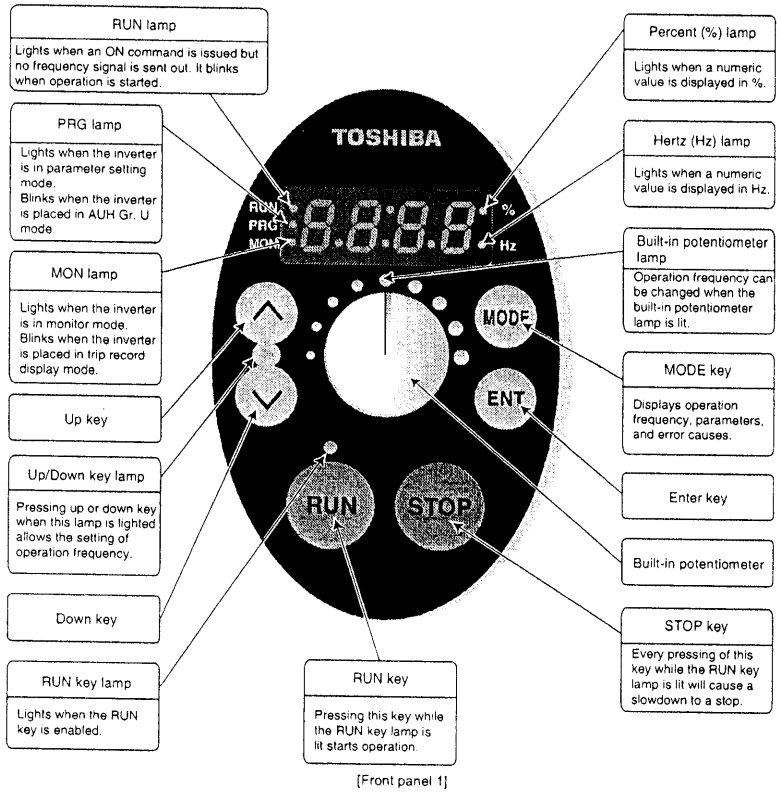


12.9.5

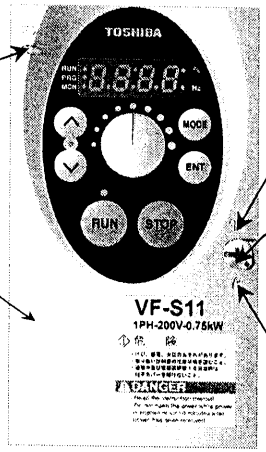


## 1.3 Names and functions

### 1.3.1 Outside view




[Front panel 1]




**Charge lamp**

Indicates that high voltage is still present within the inverter. Do not open the terminal board cover while this is lit.

**Front panel**

The front panel of the inverter or terminal board
To avoid touching the terminal board by mistake, be sure to close the front panel before starting operation.

**Unlock position mark**

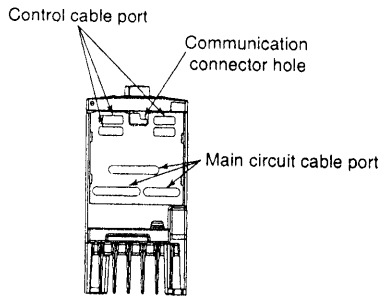
The front panel is unlocked when the dot on the locking screw is on this (upper) side.

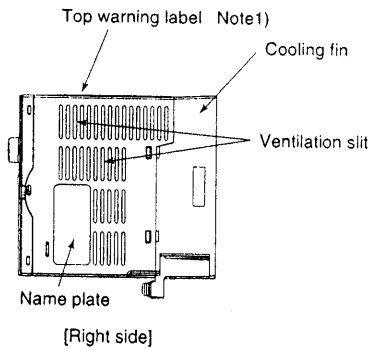
**Front panel locking screw**

The inverter came with this screw in the locked position. So from this position, turn the screw 90° counterclockwise to unlock the front panel, or turn it 90° clockwise to lock the front panel.
The screw does not turn 360°. To avoid damage to the screw, do not use excessive force when turning it.

**Lock position mark**

The front panel is locked when the dot on the locking screw is on this (lower) side.



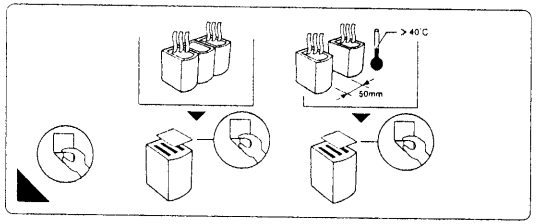




Note 1) Remove this seal when installing the inverter side by side with other inverters where the ambient temperature will rise above 40°C.





Example of the label




## 1.3.2 Power circuit and control circuit terminal boards

In case of the lug connector, cover the lug connector with insulated tube, or use the insulated lug connector.

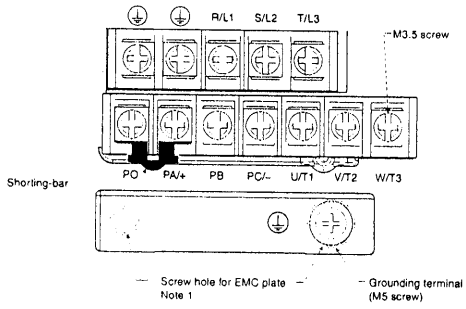
Note 1: EMC plate is supplied as standard.

### 1) Power circuit terminal board

In case of the lug connector, cover the lug connector with insulated tube, or use the insulated lug connector.

| Screw size | tightening torque | |
|---|---|---|
| M3.5 screw | 0.9Nm | 7.1lb • in |
| M4 screw | 1.3Nm | 10.7lb • in |
| M5 screw | 2.5Nm | 22.3lb • in |
| M6 screw | 4.5Nm | 40.1lb • in |

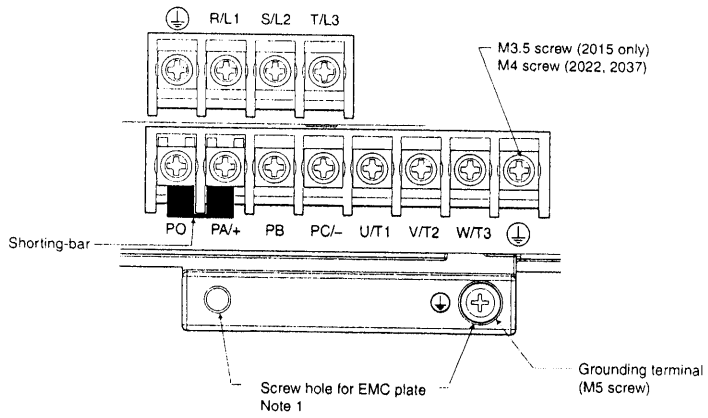
VFS11-2002 ~ 2007PM



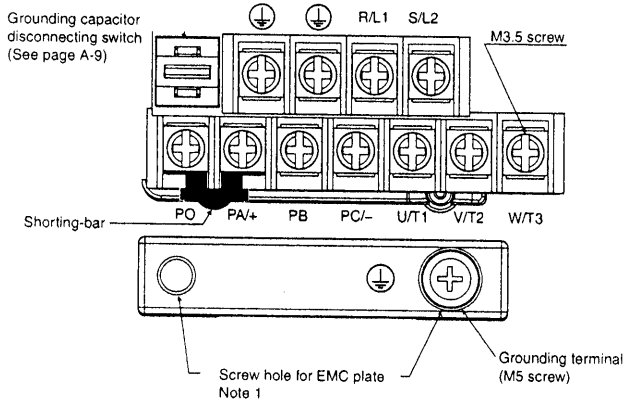



12.2.5

VFS11-2015 ~ 2037PM



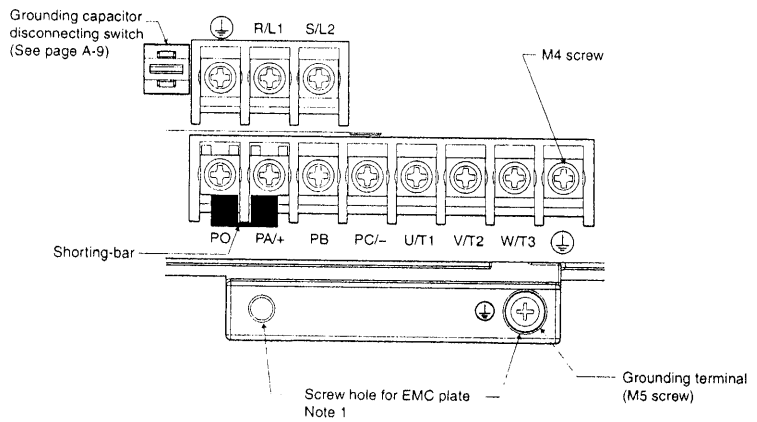

VFS11S-2002 ~ 2007PL



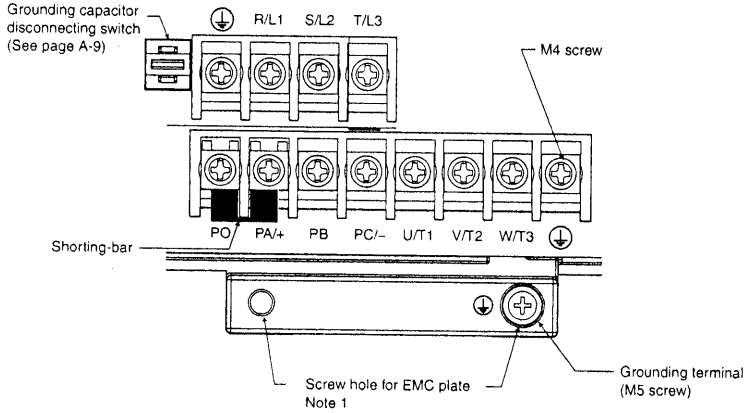




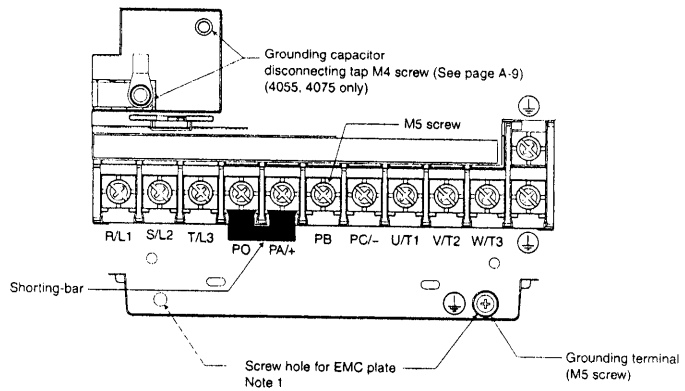

VFS11S-2015, 2022PL



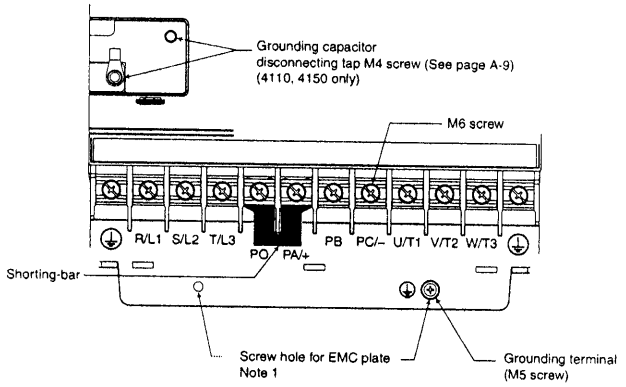

VFS11-4004 ~ 4037PL, 6007 ~ 6037P



VFS11-2055, 2075PM
-4055, 4075PL, 6055, 6075P




VFS11-2110, 2150PM
-4110, 4150PL, 6110, 6150P








## 2) Grounding capacitor disconnecting switch and taps

**⚠ Warning**

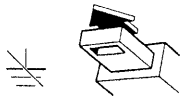
Mandatory: The grounding capacitor disconnecting tap is provided with a protection cover. To avoid shock hazards, always attach the cover after connecting or disconnecting the capacitor to or from the tap.

Every single-phase 240V/three-phase 500V model has a built-in high-attenuation noise filter, which is grounded through a capacitor.
If you want to disconnect the capacitor from the grounding line to reduce the amount of leakage current, you can do so easily using the switch or tap. Keep in mind, however, that disconnecting the capacitor from the grounding line causes the inverter to become non-compliant with the EMC directive. Also note that the inverter must always be turned off before the capacitor is disconnected or reconnected.

Note) In case of three phase 500V-4.0kW model, if you disconnect the capacitor from ground, set the parameter of carrier frequency F300 to 4kHz or less with motor cable length 30m or less.

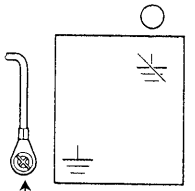
4.0kW or less : Switch

← To connect the capacitor to ground, push this switch. (Factory default position)



← To disconnect the capacitor from ground, pull up this switch.

5.5kW or more : Tap



← To disconnect the capacitor from ground, connect the lug terminal to this tap.

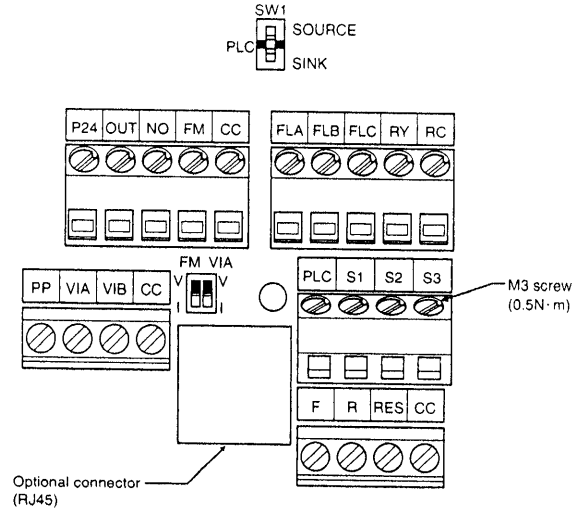
To connect the capacitor to ground, connect the lug terminal to this tap. (Factory default setting)



12.2.5

3) Control circuit terminal board

The control circuit terminal board is common to all equipment.




Wire size

Solid wire: 0.3 ~ 1.5 ($mm^2$)

Stranded wire: 0.3 ~ 1.5 ($mm^2$)
(AWG 22 ~ 16)

Sheath strip length: 6 (mm)

Screwdriver: Small-sized flat-blade screwdriver
(Blade thickness: 0.4 mm or less, blade width: 2.2 mm or less)

Factory default settings of slide switches

SW1: SINK (Negative) side (WN, AN type)
SOURCE (Positive) side (WP type)

FM: V side

VIA: V side

See 2.3.2 for details on all terminal functions.



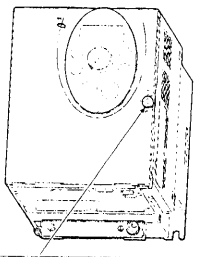
12.2.5



## 1.3.3 How to open the front (terminal board) cover

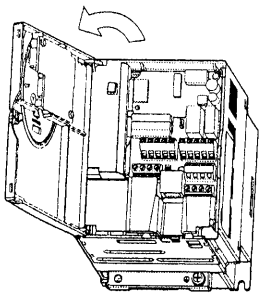
To wire the terminal board, remove the front lower cover in line with the steps given below.

(1)



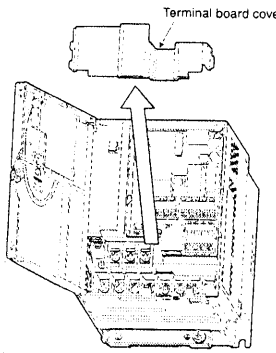
Turn the locking screw on the right side of the front panel 90° counterclockwise to align the dot on the screw with the unlock position mark (upper side). To avoid damage to the screw, do not apply excessive force to turn the screw more than 90 degrees.

(2)



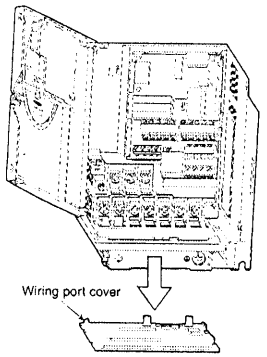
Pull the front panel toward you and swing it open to the left.

(3)




Remove the terminal board cover by pulling it up toward you.

(4)




Remove the wiring port cover by pulling it down, pass cables through the wiring port, and connect the cables to the terminal board.

# 1.4 Notes on the application

## 1.4.1 Motors

When the VF-S11 and the motor are used in conjunction, pay attention to the following items.

| ⚠ Warning | |
|---|---|
| Mandatory | Use an inverter that conforms to the specifications of power supply and three-phase induction motor being used. If the inverter being used does not conform to those specifications, not only will the three-phase induction motor not rotate correctly, but it may cause serious accidents through overheating and fire. |

### Comparisons with commercial power operation.

The VF-S11 Inverter employs the sinusoidal PWM system. However, the output voltage and output current are not perfect sine waves, they have a distorted wave that is close to sinusoidal waveform. This is why compared to operation with a commercial power there will be a slight increase in motor temperature, noise and vibration.

### Operation in the low-speed area

When running continuously at low speed in conjunction with a general purpose motor, there may be a decline in that motor's cooling effect. If this happens, operate with the output decreased from rated load.

To carry out low-speed operation continuously at the rated torque, we recommend to use a inverter rated motor or a forced cooled motor designed for use with an inverter. When operating in conjunction with a inverter rated motor, you must change the inverter's motor overload protection level to VF motor use (OLM).

### Adjusting the overload protection level

The VF-S11 Inverter protects against overloads with its overload detection circuits (electronic thermal). The electronic thermal's reference current is set to the inverter's rated current, so it must be adjusted in line with the rated current of the general purpose motor being used in combination.

### High speed operation at and above 60Hz

Operating at frequencies greater than 60Hz will increase noise and vibration. There is also a possibility this will exceed the motor's mechanical strength limits and the bearing limits so you should inquire to the motor's manufacturer about such operation.

### Method of lubricating load mechanisms

Operating an oil-lubricated reduction gear and gear motor in the low-speed areas will worsen the lubricating effect. Check with the manufacturer of the reduction gear to find out about operable gearing area.





### Low loads and low inertia loads

The motor may demonstrate instability such as abnormal vibrations or overcurrent trips at light loads of 50 % or under of the load percentage, or when the load's inertia moment is extremely small. If that happens reduce the carrier frequency.

### Occurrence of instability

Unstable phenomena may occur with the load and motor combinations shown below.

- Combined with a motor that exceeds applicable motor ratings recommended for the inverter
- Combined with special motors
- For 600V class or 500V class with long cable

To deal with the above lower the settings of inverter carrier frequency.

- Combined with couplings between load devices and motors with high backlash

When using the inverter in the above combination, use the S-pattern acceleration/deceleration function, or when vector control is selected, adjust the speed control response/stability factor or switch to V/f control mode.

- Combined with loads that have sharp fluctuations in rotation such as piston movements

In this case, adjust the response time (inertial moment setting) during vector control or switch to V/f control.

### Braking a motor when cutting off power supply

A motor with its power cut off goes into free-run, and does not stop immediately. To stop the motor quickly as soon as the power is cut off install an auxiliary brake. There are different kinds of brake devices, both electrical and mechanical. Select the brake that is best for the system.

### Load that produces regenerative torque

When combined with a load that produces regenerative torque, the overvoltage or overcurrent protection function may be activated to trip the inverter. For this kind of situation, you must install a dynamic braking resistor that complies with the load conditions, or increase deceleration time.

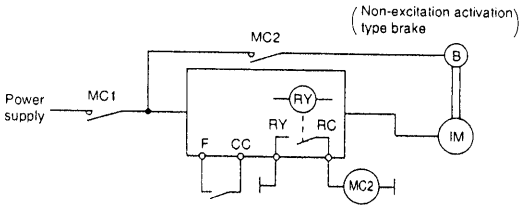


/a.2.5

### Braking motor

When using a braking motor, if the braking circuit is directly connected to the inverters's output terminals, the brake cannot be released because of the lowered starting voltage. Therefore, when using a braking motor, connect the braking circuit to the inverter's power supply side, as shown in the figure below. Usually, braking motors produce larger noise in low speed ranges.

Note: In the case of the circuit shown on the below, assign the function of detecting low-speed signals to the RY and RC terminals. Make sure the parameter F 130 is set to 4 (factory default setting).




Run/stop

### Measures to protect motors against surge voltages

In a system in which a 500V-class inverter is used to control the operation of a motor, very high surge voltages may be produced. When applied to the motor coils repeatedly for a long time, may cause deterioration of their insulation, depending on the cable length, cable routing and types of cables used. Here are some examples of measures against surge voltages.

(1) Lower the inverter's carrier frequency.
(2) Set the parameter F 3 16 (Carrier frequency control mode selection) to 2 or 3.
(3) Use a motor with high insulation strength.
(4) Insert an AC reactor or a surge voltage suppression filter between the inverter and the motor.

## 1.4.2 Inverters

### Protecting inverters from overcurrent

The inverter has an overcurrent protection function. The programmed current level is set to the inverter's maximum applicable motor. If the motor used has a small capacity, the overcurrent level and the electronic thermal protection must be readjusted. If adjustment is necessary, see 5-13, and make adjustments as directed.

### Inverter capacity

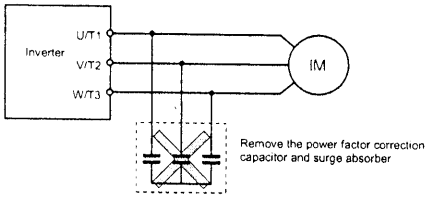
Do not use a small-capacity (kVA) inverter to control the operation of a large-capacity motor (two-class or more larger motor), no matter how light the load is. Current ripple will raise the output peak current making it easier to set off the overcurrent trip.





### Power factor correction capacitor

Power factor correction capacitors cannot be installed on the output side of the inverter. When a motor is run that has a power factor correction capacitor attached to it, remove the capacitors. This can cause inverter malfunction trips and capacitor destruction.

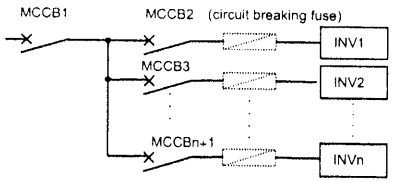



Power factor correction capacitor

### Operating at other than rated voltage

Connections to voltages other than the rated voltage described in the rating label cannot be made. If a connection must be made to a power supply other than one with rated voltage, use a transformer to raise or lower the voltage to the rated voltage.

### Circuit breaking when two or more inverters are used on the same power line.




Breaking of selected inverter

There is no fuse in the Inverter's main circuit. Thus, as the diagram above shows, when more than one inverter is used on the same power line, you must select interrupting characteristics so that only the MCCB2 will trip and the MCCB1 will not trip when a short occurs in the inverter (INV1). When you cannot select the proper characteristics install a circuit interrupting fuse between the MCCB2 and the INV1.

### If power supply distortion is not negligible

If the power supply distortion is not negligible because the inverter shares a power distribution line with other systems causing distorted waves, such as systems with thyristors or large-capacity inverters, install an input reactor to improve the input power factor, to reduce higher harmonics, or to suppress external surges.

## ■ Disposal

If an inverter is no longer usable, dispose of it as industrial waste.

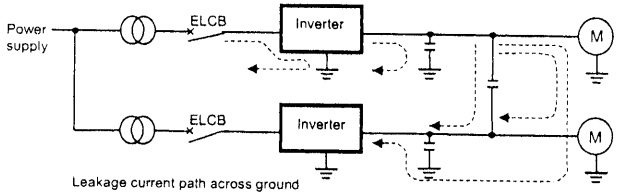
## 1.4.3 What to do about the leak current

**⚠ Warning**

Current may leak through the inverter's input/output wires because of insufficient electrostatic capacity on the motor with bad effects on peripheral equipment.
The leakage current's value is affected by the carrier frequency and the length of the input/output wires. Test and adopt the following remedies against leak current.

### (1) Effects of leak current across ground

Leakage current may flow not just through the inverter system but also through ground wires to other systems. Leakage current will cause earth leakage breakers, leakage current relays, ground relays, fire alarms and sensors to operate improperly, and it will cause superimposed noise on the CRT screen or display of incorrect current detection with the CT.




Leakage current path across ground

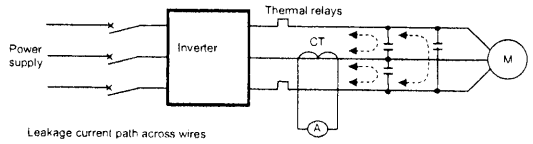
**Remedies:**

1. If there is no radio-frequency interference or similar problem, detach the built-in noise filter capacitor, using the grounding capacitor disconnecting switch or tap. (See 1.3.2-2)
2. Reduce PWM carrier frequency.
   The setting of PWM carrier frequency is done with the parameter F300.
   Although the electromagnetic noise level is reduced, the motor acoustic noise is increased.
3. Use high frequency remedial products for earth leakage breakers.





### (2) Affects of leakage current across lines

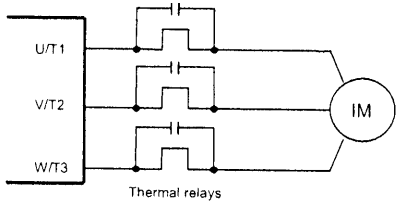



Leakage current path across wires

(1) Thermal relays
The high frequency component of current leaking into electrostatic capacity between inverter output wires will increase the effective current values and make externally connected thermal relays operate improperly. If the wires are more than 50 meters long, it will be easy for the external thermal relay to operate improperly with models having motors of low rated current (several A(ampere) or less), especially the 500V and 600V class low capacity (3.7kW or less) models, because the leak current will increase in proportion to the motor rating.

**Remedies:**

1. Use the electronic thermal built into the inverter. (See 5.13)
   The setting of the electronic thermal is done using parameter OLN, tHr.
2. Reduce the inverter's PWM carrier frequency. However, that will increase the motor's magnetic noise.
   The setting of PWM carrier frequency is done with the parameter F300. (See 6.12)
3. This can be improved by installing 0.1μ~0.5μF - 1000V film capacitor to the input/output terminals of each phase in the thermal relay.




Thermal relays

(2) CT and ammeter

If a CT and ammeter are connected externally to detect inverter output current, the leak current's high frequency component may destroy the ammeter. If the wires are more than 50 meters long, it will be easy for the high frequency component to pass through the externally connected CT and be superimposed on and burn the ammeter with models having motors of low rated current (several A(ampere) or less), especially the 500V and 600V class low capacity (3.7kW or less) models, because the leak current will increase in proportion to the motor's rated current.

Remedies:

1. Use a meter output terminal in the inverter control circuit.
   The load current can be output on the meter output terminal (FM). If the meter is connected, use an ammeter of 1mAdc full scale or a voltmeter of 7.5V-1mA full scale.
   0-20mAdc (4-20mAdc) can be also output. (See 5.5)
2. Use the monitor functions built into the inverter.
   Use the monitor functions on the panel built into the inverter to check current values. (See 8.1.1)

## 1.4.4 Installation

### ■ Installation environment

The VF-S11 Inverter is an electronic control instrument. Take full consideration to installing it in the proper operating environment.

**⚠ Danger**

| | |
|---|---|
| Prohibited | • Do not place any inflammable substances near the VF-S11 Inverter. If an accident occurs in which flame is emitted, this could lead to fire. |
| Mandatory | • Operate under the environmental conditions prescribed in the instruction manual. Operations under any other conditions may result in malfunction. |

**⚠ Warning**

| | |
|---|---|
| Prohibited | • Do not install the VF-S11 Inverter in any location subject to large amounts of vibration. This could cause the unit to fall, resulting in bodily injury. |
| Mandatory | • Check to make sure that the input power voltage is +10%, -15% of the rated power voltage written on the rating label (±10% when the load is 100% in continuous operation) If the input power voltage is not +10%, -15% of the rated power voltage (±10% when the load is 100% in continuous operation) this may result in fire. |





**⚠ Warning**

Prohibited

- Avoid operation in any location where there is direct spraying of the following solvents or other chemicals. The plastic parts may be damaged to a certain degree depending on their shape, and there is a possibility of the plastic covers coming off. If the chemical or solvent is anything other than those shown below, please contact us in advance.

((Table 1) Examples of applicable chemicals and solvents

| |
|---|
| Acetic acid (density of 10% or less) |
| Hydrochloric acid (density of 10% or less) |
| Sulfuric acid (density of 10% or less) |
| Sodium chloride |
| Hexane |
| Triethylene glycol |

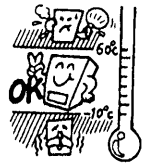
(Table 2) Examples of unapplicable chemicals and solvents

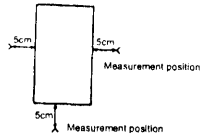
| |
|---|
| Acetone |
| Benzene |
| Chloroform |
| Ethylene chloride |
| Ethyl acetate |
| Glycerin |
| Tetrachloroethylene |
| Trichloroethylene |
| Xylene |

Note: The plastic cover has resistance to deformation by the above applicable solvents. They are not examples for resistance to fire or explosion.

- Do not install in any location of high temperature, high humidity, moisture condensation and freezing and avoid locations where there is exposure to water and/or where there may be large amounts of dust, metallic fragments and oil mist.
- Do not install in any location where corrosive gases or grinding fluids are present.

- Operate in areas where ambient temperature ranges from -10°C to 60°C.
  Operation over 40°C is allowed when the top label is peeled off. When installing the inverter where the ambient temperature will rise above 50°C, remove the label (seal) from the top and operate it at a current lower than the rated one.



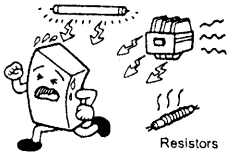




Note: The inverter is a heat-emitting body. Make sure proper space and ventilation is provided when installing in the cabinet. When installing inside a cabinet, we recommend the top seal peeled off although 40°C or less.

- Do not install in any location that is subject to large amounts of vibration.

Note: If the VF-S11 Inverter is installed in a location that is subject to vibration, anti-vibration measures are required. Please consult with Toshiba about these measures.

- If the VF-S11 Inverter is installed near any of the equipment listed below, provide measures to insure against errors in operation.



Resistors

| | |
|---|---|
| Solenoids: | Attach surge suppressor on coil. |
| Brakes: | Attach surge suppressor on coil. |
| Magnetic contactors: | Attach surge suppressor on coil. |
| Fluorescent lights: | Attach surge suppressor on coil. |
| Resistors: | Place far away from VF-S11 Inverter. |

## ■ How to install

| Danger | |
|---|---|
| Prohibited | • Do not install or operate the inverter if it is damaged or any component is missing. This can result in electric shock or fire. Please consult your local sales agency for repairs. Call your local sales agency for repairs. |
| Mandatory | • Mount the inverter on a metal plate. The rear panel gets very hot. Do not install in an inflammable object, this can result in fire.<br>• Do not operate with the front panel cover removed. This can result in electric shock.<br>• An emergency stop device must be installed that fits with system specifications (e.g. shut off input power then engage mechanical brake). Operation cannot be stopped immediately by the inverter alone, thus risking an accident or injury.<br>• All options used must be those specified by Toshiba. The use of any other option may result in an accident. |

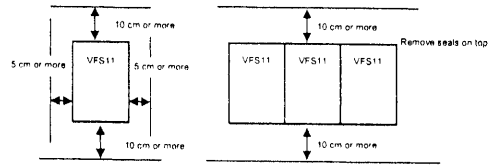
| Warning | |
|---|---|
| Mandatory | • The main unit must be installed on a base that can bear the unit's weight. If the unit is installed on a base that cannot withstand that weight, the unit may fall resulting in injury.<br>• If braking is necessary (to hold motor shaft), install a mechanical brake. The brake on the inverter will not function as a mechanical hold, and if used for that purpose, injury may result. |





Install the inverter in a well-ventilated indoor place and mount it on a flat metal plate in portrait orientation. If you are installing more than one inverter, the separation between inverters should be at least 5 centimeters, and they should be arranged in horizontal rows. If the inverters are horizontally arranged with no space between them (side-by-side installation), peel off the ventilation seals on top of the inverter. It is necessary to decrease the current if the inverter is operated at over 50°C.

•Standard Installation •Side-by-side Installation




The space shown in the diagram is the minimum allowable space. Because air cooled equipment has cooling fans built in on the top or bottom surfaces, make the space on top and bottom as large as possible to allow for air passage.

Note: Do not install in any location where there is high humidity or high temperatures and where there are large amounts of dust, metallic fragments and oil mist.

## ■ Calorific values of the inverter and the required ventilation

About 5% of the rated power of the inverter will be lost as a result of conversion from AC to DC or from DC to AC. In order to suppress the rise in temperature inside the cabinet when this loss becomes heat loss, the interior of the cabinet must be ventilated and cooled.

The amount of forcible air-cooling ventilation required and the necessary heat discharge surface quantity when operating in a sealed cabinet according to motor capacity are as follows.

Notes

1) The heat loss for the optional external devices (input reactor, DC reactor, radio noise reduction filters, etc.) is not included in the calorific values in the table.
2) Case of 100% Load Continuation operation.



18.2.5

| Voltage class | Operating motor capacity (kW) | Inverter type | | Calorific Values: Carrier frequency 4kHz | Calorific Values: Carrier frequency 12kHz | Amount of forcible air cooling ventilation required ($m^3$/min) | Heat discharge surface area required for sealed storage cabinet($m^2$) |
|---|---|---|---|---|---|---|---|
| Single-phase 240V class | 0.2 | VFS11S- | 2002PL | 21 | 26 | 0.15 | 0.52 |
| | 0.4 | | 2004PL | 36 | 44 | 0.25 | 0.88 |
| | 0.75 | | 2007PL | 52 | 59 | 0.34 | 1.18 |
| | 1.5 | | 2015PL | 87 | 99 | 0.56 | 1.98 |
| | 2.2 | | 2022PL | 116 | 125 | 0.71 | 2.50 |
| Three -Phase 240V class | 0.2 | VFS11- | 2002PM | 21 | 26 | 0.15 | 0.52 |
| | 0.4 | | 2004PM | 36 | 44 | 0.25 | 0.88 |
| | 0.55 | | 2005PM | 40 | 46 | 0.26 | 0.92 |
| | 0.75 | | 2007PM | 51 | 58 | 0.33 | 1.16 |
| | 1.5 | | 2015PM | 88 | 101 | 0.58 | 2.02 |
| | 2.2 | | 2022PM | 115 | 125 | 0.71 | 2.50 |
| | 4.0 | | 2037PM | 171 | 188 | 1.07 | 3.76 |
| | 5.5 | | 2055PM | 266 | 281 | 1.60 | 5.62 |
| | 7.5 | | 2075PM | 349 | 392 | 2.23 | 7.84 |
| | 11 | | 2110PM | 489 | 549 | 3.13 | 10.98 |
| | 15 | | 2150PM | 634 | 704 | 4.01 | 14.08 |
| Three-Phase 500V class | 0.4 | VFS11- | 4004PL | 43 | 60 | 0.34 | 1.20 |
| | 0.75 | | 4007PL | 51 | 68 | 0.39 | 1.36 |
| | 1.5 | | 4015PL | 71 | 95 | 0.54 | 1.90 |
| | 2.2 | | 4022PL | 88 | 118 | 0.67 | 2.36 |
| | 4.0 | | 4037PL | 138 | 161 | 0.92 | 3.22 |
| | 5.5 | | 4055PL | 205 | 230 | 1.31 | 4.60 |
| | 7.5 | | 4075PL | 247 | 324 | 1.85 | 6.48 |
| | 11 | | 4110PL | 414 | 551 | 3.14 | 11.02 |
| | 15 | | 4150PL | 501 | 659 | 3.76 | 13.18 |
| Three-Phase 600V class | 0.75 | VFS11- | 6007P | 48 | 64 | 0.36 | 1.28 |
| | 1.5 | | 6015P | 61 | 83 | 0.47 | 1.66 |
| | 2.2 | | 6022P | 76 | 104 | 0.59 | 2.08 |
| | 4.0 | | 6037P | 97 | 119 | 0.68 | 2.38 |
| | 5.5 | | 6055P | 132 | 155 | 0.88 | 3.10 |
| | 7.5 | | 6075P | 171 | 216 | 1.40 | 4.32 |
| | 11 | | 6110P | 302 | 422 | 2.41 | 8.44 |
| | 15 | | 6150P | 383 | 527 | 3.00 | 10.54 |

## ■ Panel designing taking into consideration the effects of noise

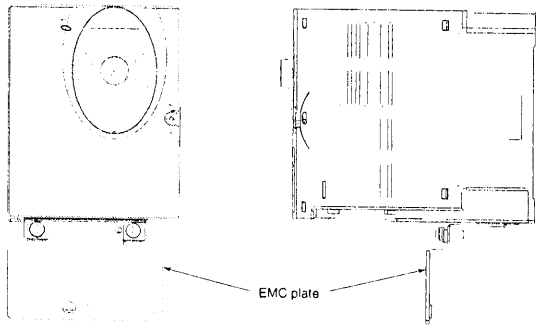
The inverter generates high frequency noise. When designing the control panel setup, consideration must be given to that noise. Examples of measures are given below.

- Wire so that the main circuit wires and the control circuit wires are separated. Do not place them in the same conduit, do not run them parallel, and do not bundle them.
- Provide shielding and twisted wire for control circuit wiring.
- Separate the input (power) and output (motor) wires of the main circuit. Do not place them in the same conduit, do not run them parallel, and do not bundle them.
- Ground the inverter ground terminals (⏚).
- Install surge suppressor on any magnetic contactor and relay coils used around the inverter.
- Install noise filters if necessary.





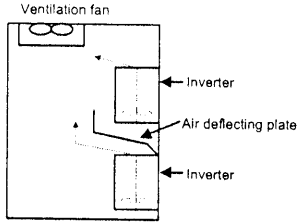
- Install EMC plate and use shielded wires.




## ■ Installing more than one unit in a cabinet

If you are installing two or more inverters in one cabinet, pay attention to the following.

- Inverters may be installed side by side with each other with no space left between them.
- When installing inverters side by side, detach the caution label on the top surface of each inverter and use them where the ambient temperature will not rise above 40°C.
  When using inverters where the ambient temperature will rise above 40°C, leave a space of 5 cm or more between them and remove the caution label from the top of each inverter, or operate each inverter at a current lower than the rated one.
- Ensure a space of at least 20 centimeters on the top and bottom of the inverters.
- Install an air deflecting plate so that the heat rising up from the inverter on the bottom does not affect the inverter on the top.



# 2. Connection

| Danger | |
|---|---|
| Disassembly prohibited | • Never disassemble, modify or repair.<br>This can result in electric shock, fire and injury. For repairs, call your sales agency. |
| Prohibited | • Don't stick your fingers into openings such as cable wiring hole and cooling fan covers.<br>This can result in electric shock or other injury.<br>• Don't place or insert any kind of object into the inverter (electrical wire cuttings, rods, wires). This can result in electric shock or fire.<br>• Do not allow water or any other fluid to come in contact with the inverter.<br>That may result in electric shock or fire. |

| Warning | |
|---|---|
| Prohibited | • When transporting or carrying, do not hold by the front panel covers.<br>The covers may come off and the unit will drop out resulting in injury. |

## 2.1 Cautions on wiring

| Danger | |
|---|---|
| Prohibited | • Never remove the front cover when power is on or open door if enclosed in a cabinet.<br>The unit contains many high voltage parts and contact with them will result in electric shock. |
| Mandatory | • Turn power on only after attaching the front cover or closing door if enclosed in a cabinet.<br>If power is turned on without the front cover attached or closing door if enclosed in a cabinet. This can result in electric shock or other injury.<br>• Electrical construction work must be done by a qualified expert.<br>Connection of input power by someone who does not have that expert knowledge may result in fire or electric shock.<br>• Connect output terminals (motor side) correctly.<br>If the phase sequence is incorrect, the motor will operate in reverse and that may result in injury.<br>• Wiring must be done after installation.<br>If wiring is done prior to installation that may result in injury or electric shock.<br>• The following steps must be performed before wiring.<br>(1) Shut off all input power.<br>(2) Wait at least ten minutes and check to make sure that the charge lamp is no longer lit.<br>(3) Use a tester that can measure DC voltage (800VDC or more), and check to make sure that the voltage to the DC main circuits (across PA-PC) is 45V or less.<br>If these steps are not properly performed, the wiring will cause electric shock.<br>• Tighten the screws on the terminal board to specified torque.<br>If the screws are not tightened to the specified torque, it may lead to fire. |





| Danger | |
|---|---|
| Be Grounded | • Ground must be connected securely.<br>If the ground is not securely connected, it could lead to electric shock or fire when a malfunction or current leak occurs. |

| Warning | |
|---|---|
| Prohibited | • Do not attach devices with built-in capacitors (such as noise filters or surge absorber) to the output (motor side) terminal.<br>This could cause a fire. |

### ■ Preventing radio noise

To prevent electrical interference such as radio noise, separately bundle wires to the main circuit's power terminals (R/L1, S/L2, T/L3) and wires to the motor terminals (U/T1, V/T2, W/T3).

### ■ Control and main power supply

The control power supply and the main circuit power supply for the VFS11 are the same. (See 6.19.3)
If a malfunction or trip causes the main circuit to be shut off, control power will also be shut off. When checking the cause of the malfunction or the trip, use the trip holding retention selection parameter.

### ■ Wiring

- Because the space between the main circuit terminals is small use sleeved pressure terminals for the connections. Connect the terminals so that adjacent terminals do not touch each other.
- For ground terminal ⏚ use wires of the size that is equivalent to or larger than those given in table 10.1 and always ground the inverter (240V voltage class: D type ground, 500V class: C type ground).
  Use as large and short a ground wire as possible and wire it as close as possible to the inverter.
- For the sizes of electric wires used in the main circuit, see the table in 10.1.
- The length of the main circuit wire in 10-1 should be no longer than 30 meters. If the wire is longer than 30 meters, the wire size (diameter) must be increased.

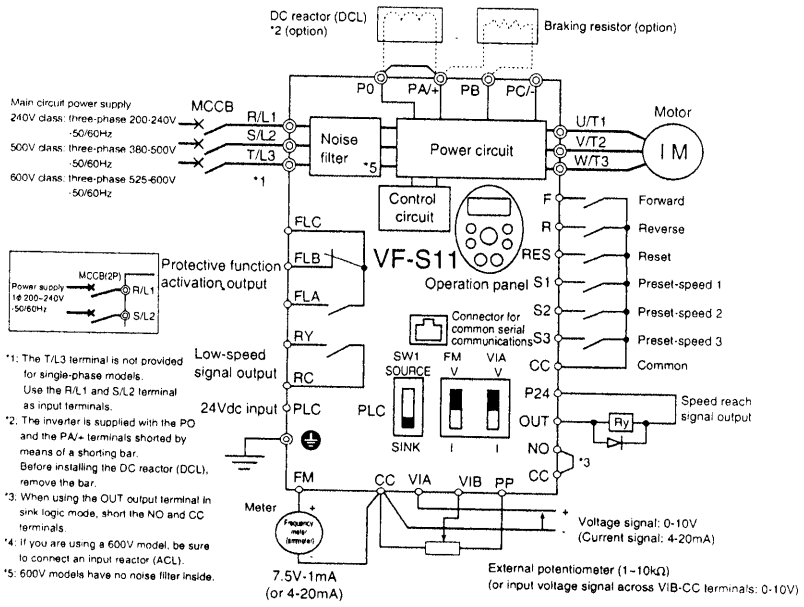
## 2.2 Standard connections

| Danger | |
|---|---|
| Prohibited | • Do not connect input power to the output (motor side) terminals (U/T1, V/T2, W/T3).<br>Connecting input power to the output could destroy the inverter or cause a fire.<br>• Do not insert a resistor between DC terminals (between PA/+ and PC/-, or between PO and PC/-).<br>It could cause a fire.<br>See 6.13.4 for the connection of a resistor.<br>• First shut off input power and wait at least 10 minutes before touching wires on equipment (MCCB) that is connected to inverter power side.<br>Touching the wires before that time could result in electric shock. |

## 2.2.1 Standard connection diagram 1

This diagram shows a standard wiring of the main circuit.

Standard connection diagram - SINK (Negative) (common:CC)



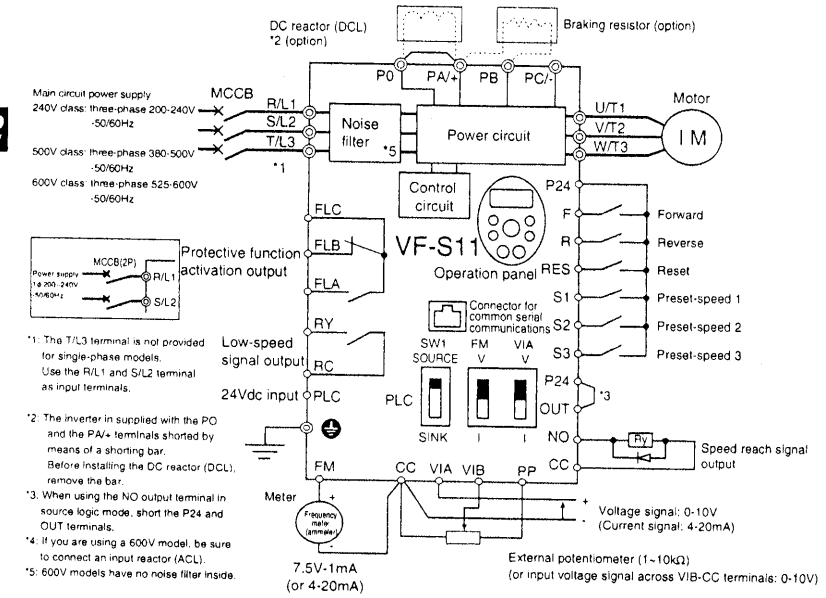

*1: The T/L3 terminal is not provided for single-phase models. Use the R/L1 and S/L2 terminal as input terminals.
*2: The inverter is supplied with the PO and the PA/+ terminals shorted by means of a shorting bar. Before installing the DC reactor (DCL), remove the bar.
*3: When using the OUT output terminal in sink logic mode, short the NO and CC terminals.
*4: If you are using a 600V model, be sure to connect an input reactor (ACL).
*5: 600V models have no noise filter inside.





## 2.2.2 Standard connection diagram 2

Standard connection diagram - SOURCE (Positive) (common:P24)




*1: The T/L3 terminal is not provided for single-phase models. Use the R/L1 and S/L2 terminal as input terminals.
*2: The inverter is supplied with the PO and the PA/+ terminals shorted by means of a shorting bar. Before installing the DC reactor (DCL), remove the bar.
*3: When using the NO output terminal in source logic mode, short the P24 and OUT terminals.
*4: If you are using a 600V model, be sure to connect an input reactor (ACL).
*5: 600V models have no noise filter inside.



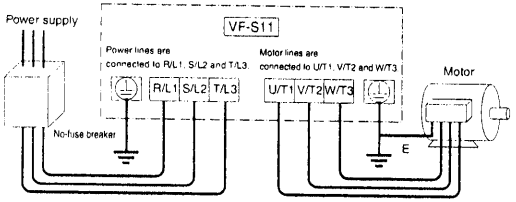
12.8.5

# 2.3 Description of terminals

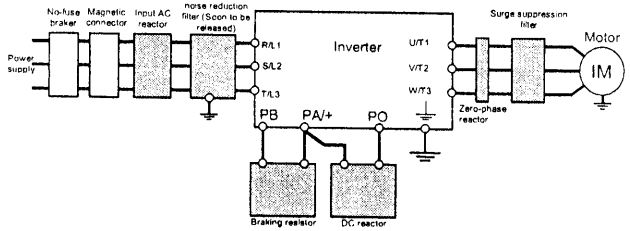
## 2.3.1 Power circuit terminals

This diagram shows an example of wiring of the main circuit. Use options if necessary.

■ Power supply and motor connections




■ Connections with peripheral equipment




Note 1: The T/L3 terminal is not provided for any single-phase 240V model. So if you are using a single-phase 240V model, use the R/L1 and S/L2 terminals to connect power cables.

Note 2: If you are using a 600V model, be sure to connect an input reactor (ACL).





■ Power circuit

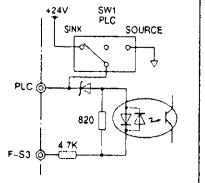
| Terminal symbol | Terminal function |
|---|---|
| ⏚ | Grounding terminal for connecting inverter. There are 3 terminals in total. 2 terminals in the terminal board, 1 terminal in the cooling fin. |
| R/L1,S/L2,T/L3 | 240V class: single-phase 200 to 240V-50/60Hz<br>three-phase 200 to 240V-50/60Hz<br>500V class: three-phase 380 to 500V-50/60Hz<br>600V class: three-phase 525 to 600V-50/60Hz<br>* Single-phase input: R/L1 and S/L2 terminals |
| U/T1,V/T2,W/T3 | Connect to a (three-phase induction) motor. |
| PA/+, PB | Connect to braking resistors.<br>Change parameters F304, F305, F308, F309 if necessary. |
| PC/- | This is a negative potential terminal in the internal DC main circuit. DC common power can be input across the PA terminals (positive potential) |
| PO, PA/+ | Terminals for connecting a DC reactor (DCL: optional external device). Shorted by a short bar when shipped from the factory. Before installing DCL, remove the short bar. |

The arrangement of power circuit terminals are different from each range.
Refer to 1.3.2.1).

## 2.3.2 Control circuit terminals

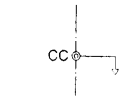
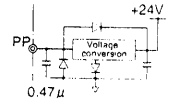
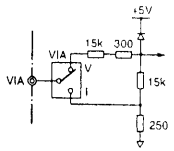
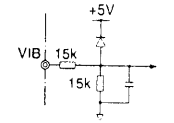
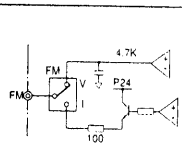
The control circuit terminal board is common to all equipment.
Regarding to the function and specification of each terminal, please refer to the following table.
Refer to 1.3.2.3) about the arrangement of control circuit terminals.

■ Control circuit terminals

| Terminal symbol | Input/output | Function | | Electrical specifications | Inverter internal circuits |
|---|---|---|---|---|---|
| F | Input | Multifunction programmable contact input | Shorting across F-CC causes forward rotation; open causes slow-down and stop. (When ST is always ON) | No voltage contact input 24Vdc-5mA or less<br>*Sink/Source/PLC selectable using SW1 |  |
| R | Input | | Shorting across R-CC causes reverse rotation; open causes slow-down and stop. (When ST is always ON) | | |
| RES | Input | | This inverter protective function is disabled if RES are CC is connected. Shorting RES and CC has no effect when the inverter is in a normal condition. | | |
| S1 | Input | | Shorting across S1-CC causes preset speed operation. | | |
| S2 | Input | | Shorting across S2-CC causes preset speed operation. | | |
| S3 | Input | | Shorting across S3-CC causes preset speed operation. | | |
| PLC | Input (common) | External 24Vdc power input. When the source logic is used, a common terminal is connected. | | 24VDC (Insulation resistance: DC50V) | |



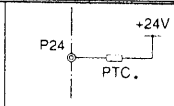
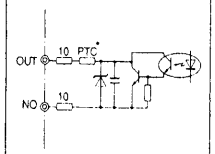
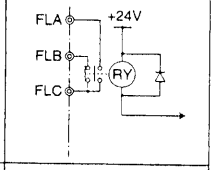
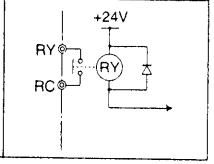
Factory default setting
WN, AN type : SINK side
WP type : SOURCE side

| Terminal symbol | Input/output | Function | Electrical specifications | Inverter internal circuits |
|---|---|---|---|---|
| CC | Common to Input/output | Control circuit's equipotential terminal (3 terminals) | |   |
| PP | Output | Analog power supply output | 10Vdc (permissible load current: 10mA) |   |
| VIA | Input | Multifunction programmable analog input. Factory default setting: 0~10Vdc and 0~60Hz (0~50Hz) frequency input. The function can be changed to 4~20mAdc (0~20mA) current input by flipping the dip switch to the I position.<br><br>By changing parameter setting, this terminal can also be used as a multifunction programmable contact input terminal. When using the sink logic, be sure to insert a resistor between P24-VIA (4.7 kΩ-1/2 W). Also move the VIA dip switch to the V position. | 10Vdc (internal impedance: 30kΩ)<br><br>4-20mA (internal impedance: 250Ω) |   |
| VIB | Input | Multifunction programmable analog input. Standard default setting: 0~10Vdc input and 0~60Hz (0~50Hz) frequency<br><br>By changing parameter setting, this terminal can also be used as a multifunction programmable contact input terminal. When using the sink logic, be sure to insert a resistor between P24 and VIB. (4.7 kΩ-1/2 W) | 10Vdc (internal impedance: 30kΩ) |   |
| FM | Output | Multifunction programmable analog output. Standard default setting: output frequency.<br>The function can be changed to 0-20mAdc (4-20mA) current output by flipping the FM slide switch to the I position. | 1mAdc full-scale ammeter or 7.5Vdc (10Vdc)1mA full-scale voltmeter<br><br>0-20mA (4-20mA) DC ammeter<br><br>Permissible load resistance: 750Ω or less |   |

2





| Terminal symbol | Input/output | Function | Electrical specifications | Inverter internal circuits |
|---|---|---|---|---|
| P24 | Output | 24Vdc power output | 24Vdc-100mA |   |
| OUT<br>NO | Output | Multifunction programmable open collector output. Standard default settings detect and output speed reach signal output frequencies.<br>Multifunction output terminals to which two different functions can be assigned.<br>The NO terminal is an isoelectric output terminal. It is insulated from the CC terminal.<br><br>By changing parameter settings, these terminals can also be used as multifunction programmable pulse train output terminals. | Open collector output 24Vdc-50mA<br><br>To output pulse trains, a current of 10mA or more needs to be passed<br><br>Pulse frequency range: 38~1600Hz |   |
| FLA<br>FLB<br>FLC | Output | Multifunction programmable relay contact output.<br>Detects the operation of the inverter's protection function.<br>Contact across FLA-FLC is closed and FLB-FLC is opened during protection function operation. | 250Vac-1A (cosϕ=1) : at resistance load 30Vdc-0.5A 250Vac-0.5A (cosϕ=0.4) |   |
| RY<br>RC | Output | Multifunction programmable relay contact output.<br>Standard default settings detect and output low-speed signal output frequencies.<br>Multifunction output terminals to which two different functions can be assigned. | 250Vac-1A (cosϕ=1) : at resistance load 30Vdc-0.5A 250Vac-0.5A (cosϕ=0.4) |   |

2

* PTC (Positive Temperature Coefficient) : Resettable thermal fuse resistor for over current protection

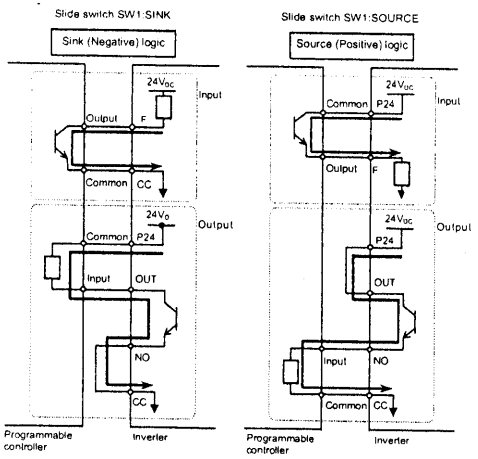


12.2.25

## ■ SINK (Negative) logic/SOURCE (Positive) logic (When the inverter's internal power supply is used)

Current flowing out turns control input terminals on. These are called sink logic terminals. (Type: -AN/-WN)
The general used method in Europe is source logic in which current flowing into the input terminal turns it on (Typ: -WP)
Sink logic is sometimes referred to as negative logic, and source logic is referred to as positive logic.
Each logic is supplied with electricity from either the inverter's internal power supply or an external power supply, and its connections vary depending on the power supply used.

<Examples of connections when the inverter's internal power supply is used>



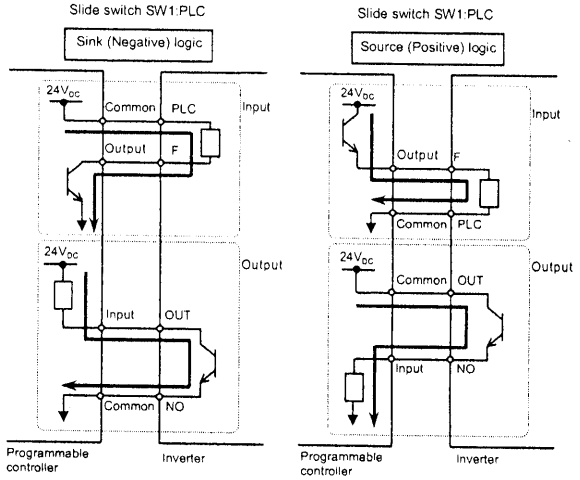





## ■ SINK (Negative) logic/SOURCE (Positive) logic (When an external power supply is used)

The PLC terminal is used to connect to an external power supply or to insulate a terminal from other input or output terminals. As for input terminals, turn the SW1 slide switch to the PLC position.

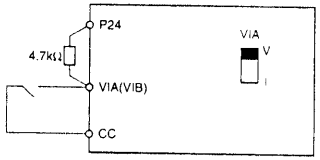
<Examples of connections when an external power supply is used>




## ■ Selecting the functions of the VIA and VIB terminals between analog input and contact input

The functions of the VIA and VIB terminals can be selected between analog input and contact input by changing parameter settings (*F 109*). (Factory default setting: Analog input)
When using these terminals as contact input terminals in a sink logic circuit, be sure to insert a resistor between the P24 and VIA terminals or between the P24 and VIB terminals. (Recommended resistance: 4.7KΩ-1/2W)
When using the VIA terminal as a contact input terminal, be sure to turn the VIA switch to the V position. If no resistor is inserted or the VIA slide switch is not turned to the V position, contact input will be left always ON, which is very dangerous.
Switch between analog input and contact input before connecting the terminals to the control circuit terminals. Otherwise the inverter or devices connected to it may be damaged.

☆ The figure on the right shows an example of the connection of input terminals VIA and VIB when they are used as contact input terminals. This example illustrates the connection when the inverter is used in sink (Negative) logic mode.




## ■ Logic switching/Voltage-current output switching (slide switch)

(1) Logic switching

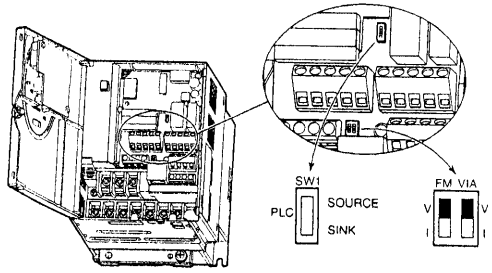
Use SW1 to switch between logics.

Switch between logics before wiring to the inverter and without supplying power. If switching between sink, source and PLC is done when power is turned on after switching or when the inverter is supplied with power, the inverter might become damaged. Confirm it before supplying power.

(2) Voltage-current output switching

Use the FM switch to switch between voltage output and current output.

Switch the FM terminal's voltage-current output before wiring to inverter or without supplying power.




Factory default settings of slide switches

SW1 : SINK (Negative) side (WN, AN type)

SOURCE (Positive) side (WP type)

FM : V side

VIA : V side





# 3. Operations

| Danger | |
|---|---|
| Prohibited | • Do not touch inverter terminals when electrical power is going to the inverter even if the motor is stopped.<br>Touching the inverter terminals while power is connected to it may result in electric shock.<br>• Do not touch switches when the hands are wet and do not try to clean the inverter with a damp cloth.<br>Such practices may result in electric shock.<br>• Do not go near the motor in alarm-stop status when the retry function is selected.<br>The motor may suddenly restart and that could result in injury.<br>Take measures for safety, e.g. attaching a cover to the motor, against accidents when the motor unexpectedly restarts. |
| Mandatory | • Turn power on only after attaching the front cover or closing door if enclosed in a cabinet.<br>If power is turned on without the front cover attached or closing door if enclosed in a cabinet, that may result in electric shock or other injury.<br>• If the inverter begins to emit smoke or an unusual odor, or unusual sounds, immediately turn power off.<br>If the equipment is continued in operation in such a state, the result may be fire. Call your local sales agency for repairs.<br>• Always turn power off if the inverter is not used for long periods of time.<br>• Turn input power on after attaching the front cover.<br>When enclosed inside a cabinet and using with the front cover removed, always close the cabinet doors first and then turn power on. If the power is turned on with the front cover or the cabinet doors open, it may result in electric shock.<br>• Make sure that operation signals are off before resetting the inverter after malfunction.<br>If the inverter is reset before turning off the operating signal, the motor may restart suddenly causing injury. |

| Warning | |
|---|---|
| Contact prohibited | • Do not touch heat radiating fins or discharge resistors.<br>These device are hot, and you'll get burned if you touch them. |
| Prohibited | • Observe all permissible operating ranges of motors and mechanical equipment. (Refer to the motor's instruction manual.)<br>Not observing these ranges may result in injury. |

## 3.1 Simplified Operation of the VF-S11

The procedures for setting operation frequency and the methods of operation can be selected from the following.

Start / Stop : (1) Start and stop using the operation panel keys
(2) Run and stop from the operation panel

Setting the frequency : (1) Setting using the potentiometer on the inverter main unit
(2) Setting using the operation panel
(3) Setting using external signals to the terminal board (0-10Vdc, 4-20mAdc)

Use the basic parameters CMOD (Operation command mode selection), FMOD (Speed setting mode selection).

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| CMOD | Command mode selection | 0: Terminal board<br>1: Panel | 1 |
| FMOD | Frequency setting mode | 0: Internal potentiometer setting<br>1: VIA<br>2: VIB<br>3: Operation panel<br>4: Serial communication<br>5: External contact up/down<br>6: VIA+VIB (Override) | 0 |

* See 5.4 for FMOD=4, 5 and 6.





### 3.1.1 How to start and stop

[Example of a CMOD setting procedure]

| Key operated | LED display | Operation |
|---|---|---|
| | 0.0 | Displays the operation frequency (operation stopped). (When standard monitor display selection F710=0 [Operation frequency]) |
| MODE | RUH | Displays the first basic parameter [History (RUH)]. |
| ▲ ▼ | CMOD | Press either the △ or ▽ key to select "CMOD". |
| ENT | 1 | Press ENTER key to display the parameter setting. (Default setting: 1). |
| ▲ ▼ | 0 | Change the parameter to 0 (terminal board) by pressing the △ key. |
| ENT | 0⇔CMOD | Press the ENTER key to save the changed parameter. CMOD and the parameter set value are displayed alternately. |

(1) Start and stop using the operation panel keys (CMOD= 1)

Use the RUN and STOP keys on the operation panel to start and stop the motor.

RUN : Motor starts. STOP : Motor stops.

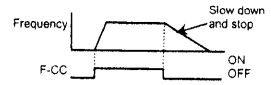
☆ To switch between forward run and reverse run from the control panel, the parameter Fr (forward/reverse run selection) needs to be set to 2 or 3.

(2) RUN/STOP by means of an external signal to the terminal board (CMOD=0): Sink (Negative) logic

Use external signals to the inverter terminal board to start and stop the motor.

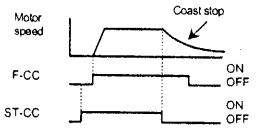
Short F and CC terminals: run forward

Open F and CC terminals: slow down and stop




(3) Coast stop

The standard default setting is for slowdown stop. To make a coast stop, assign a "1(ST)" terminal function to an idle terminal using the programmable terminal function.
Change to F110=0.
For coast stop, open the ST-CC when stopping the motor in the state described at left.The monitor on the inverter at this time will display OFF.






12.2.5

## 3.1.2 How to set the frequency

[Example of a FnOd setting procedure]

| Key operated | LED display | Operation |
|---|---|---|
| | 0.0 | Displays the operation frequency (operation stopped). (When standard monitor display selection F710=0 [Operation frequency]) |
| MODE | AUH | Displays the first basic parameter [History (AUH)]. |
| ▲ ▼ | FnOd | Press either the △ key or ▽ key to select "FnOd". |
| ENT | 0 | Press ENTER key to display the parameter setting. (Default setting: 0). |
| ▲ ▼ | 3 | Change the parameter to 3 (Operation panel) by pressing the △ key. |
| ENT | 3⇔FnOd | Press the ENTER key to save the changed parameter. FnOd and the parameter set value are displayed alternately. |

* Pressing the MODE key twice returns the display to standard monitor mode (displaying operation frequency).

### (1) Setting the frequency using the potentiometer on the inverter main unit (FnOd=0)

Set the frequency with the notches on the potentiometer.

Move clockwise for the higher frequencies.

The potentiometer has hysteresis. So the set value may slightly change when the inverter is turned off, and then turned back on.

### (2) Setting the frequency using the operation panel (FnOd=3)

Set the frequency with the operation panel.

▲ : Moves the frequency up ▼ : Moves the frequency down

■ Example of operating a run from the panel

| Key operated | LED display | Operation |
|---|---|---|
| | 0.0 | Displays the operation frequency. (When standard monitor display selection F710=0 [Operation frequency]) |
| ▲ ▼ | 50.0 | Set the operation frequency. |
| ENT | 50.0⇔FC | Press the ENT key to save the operation frequency. FC and the frequency are displayed alternately. |
| ▲ ▼ | 60.0 | Pressing the △ key or the ▽ key will change the operation frequency even during operation. |

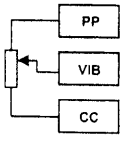




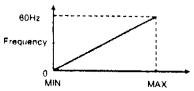
### (3) Setting the frequency using the operation panel (FnOd= 1 or 2)

■ Frequency setting

1) Setting the frequency using external potentiometer

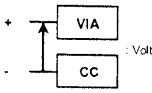



★Potentiometer
Setting frequency using the potentiometer (1-10kΩ, 1/4W)
For more detailed information on adjustments, see 6.5.




* The input terminal VIA can be used in the same way.
FnOd= 1: VIA effective, FnOd=2: VIB effective
For more details, see 6.5.

2) Setting the frequency using input voltage (0~10V)

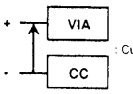



★Voltage signal
Setting frequency using voltage signals (0~10V).
For more detailed information on adjustments, see 6.5.

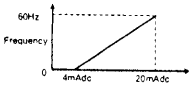
* The input terminal VIB can be used in the same way.
FnOd= 1: VIA effective, FnOd=2: VIB effective
For more details, see 6.5.

Note: Be sure to turn the VIA slide switch to the V (voltage) position.

3) Setting the frequency using current input (4~20mA)




★Current Signal
Current signal Setting frequency using current signals (4~20mA). For more detailed information on adjustments, see 6.5.




* Setting of parameters also allow 0-20mAdc.

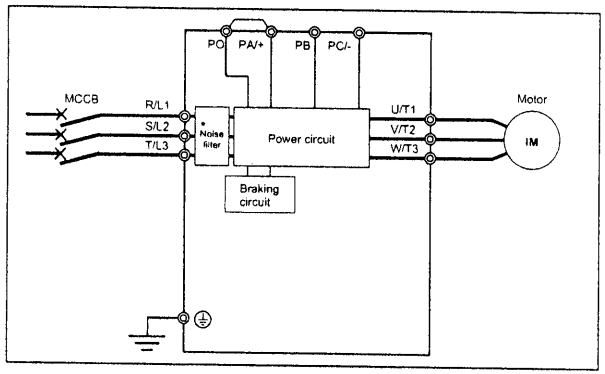
Note: Be sure to turn the VIA slide switch to the I (current) position.

## 3.2 How to operate the VF-S11

Overview of how to operate the inverter with simple examples.

**Ex.1** Setting the operation frequency using built-in potentiometer and running and stopping using the operation panel.

(1) Wiring




Parameter setting (default setting)

| Title | Function | Programmed value |
|---|---|---|
| CMOd | Command mode selection | 1 |
| FMOd | Frequency setting mode selection 1 | 0 |

(3) Operation

Run/stop: Press the (RUN) and (STOP) keys on the panel.

Frequency setting: Set adjusting position of notches on the potentiometer.

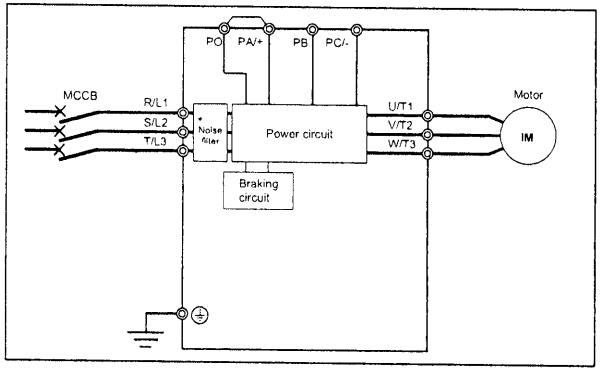
* 600V models have no noise filter inside.





**Ex.2** Setting the operation frequency using the operation panel and running and stopping using the operation panel.

(1) Wiring




(2) Parameter setting

| Title | Function | Programmed value |
|---|---|---|
| CMOd | Command mode selection | 1 |
| FMOd | Frequency setting mode selection 1 | 3 |

(3) Operation

Run/stop: Press the (RUN) and (STOP) keys on the panel.

Frequency setting: Set with the (▲) (▼) keys on the operation panel.

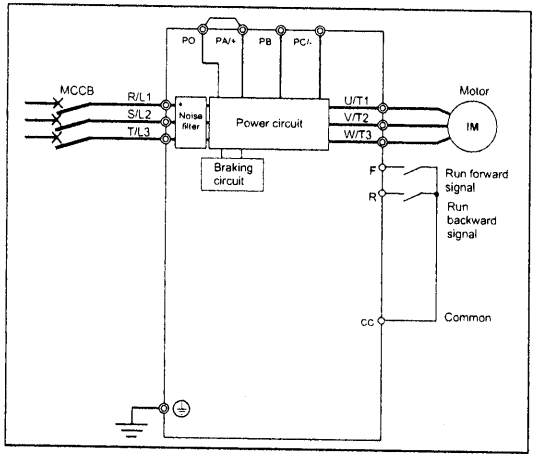
To store the set frequencies in memory, press the (ENT) key.

FC and the set frequency will flash on and off alternately.

* 600V models have no noise filter inside.

## Ex.3 Setting the operation frequency using built-in potentiometer and running and stopping using external signals.

(1) Wiring




(2) Parameter setting

| Title | Function | Programmed value |
|---|---|---|
| CMOd | Command mode selection | 0 |
| FMOd | Frequency setting mode selection | 0 |

(3) Operation

Run/stop: ON/OFF input to F-CC, R-CC. (Set SW1 to Sink logic)

Frequency setting: Set adjusting position of notches on the potentiometer.

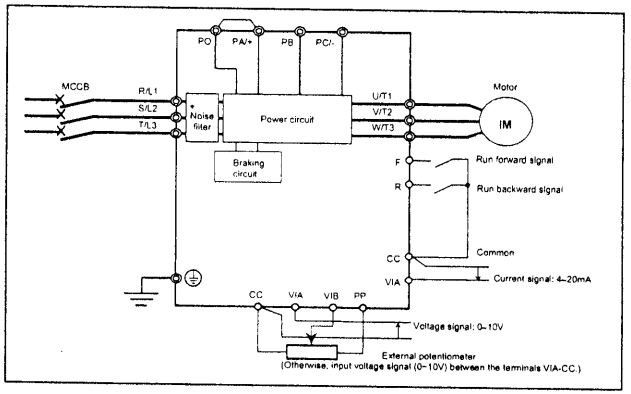
* 600V models have no noise filter inside.





## Ex.4 Operation frequency setting, running and stopping using external signals.

(1) Wiring




(2) Parameter setting

| Title | Function | Programmed value |
|---|---|---|
| CMOd | Command mode selection | 0 |
| FMOd | Frequency setting mode selection | 1or2 |

(3) Operation

Run/stop: ON/OFF input to F-CC, R-CC. (Set SW1 to Sink logic)

Frequency setting: VIA and VIB: 0-10Vdc (External potentiometer)

VIA: Input 4-20mAdc.

Use the VIA slide switch to switch between voltage and current to the VIA terminal.

Voltage input: V side

Current input: I side

* 600V models have no noise filter inside.

# 4. Basic VF-S11 operations

The VF-S11 has the following four monitor modes.

**Standard monitor mode** : The standard inverter mode. This mode is enabled when inverter power goes on.

This mode is for monitoring the output frequency and setting the frequency designated value. In it is also displayed information about status alarms during running and trips.

- Setting frequency designated values ⇒ see 3.1.2
- Status alarm

  If there is an error in the inverter, the alarm signal and the frequency will flash alternately in the LED display.

  *C*: When a current flows at or higher than the overcurrent stall level.
  *P*: When a voltage is generated at or higher than the over voltage stall level.
  *L*: When a load reaches 50% or higher of the overload trip value.
  *H*: When the temperature reaches the overheating protection alarm level.

**Setting monitor mode** : The mode for setting inverter parameters.

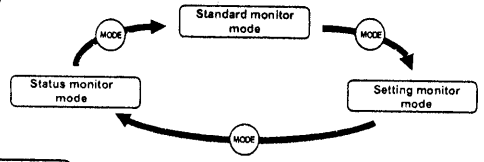
How to set parameters ⇒ see 4.2

**Status monitor mode** : The mode for monitoring all inverter status.

Allows monitoring of set frequencies, output current/voltage and terminal information.

For more on how to use the monitor ⇒ see 8.1.

Pressing the key (MODE) will move the inverter through each of the modes.




**Panel jog mode** : This mode allows you to jog the motor by controlling the operation from the operation panel.
This mode is hidden by default.

To use the panel jog mode, set the parameter *F262* to *1*.

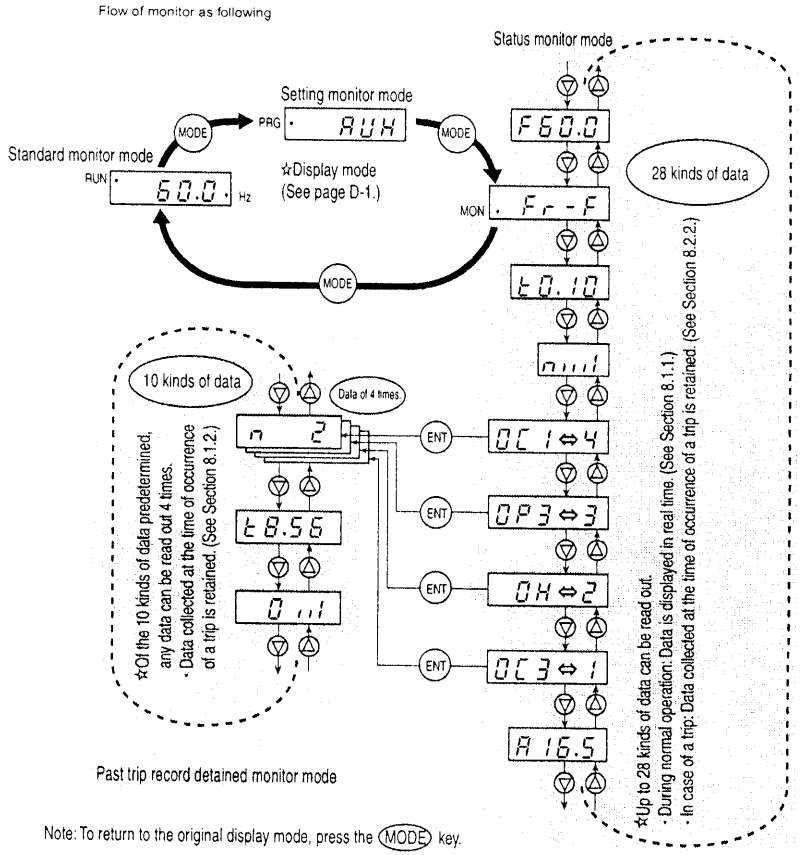
Jog run mode ⇒ see 6.9





## 4.1 Flow of status monitor mode

Flow of monitor as following




Note: To return to the original display mode, press the (MODE) key.

## 4.2 How to set parameters

The standard default parameters are programmed before the unit is shipped from the factory. Parameters can be divided into 4 major categories. Select the parameter to be changed or to be searched and retrieved.

- **Basic parameters** : The basic parameters that must be programmed before the first use. (See 4.2.1)
- **Extended parameters** : The parameters for detailed and special setting. (See 4.2.2)
- **User parameters** (automatic edit function) : Indicates parameters that are different from the standard default setting parameters. Use them to check after setting and to change setting. (Parameter title: Ur.U). (See 4.2.3)
- **History parameter** : This parameter has the function of displaying, in reverse chronological order, the five parameters that were changed last. This function comes in very handy when you adjust the inverter repeatedly using the same parameter. (Parameter name: RUH). (See 4.2.4)

4

* Adjustment range of parameters
  - H I: An attempt has been made to assign a value that is higher than the programmable range. Or, as a result of changing other parameters, the programmed value of the parameter that is now selected exceeds the upper limit.
  - L O: An attempt has been made to assign a value that is lower than the programmable range. Or, as a result of changing other parameters, the programmed value of the parameter that is now selected exceeds the lower limit.

  If the above alarm is flashing on and off, no setting can be done of values that are equal to or greater than H I or equal to or lower than L O.





### 4.2.1 How to set the basic parameters

All of the basic parameters can be set by the same step procedures.

[Steps in key entry for basic parameters]

MODE → Switches to the setting monitor mode.

▲ ▼ → Selects parameter to be changed.

ENT → Reads the programmed parameter setting.

▲ ▼ → Changes the parameter setting.

ENT → Saves the changed value of the parameter setting.

4

* Parameters were factory-set by default before shipment.
* Select the parameter to be changed from "Table of parameters".
* If there is something that you do not understand during the operation, press the MODE key to return to the 0.0 indication.
* See 11.2 for basic parameters.

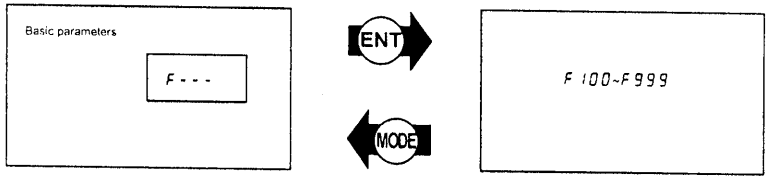
Steps in setting are as follows (example of changing the maximum frequency from 80Hz to 60Hz).

| Key operated | LED display | Operation |
|---|---|---|
| | 0.0 | Displays the operation frequency (operation stopped). (When standard monitor display selection F710=0 [Operation frequency]) |
| MODE | RUH | The first basic parameter "RUH" (history function) is displayed. |
| ▲ ▼ | FH | Press either the △ or ▽ key to select "FH". |
| ENT | 80.0 | Pressing the ENTER key reads the maximum frequency. |
| ▲ ▼ | 60.0 | Press the △ key to change the maximum frequency to 60Hz. |
| ENT | 60.0⇔FH | Press the ENT key to save the maximum frequency. FH and the frequency are displayed alternately. |

After this, ENT →Displays the same programmed parameter. MODE →Switches to the display in the status monitor mode. ▲ ▼ →Displays names of other parameters.

## 4.2.2 How to set extended parameters

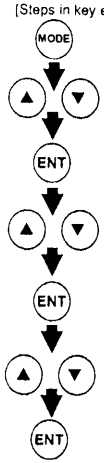
The VF-S11 has extended parameters to allow you to make full use of its functions.
All extended parameters are expressed with F and three digits.




Press the MODE key once and use the ▲▼ key to select F - - - from the basic parameters.

Press the ▲ key or the ▼ key to change the set value. Pressing the ENTER key allows the reading of parameter setting.

[Steps in key entry for extended parameters]




: switches to the setting monitor mode.(Displays AUH)

* See 11.3 for extended parameters.

: Selects "F - - -" from basic parameters.

: The first extended parameter "F 100" (Low-speed signal output frequency) is displayed.

: Selects the extended parameter whose setting needs to be changed.

: Reads the programmed parameter setting.

: Changes the parameter setting.

Saves the changed value of the extended parameter setting.
Pressing the MODE key instead of the ENT key moves back to the previous status.





■ Example of parameter setting

Steps in setting are as follows
(Example of changing the dynamic braking selection F304 from 0 to 1.)

| Key operated | LED display | Operation |
|---|---|---|
| | 0.0 | Displays the operation frequency (operation stopped). (When standard monitor display selection F710=0 [Operation frequency]) |
| MODE | AUH | The first basic parameter "AUH" (history function) is displayed. |
| ▲ ▼ | F - - - | Press either the △ or the ▽ to change to the parameter group F - - -. |
| ENT | F100 | Press the ENTER key to display the first extended parameter F100. |
| ▲ ▼ | F304 | Press the △ key to change to the dynamic braking selection F304. |
| ENT | 0 | Pressing the ENTER key allows the reading of parameter setting. |
| ▲ ▼ | 1 | Press the△key to change the dynamic braking selection from 0 to 1. |
| ENT | 1⇔F304 | Pressing the ENTER key alternately flashes on and off the parameter and changed value and allows the save of those values. |

If there is anything you do not understand during this operation, press the MODE key several times to start over from the step of AUH display.

## 4.2.3 Search and resetting of changed parameters (Gr.U)

Automatically searches for only those parameters that are programmed with values different from the standard default setting and displays them in the user parameter group Gr.U. Parameter setting can also be changed within this group.

Notes on operation
- If you reset a parameter to its factory default, the parameter will no longer appear in Gr.U.
- F00, F470 - F473 are not appeared, if the value of these parameters are changed.

■ How to search and reprogram parameters

The operations of search and resetting of parameters are as follows.

| Key operated | LED display | Operation |
|---|---|---|
| | 0.0 | Displays the operation frequency (operation stopped). (When standard monitor display selection F710=0 [Operation frequency]) |
| MODE | AUH | The first basic parameter "AUH" (history function) is displayed. |
| ▲ ▼ | Gr.U | Press △ or ▽ key to select Gr.U. |

| Key operated | LED display | Operation |
|---|---|---|
| ENT | U - - - | Press the ENTER key to enable the user parameter automatic edit function. |
| ENT or ▲ ▼ | U - - F (U - - r) ↓ ACC | Searches for parameters that are different in value from the standard default setting and displays those parameters. Press the ENTER key or the △ key to change the parameter displayed. (Pressing the ▽ key moves the search in the reverse direction). |
| ENT | 8.0 | Press the ENTER key to display the set value. |
| ▲ ▼ | 5.0 | Press the△ key and▽ key to change set value. |
| ENT | 5.0⇔ACC | Press the ENTER key to save the changed value. The parameter name and the programmed value will flash on and off alternately. After the change has been saved, "U - - -" is displayed. |
| ▲ (▼) | U - - F (U - - r) | Use the same steps as those given above to display parameters that you want to search for or change setting with the △ key and ▽ key. |
| ▲ (▼) | Gr.U | When Gr.U appears again, the search is ended. |
| MODE MODE | Gr.U ↓ Fr - F ↓ 0.0 | A search can be canceled by pressing the MODE key. Press the MODE key once while the search is underway to return to the display of parameter setting mode. After that you can press the MODE key to return to the status monitor mode or the standard monitor mode (display of operation frequency). |

If there is anything you do not understand during this operation, press the (MODE) key several times to start over from the step of AUH display.

## 4.2.4 Searching for a history of changes, using the history function (AUH)

History function (AUH):
Automatically searches for 5 latest parameters that are programmed with values different from the standard default setting and displays them in the AUH. Parameter setting can also be changed within this group AUH.

Notes on operation
- If no history information is stored, this parameter is skipped and the next parameter "AU 1" is displayed.
- HEAd and End are added respectively to the first and last parameters in a history of changes.





■ How to use the history function

| Key operated | LED display | Operation |
|---|---|---|
| | 0.0 | Displays the operation frequency (operation stopped). (When standard monitor display selection F 710=0 [Operation frequency]) |
| MODE | AUH | The first basic parameter "AUH" (history function) is displayed. |
| ENT | ACC | The parameter that was set or changed last is displayed. |
| ENT | 8.0 | Press the ENTER key to display the set value. |
| ▲ ▼ | 5.0 | Press the△ key and▽ key to change set value. |
| ENT | 5.0⇔ACC | Press the ENTER key to save the changed value. The parameter name and the programmed value will flash on and off alternately. |
| ▲ (▼) | .... | Use the same steps as those given above to display parameters that you want to search for or change setting with the △ key and ▽ key. |
| ▲ (▼) | HEAd (End) | HEAd: First historic record<br>End: Last historic record |
| MODE MODE MODE | Parameter display ↓ AUH ↓ Fr - F ↓ 0.0 | Press the MODE key to return to the parameter setting mode "AUH." After that you can press the MODE key to return to the status monitor mode or the standard monitor mode (display of operation frequency). |

Note) Parameter F 700 (Prohibition of change of parameter settings) is not displaied in this "AUH".

## 4.2.5 Parameters that cannot be changed while running

For safety reasons, the following parameters have been set up so that they cannot be reprogrammed while the inverter is running. Stop operation ("0.0" or "OFF" is displayed) before changing parameter settings.

[Basic parameters]

- AU1 (Automatic acceleration/deceleration)
- AU2 (Parameter setting macro torque boost)
- AU4 (Parameter setting macro function)
- CMOd (Command mode selection)
- FMOd (Frequency setting mode selection 1)

} Set F736, and they can be changed while the inverter is running.

- tYP (Default setting)
- FH (Maximum frequency)
- uL (Base frequency 1)
- uLu (Base frequency voltage1)
- Pt (V/F control mode selection 1)

[Extended parameters]

- F105 : Priority selection
- F108~F118 : Input terminal selection parameters
- F130~F139 : Output terminal selection parameters
- F170 : Base frequency 2
- F171 : Base frequency voltage 2
- F261 : Jog stopping pattern
- F301~F311 : Protection parameters
- F316 : Carrier frequency control mode selection
- F342~F345 : Braking mode parameters
- F400 : Auto-tuning
- F415~F419 : Motor constant parameters
- F480~F496 : Motor control parameters
- F603 : Emergency stop selection
- F605 : Output phase failure detection mode selection
- F608 : Input phase failure detection mode selection
- F613 : Detection of output short-circuit during start-up selection
- F626 : Over-voltage stall protection level
- F627 : Under voltage trip/alarm selection
- F669 : Logic output/pulse train output selection (OUT-NO)
- F910~F912 : PM motor parameters

The setting of any parameter other than the above can be changed even during operation.
Keep in mind, however, that when the parameter F700 (prohibition of change of parameter settings) is set to 1 (prohibited), no parameters can be set or changed.





## 4.2.6 Returning all parameters to standard default setting

Setting the standard default setting parameter tYP=3, all parameters can be returned to the those factory default settings.
Note: For more details on the standard default setting parameter tYP, see 5.6.

Notes on operation

- We recommend that before this operation you write down on paper the values of those parameters, because when setting tYP=3, all parameters with changed values will be returned to standard factory default setting.
- Note that FM, FMSL, F109, F470 - F473, F669 and F880 will not be reset to their factory default settings.

■ Steps for returning all parameters to standard default setting

| Key operated | LED display | Operation |
|---|---|---|
| | 0.0 | Displays the operation frequency (perform during operation stopped) |
| MODE | AUH | The first basic parameter "AUH" (history function) is displayed. |
| ▲ ▼ | tYP | Press the △ key or the ▽ key to change to tYP. |
| ENT | 3 0 | Pressing the ENTER key displays the programmed parameters. (tYP will always display "0(zero)" on the right, the previous setting on the left.) |
| ▲ ▼ | 3 3 | Press the△ key or the▽ key to change the set value. To return to standard factory default setting, change to "3". |
| ENT | In It | Pressing the ENTER key displays " In It " while returning all parameters to factory default setting. |
| | 0.0 | The monitor returns to the display of setup parameters. |

If there is anything you do not understand during this operation, press the MODE key several times to start over from the step of AUH display.

## 4.2.7 How to save/load the user setting parameters

The current settings of all parameters can be stored (saved) in memory at a time by setting the standard setting mode selection parameter tYP to 1. Also, all parameter settings stored in memory can be restored (loaded) by setting parameter tYP to 8. This means that you can use this parameter (tYP=1 and 8) as the parameter for your own initial settings (default settings).



4.2.5

# 5. Basic parameters

Before you operate the inverter, the parameters that you must first program are the basic parameters.

## 5.1 Setting acceleration/deceleration time

AU 1 : Automatic acceleration/deceleration

ACC : Acceleration time 1

dEC : Deceleration time 1

- Function
  1) For acceleration time 1 ACC programs the time that it takes for the inverter output frequency to go from 0Hz to maximum frequency FH.
  2) For deceleration time 1 dEC programs the time that it takes for the inverter output frequency to got from maximum frequency FH to 0Hz.

### 5.1.1 Automatic acceleration/deceleration

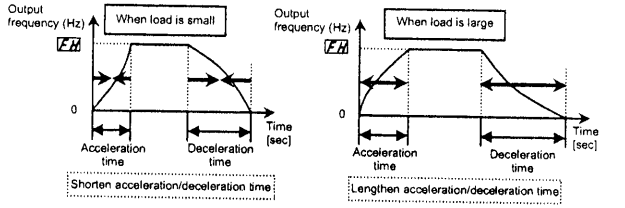
This automatically adjusts acceleration and deceleration time in line with load size.

AU 1 = 1

* Adjusts the acceleration/deceleration time automatically within the range of 1/8 to 8 times as long as the time set with the ACC or dEC, depending on the current rating of the inverter.

AU 1 =2

* Automatically adjusts speed during acceleration only. During deceleration, speed is not adjusted automatically but reduced at the rate set with dEC.




Set AU 1 (automatic acceleration/deceleration) to 1 or 2.





[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| AU 1 | Automatic acceleration/deceleration | 0: Disabled (manual)<br>1: Automatic<br>2: Automatic (only at acceleration) | 0 |

☆ When automatically setting acceleration/deceleration time, always change the acceleration/deceleration time so that it conforms to the load. The acceleration/deceleration time changes constantly with load fluctuations. For inverters that requires a fixed acceleration/deceleration time, use the manual settings (ACC, dEC).

☆ Setting acceleration/deceleration time (ACC, dEC) in conformance with mean load allows optimum setting that conforms to further changes in load.

☆ Use this parameter after actually connecting the motor.

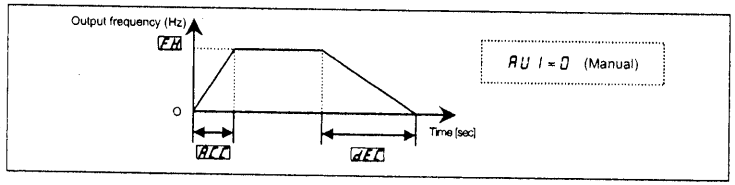
☆ When the inverter is used with a load that fluctuates considerably, it may fail to adjust the acceleration or deceleration time in time, and therefore may be tripped

[Methods of setting automatic acceleration/deceleration]

| Key operated | LED display | Operation |
|---|---|---|
| | 0.0 | Displays the operation frequency.<br>(When standard monitor display selection F710 is set to 0 [Operation frequency]) |
| MODE | AUH | The first basic parameter "AUH" (history function) is displayed. |
| ▲ | AU 1 | Press the △ key to change the parameter to AU 1. |
| ENT | 0 | Pressing the ENTER key allows the reading of parameter setting. |
| ▲ | 1 | Press the △ key to change the parameter to 1 or 2. |
| ENT | 1⇔AU 1 | Press the ENTER key to save the changed parameter. AU 1 and the parameter are displayed alternately. |

### 5.1.2 Manually setting acceleration/deceleration time

Set acceleration time from 0 (Hz) operation frequency to maximum frequency FH and deceleration time as the time when operation frequency goes from maximum frequency FH to 0 (Hz).



[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| ACC | Acceleration time 1 | 0.0-3200 sec. | 10.0 |
| dEC | Deceleration time 1 | 0.0-3200 sec. | 10.0 |

Note: When the acceleration/deceleration time is set at 0.0 seconds, the inverter speed increases or reduces speed within 0.05 seconds.

☆ If the programmed value is shorter than the optimum acceleration/deceleration time determined by load conditions, overcurrent stall or overvoltage stall function may make the acceleration/deceleration time longer than the programmed time. If an even shorter acceleration/deceleration time is programmed, there may be an overcurrent trip or overvoltage trip for inverter protection. (For further details, see 13.1)

## 5.2 Increasing starting torque

### AU2: Torque boost setting macro function

- Function
  Simultaneously switches inverter output (V/F) control and programs motor constants automatically (On-line automatic-tuning function) to improve torque generated by the motor. This parameter integrates the setting of special V/F control selection such as vector control.

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| AU2 | Torque boost setting macro function | 0: Disabled<br>1: Automatic torque boost + auto-tuning<br>2: Vector control + auto-tuning<br>3: Energy saving + auto-tuning | 0 |

Note: Parameter displays on the right always return to 0 after setting. The previous setting is displayed on the left.
Ex. 1 0

#### 1) Increasing torque automatically according to the load

Set AU2 is set to 1 (automatic torque boost + auto-tuning)

When AU2 is set to 1 (automatic torque boost + auto-tuning), the inverter keeps track of the load current in any speed range and automatically adjusts the output voltage to ensure enough torque and stable operation.

Note 1: The same characteristic can be obtained by setting the V/F control mode selection parameter Pt to 2 (automatic torque boost control) and the auto-tuning parameter F400 to 2 (auto-tuning).
⇒ See 5.12

Note 2: Setting AU2 to 1 automatically programs Pt to 2.

Note 3: The accuracy of auto-tuning can be increased by specifying the rated current of the driven motor, using the motor rated current setting parameter F415.





#### 2) When using vector control (increasing starting torque and high-precision operations)

Set AU2 to 2 (vector control + auto-tuning)

Setting AU2 to 2 (vector control + auto-tuning) provides high starting torque bringing out the maximum in motor characteristics from the low-speed range. This suppresses changes in motor speed caused by fluctuations in load to provide high precision operation. This is an optimum feature for elevators and other load transporting machinery.

Note 1: The same charactenstic can be obtained by setting the V/F control mode selection parameter Pt to 3 (vector control) and the auto-tuning parameter F400 to 2 (auto-tuning). ⇒ See 5.12

Note 2: Setting AU2 to 2 automatically programs Pt to 3.

#### 3) Energy-saving operation

AU2 is set to 3 (energy saving + auto-tuning)

When AU2 is set to 3 (energy saving + auto-tuning), the inverter always passes a current appropriate to the load for energy saving.

Note 1: The same charactenstic can be obtained by setting the V/F control mode selection parameter Pt to 4 (automatic energy saving) and the auto-tuning parameter F400 to 2 (auto-tuning).

Note 2: When AU2 is set to 3, Pt is automatically set to 4.

[Example of parameter setting]

| Key operated | LED display | Operation |
|---|---|---|
| | 0.0 | Displays the operation frequency. (Perform during operation stopped.) (When standard monitor display selection F710 is set to 0 [Operation frequency]) |
| MODE | AUH | The first basic parameter "AUH" (history function) is displayed. |
| ▲ | AU2 | Press the △ key to change the parameter to AU2 |
| ENT | 0 0 | Pressing the ENTER key allows the reading of parameter setting. |
| ▲ | 0 3 | Change the parameter setting to 3 (energy saving + auto-tuning), using the △ key. |
| ENT | 0 3⇔AU2 | Press the ENTER key to save the changed parameter. AU2 and the parameter are displayed alternately. |

If vector control cannot be programmed....
First read the precautions about vector control in 5.11, 8.
1) If the desired torque cannot be obtained ⇒ see 6.17.1
2) If auto-tuning error "Etn" appears ⇒ see 6.17.1

■ AU2 (Torque boost setting macro function) and Pt (V/F control mode selection)

Automatic torque boost is the parameter for setting V/F control mode selection (Pt) and auto-tuning (F400) together. That is why all parameters related to change automatically when AU2 is changed.

| AU2 | | Automatically programmed parameters | | |
|---|---|---|---|---|
| | | Pt | | F400 |
| 0 | Displays 0 after resetting | - | Check the programmed value of Pt. | - |
| 1 | Automatic torque boost + auto-tuning | 2 | Automatic torque boost | Executed (0 after execution) |
| 2 | Vector control + auto-tuning | 3 | Sensorless vector control | Executed (0 after execution) |
| 3 | Energy saving + auto-tuning | 4 | Energy saving | Executed (0 after execution) |

4) Increasing torque manually (V/F constant control)

This is the setting of constant torque characteristics that are suited for such things as conveyors. It can also be used to manually increase starting torque.

If V/F constant control is programmed after changing AU2.

Set V/F control mode selection Pt = 0 (V/F constant).

⇒ see 5.11

Note 1: To further increase torque, increase the torque boost amount 1ub.
How to set the torque boost amount 1ub
⇒ see 5.12

Note 2: V/F control selection Pt = 1 (variable torque) is an effective setting for load such as fans and pumps.
⇒ see 5.11





## 5.3 Specifying an operation mode, using parameters

### AU4: Parameter setting macro function

- Function
  Automatically programs all parameters (parameters described below) related to the functions by selecting the inverter's operating method.
  The major functions can be programmed simply.

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| AU4 | Parameter setting macro function | 0: Disabled<br>1: Coast stop<br>2: 3-wire operation<br>3: External input UP/DOWN setting<br>4: 4-20mA current input operation | 0 |

Note: When this parameter is invoked after it has been set, 0 is always displayed (on the right side).
The number on the left side refers to the number specified previously.
Example [1 0]

Automatically programmed functions and parameter set values

| Relational parameter | Default setting value | 1: Coast stop | 2: 3-wire operation | 3: External input UP/DOWN setting | 4: 4-20mA current input operation |
|---|---|---|---|---|---|
| CN0d | 1: Operation panel | 0: Terminal board | 0: Terminal board | 0: Terminal board | 0: Terminal board |
| FN0d | 0: Potentiometer | 0: Potentiometer | 0: Potentiometer | 5: UP/DOWN from external contact | 1: VIA |
| F110 (Always) | 1: ST | 0: Disabled | 1: ST | 1: ST | 1: ST |
| F111 (F) | 2:F | 2:F | 2:F | 2:F | 2:F |
| F112 (R) | 3:R | 3: | 3:R | 3:R | 3:R |
| F113 (RES) | 10: RES | 10: RES | 10: RES | 10: RES | 10: RES |
| F114 (S1) | 6: SS1 | 6: SS1 | 6: SS1 | 41:UP | 6: SS1 |
| F115 (S2) | 7: SS2 | 7: SS2 | 7: SS2 | 42: DOWN | 7: SS2 |
| F116 (S3) | 8: SS3 | 1: ST | 49: HD | 43: CLR | 38: FCHG |
| F201 | 0 (%) | - | - | - | 20 (%) |

Note) See K-16 for input terminal functions.

Disabled (AU4=0)

The parameter does nothing. Even if set to 0, AU4 will not return the setting you made to its factory default.

Coast stop (AU4=1)

Setting for coast stopping. In sink logic mode, closing the circuit between the S3 and CC terminals places the inverter in standby mode and opening the circuit places it in coast stop mode, because ST (standby signal) is assigned to the S3 terminal.

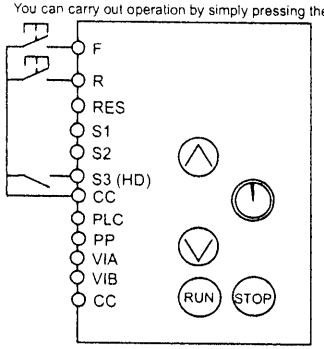
Refer to 3.1.1 (3) and 6.3.1 for details.

3-wire operation (AU4=2)

Can be operated by a momentary push-button. HD (operation holding) is assigned to the terminal S3. A self-holding of operations is made in the inverter by connecting the stop switch (b-contact) to the S3 terminal and connecting the running switch (a-contact) to the F terminal or the R terminal.

☆ Three-wire operation (one-touch operation)

You can carry out operation by simply pressing the ON/OFF button.




Selecting HD (operation holding) with the input terminal selection parameter

Select HD (operation holding) using the input terminal selection parameter, and turn HD on to get the inverter ready for operation or turn HD off to stop operation.

Note 1 : To carry out three-wire operation, set F110 to 1 (ST) and CNOd to 0 (terminal board).
To assign HP (operation holding) to input terminal S3, set parameter F116 to 49 (operation holding).

Note 2 : Even if each terminal is ON, any command entered through a terminal is ignored when power is turned on (to prevent the load from starting to move unexpectedly). Enable to turn the input terminal on at power on.

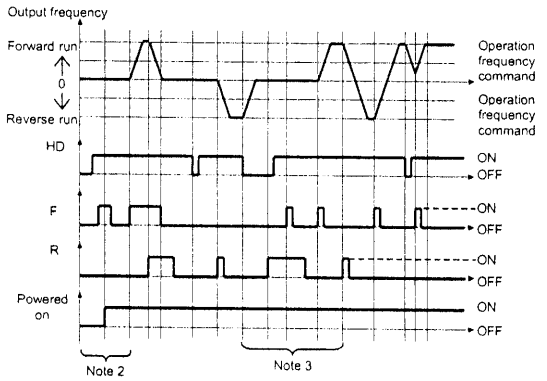
Note 3 : When HD is OFF, any attempt to turn on F or R is ignored. When R is ON, you cannot start operation by turning on HD. Even when both R and HD are ON, you cannot start operation by turning on F. To start operation, turn off F and R temporarily, then turn them back on.

Note 4 : If select Jog run command during three-wire operation, inverter stops.

Note 5 : Sending out a RUN signal during DC braking has no effect in stopping DC braking








External input UP/DOWN setting (AU4=3)

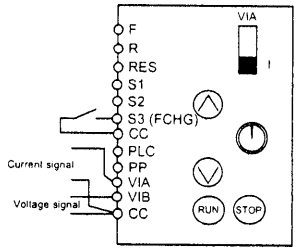
Allows setting of frequency with the Input from an external contact. Can be applied to changes of frequencies from several locations.

UP (frequency up signal input from external contact) is assigned to the S1 terminal, and DOWN (frequency down signal input from external contact) are assigned to the S2 and CLR (frequency up/down clear signal input from external contact) are assigned to the S3 terminals respectively. Frequencies can be changed by input to the S1 and S2 terminals.

Refer to 6.5.3 for details.

4-20 mA current input(AU4=4)

Used for setting frequencies with 4-20mA current input. Switching between remote control and manual control (different frequency commands) can be made by turning on or off the S3 terminal, because FCHG (forced change of frequency commands) is assigned to the S3 terminal with priority current input.






12.2.5

## 5.4 Selection of operation mode

CMOD: Command mode selection

FMOD: Frequency setting mode selection 1

- Function
  These parameters are used to specify which input device (operation panel or terminal board) takes priority in entering an operation stop command or a frequency setting command (internal potentiometer, VIA, VIB, operation panel, serial communication device, external contact up/down, VIA+VIB).

<Command mode selection>

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| CMOD | Command mode selection | 0: Terminal board<br>1: Operation panel | 1 |

Programmed value

0: Terminal board operation — ON and OFF of an external signal Runs and stops operation.

1: Operation panel operation — Press the (RUN) and (STOP) keys on the operation panel to start and stop.

- There are two types of function: the function that conforms to commands selected by CMOD, and the function that conforms only to commands from the terminal board. See the table of input terminal function selection in Chapter 11.
- When priority is given to commands from a linked computer or terminal board, they have priority over the setting of CMOD.

<Frequency setting mode selection>

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| FMOD | Frequency setting mode selection 1 | 0: Built-in potentiometer<br>1: VIA<br>2: VIB<br>3: Operation panel<br>4: Serial communication<br>5: UP/DOWN from external contact<br>6: VIA+VIB (Override) | 0 |





[Programmed value]

0: Potentiometer — The internal potentiometer to the inverter is used for setting frequencies. Turning the notches clockwise raises the frequency.

1: VIA input — A frequency command is set by means of a signal from an external input device (VIA terminal: 0-10Vdc or 4-20mAdc).

2: VIB input — An external signal (VIB terminal: 0-10Vdc) is used to specify a frequency command.

3: Operation panel — Press the (▲) key or the (▼) key on either the operation panel or the expansion panel (optional) to set frequency.

4: Communication — Frequencies are set by commands from an external control unit.

5: UP/DOWN frequency — Terminals are used to specify an up/down frequency command.

6: VIA+VIB (Override) — The sum of the values entered through the VIA and VIB terminals is used as a frequency command value.

☆ No matter what value the command mode selection CMOD and the frequency setting mode selection FMOD are set to the control input terminal functions described below are always in operative state.
- Reset terminal (default setting: RES, valid only for tripping)
- Standby terminal (when programmed by programmable input terminal functions).
- External input tripping stop terminal command (when so set using the programmable input terminal function)

☆ To make changes in the command mode selection CMOD and the frequency setting mode selection 1 FMOD, first stop the inverter temporarily.
(Can be changed while in operation when F736 is set to 0.)

### ■ Preset-speed operation

CMOD: Set to 0 (Terminal board).
FMOD: Valid in all setting values.

## 5.5 Meter setting and adjustment

FMSL: Meter selection

FM: Meter adjustment

- Function
  The signal output from the FM terminal is an analog voltage signal.
  For the meter, use either a full-scale 0-1mAdc ammeter or full-scale 0-7.5Vdc (or 10Vdc-1mA) voltmeter.
  Switching to 0-20mAdc (4-20mAdc) output current can be made by turning the FM slide switch to the I position. When switching to 4-20mAdc current input, make adjustments using F691 (analog output gradient) and F692 (analog output bias).

[Connected meter selection parameters]

| Title | Function | Adjustment range | Supposition output at FMSL = 17 | Default setting |
|---|---|---|---|---|
| FMSL | Meter selection | 0: Output frequency<br>1: Output current<br>2: Set frequency<br>3: DC voltage<br>4: Output voltage command value<br>5: Input power<br>6: Output power<br>7: Torque<br>8: Torque current<br>9: Motor cumulative load factor<br>10: Inverter cumulative load factor<br>11: PBR (braking resistor) cumulative load factor<br>12: Frequency setting value (after PID)<br>13: VIA/II Input value<br>14: VIB Input value<br>15: Fixed output 1 (Output current: 100%)<br>16: Fixed output 2 (Output current: 50%)<br>17: Fixed output 3 (Other than the output current: 100%)<br>18: Serial communication data<br>19: For adjustments (FM set value is displayed.) | Maximum frequency (FH)<br>-<br>Maximum frequency (FH)<br>1.5 times of rated voltage<br>1.5 times of rated voltage<br>1.85 times of rated power<br>1.85 times of rated power<br>2.5 times of rated torque<br>2.5 times of rated torque<br>Rated load factor<br>Rated load factor<br>Rated load factor<br>Maximum frequency (FH)<br>Maximum input value<br>Maximum input value<br>-<br>-<br>-<br>-<br>- | 0 |
| FM | Meter adjustment | - | - | - |

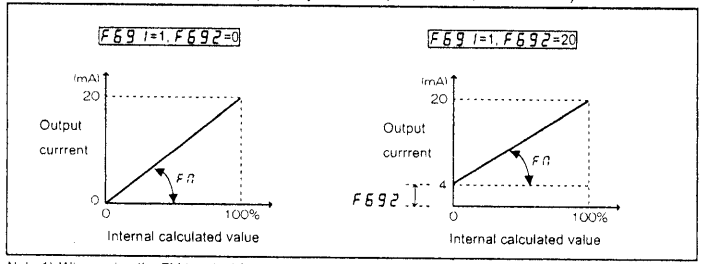




■ Resolution

All FM terminals have a maximum of 1/1000.

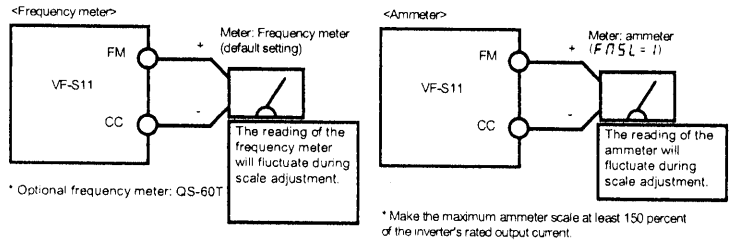
■ Example of 4-20mA output adjustment (for details, see 6.20.2)




Note 1) When using the FM terminal for current output, be sure that the external load resistance is less than 750Ω.
Note 2) Note that, if FMSL is set to 7 (torque), data will be updated at intervals of more than 40 ms.

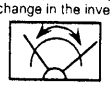
■ Adjustment scale with parameter FM (Meter adjustment)

Connect meters as shown below.



[Example of how to adjustment the FM terminal frequency meter]

- Use the meter's adjustment screw to pre-adjust zero-point.

| Key operated | LED display | Operation |
|---|---|---|
| - | 60.0 | Displays the operation frequency.<br>(When standard monitor display selection F710 is set to 0 [Operation frequency]) |
| MODE | AUH | The first basic parameter "AUH" (history function) is displayed. |
| ▲ ▼ | FM | Press either the △ or the ▽ key to select "FM". |
| ENT | 60.0 | Press the ENTER key to display the operation frequency. |
| ▲ ▼ | 60.0 | Press either the △ key or the ▽ key to adjust the meter.<br>The meter reading will change at this time but be careful because there will be no change in the inverter's digital LED (monitor) indication.<br>  <br>[Hint]<br>It's easier to make the adjustment if you push and hold for several seconds. |
| ENT | 60.0 ⇔ FM | The adjustment is complete. FM and the frequency are displayed alternately. |
| MODE + MODE | 60.0 | The display returns to its original indications.<br>(When standard monitor display selection F710 is set to 0 [Operation frequency]) |

## ■ Adjusting the meter in inverter stop state

- Adjustment of output current (FMSL = 1)
  If, when adjusting the meter for output current, there are large fluctuations in data during adjustment, making adjustment difficult, the meter can be adjusted in inverter stop state.
  When setting FMSL to 15 for fixed output 1 (100% output current), a signal of absolute values will be output (inverter's rated current = 100%). In this state, adjust the meter with the FM (Meter adjustment) parameter.
  Similarly, if you set FMSL to 16 for fixed output 2 (output current at 50%), a signal that is sent out when half the inverter's rated current is flowing will be output through the FM terminal.
  After meter adjustment is ended, set FMSL to 1 (output current).

- Adjustment of other items (FMSL=0, 2 to 14)
  If parameter FMSL is set to 17: Fixed output 3 (Other than the output current: 100%), a signal that is sent out when FMSL is set to 0, 2 to 14 (100%) will be output through the FM terminal.
  100% standard value for each item is the following:
  FMSL=0, 2, 12 : Maximum frequency (FH)
  FMSL=3, 4 : 1.5 times of rated voltage
  FMSL=5, 6 : 1.85 times of rated power
  FMSL=7, 8 : 2.5 times of rated torque
  FMSL=9, 10, 11 : Rated load factor
  FMSL=13, 14 : Maximum input value





# 5.6 Standard default setting

**ETYP: Default setting**

- Function
  Allows setting of all parameters to the standard default setting, etc. at one time.
  Note that FM, FMSL, F109, F470 ~ F473, F669 and F800 will not be reset to their factory default settings.

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| ETYP | Default setting | 0: -<br>1: 50Hz default setting<br>2: 60Hz default setting<br>3: Standard default setting (Initialization)<br>4: Trip record clear<br>5: Cumulative operation time clear<br>6: Initialization of type information<br>7: Save user-defined parameters<br>8: Call user-defined parameters<br>9: Cumulative fan operation time record clear | 0 |

★ This function will be displayed as 0 during reading on the right. This previous setting is displayed.
Example: 3 0

★ ETYP cannot be set during the inverter operating. Always stop the inverter first and then program.

### Programmed value

**Default setting (ETYP = 3)**

Setting ETYP to 3 will return all parameters to the standard values that were programmed at the factory. (Refer to 4.2.6)

☆ When 3 is programmed, <In it> will be displayed for a short time after setting and will then be erased and displayed the original indication 0.0. Trip history data will be cleared at this time.

**Trip clear (ETYP = 4)**

Setting ETYP to 4 initializes the past four sets of recorded error history data.

☆ The parameter does not change.

**Cumulative operation time clear (ETYP = 5)**

Setting ETYP to 5 resets the cumulative operation time to the initial value (zero).

**Cumulative operation time clear (ETYP = 6)**

Setting ETYP to 6 clears the trips when an EETYP format error occurs. But if the EETYP displayed, call us.

Save user setting parameters (Ł YP = 7)

Setting Ł YP to 7 saves the current settings of all parameters. (Refer to 4.2.7)

Load user setting parameters (Ł YP = 8)

Setting Ł YP to 8 loads parameter settings to (calls up) those saved by setting Ł YP to 7. (Refer to 4.2.7)

☆ By setting Ł YP to 7 or 8, you can use parameters as your own default parameters.

Cumulative fan operation time record clear (Ł YP = 9)

Setting Ł YP to 9 resets the cumulative operation time to the initial value (zero).
Set this parameter when replacing the cooling fan, and so on.

## 5.7 Forward/reverse run selection (Operation panel operation)

Fr : Forward/reverse run selection (Operation panel operation)

- Function
  Program the direction of rotation of the motor when the running and stopping are made using the RUN key and STOP key on the operation panel.
  Valid when CMOd (command mode) is set to 1 (operation panel).

■ Parameter setting

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| Fr | Forward/reverse run selection (Operation panel operation) | 0: Forward run<br>1: Reverse run<br>2: Forward run (F/R switching possible)<br>3: Reverse run (F/R switching possible) | 0 |

★ When Fr is set to 2 or 3 and an operating status is displayed, pressing the ▲ key with the ENT key held down changes the direction of rotation from reverse to forward after displaying the message "Fr - F." Pressing the ▲ key again with the ENT key held down changes the direction of rotation from forward to reverse after displaying the message "Fr - r."

★ Check the direction of rotation on the status monitor. For monitoring, see8.1
Fr - F : Forward run
Fr - r : Reverse run

★ When the F and R terminals are used for switching between forward and reverse rotation from the terminal board, the Fr forward/reverse run selection parameter is rendered invalid.
Short across the F-CC terminals: forward rotation
Short across the R-CC terminals: reverse rotation.





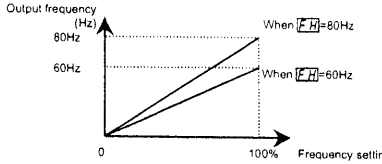
★ The inverter was factory-configured by default so that shorting terminals F-CC and terminals R-CC simultaneously would cause the motor to slow down to a stop. Using parameter F 105, however, you can choose between stop and reverse run.
Using the parameter F 105, however, you can select between forward run and reverse run.

★ This function is valid only when CMOd is set to 1 (operation panel).

## 5.8 Maximum frequency

FH : Maximum frequency

- Function
  1) Programs the range of frequencies output by the inverter (maximum output values).
  2) This frequency is used as the reference for acceleration/deceleration time.




- This function determines the value in line with the ratings of the motor and load.
- Maximum frequency cannot be adjusted during operation. To adjust, first stop the inverter.

★ If FH is increased, adjust the upper limit frequency UL as necessary.

■ Parameter setting

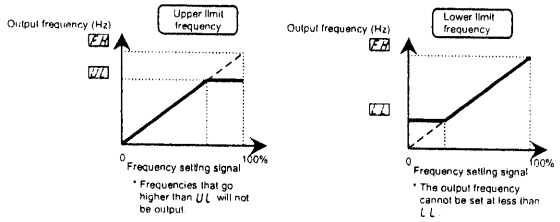
| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| FH | Maximum frequency | 30.0-500.0 (Hz) | 80.0 |

## 5.9 Upper limit and lower limit frequencies

UL : Upper limit frequency

LL : Lower limit frequency

- Function
  Programs the lower limit frequency that determines the lower limit of the output frequency and the upper limit frequency that determines the upper limit of that frequency.




■ Parameter setting

| Title | Function | Adjustment range | Factory default setting |
|---|---|---|---|
| UL | Upper limit frequency | 0.5 - FH (Hz) | 50.0 (WP type)<br>60.0 (WN, AN type) |
| LL | Lower limit frequency | 0.0 - UL (Hz) | 0.0 |

## 5.10 Base frequency

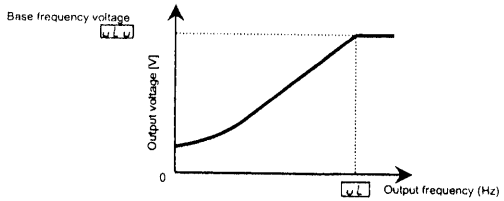
5

UL: Base frequency 1

ULV: Base frequency voltage 1

- Function
  Sets the base frequency and the base frequency voltage in conformance with load specifications or the Base frequency.

Note: This is an important parameter that determines the constant torque control area.




| Title | Function | Adjustment range | Factory default setting |
|---|---|---|---|
| UL | Base frequency 1 | 25.0-500.0 (Hz) | 50.0 (WP type)<br>60.0 (WN, AN type) |
| ULV | Base frequency voltage1 | 50-330 (V) : 240V class<br>50-660 (V) : 500/600V class | 230 (240V class)<br>460 (500V class)<br>575 (600V class) |





## 5.11 Selecting control mode

5

PT: V/F control mode selection

- Function
  With VF-S11, the V/F controls shown below can be selected.
  - O V/F constant
  - O Variable torque
  - O Automatic torque boost control *1
  - O Vector control *1
  - O Energy saving *1
  - O Dynamic energy-saving (for fans and pumps)
  - O PM motor control

  (*1) Parameter setting macro torque boost: AU2 parameter can automatically set this parameter and auto-tuning at a time.

■ Parameter setting

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| PT | V/F control mode selection | 0: V/F constant<br>1: Variable torque<br>2: Automatic torque boost control<br>3: Vector control<br>4: Energy-saving<br>5: Dynamic energy-saving (for fans and pumps)<br>6: PM motor control | 2 |

Steps in setting are as follows

(In this example, the V/F control mode selection parameter PT is set to 3 (Vector control).

[Setting V/F control mode selection to 3 (sensorless vector control)]

| Key operated | LED display | Operation |
|---|---|---|
| | 0.0 | Displays the operation frequency. (Perform during operation stopped.) (When standard monitor display selection F710 is set to 0 [Operation frequency]) |
| MODE | AUH | The first basic parameter "AUH" (history function) is displayed. |
| ▲ | PT | Press the △ key to change the parameter to PT (V/F control mode selection) |
| ENT | 2 | Press the ENTER key to display the parameter setting. (Standard default setting: 2 (automatic torque boost control)) |
| ▲ | 3 | Press the△ key to change the parameter to 3 (vector control). |
| ENT | 3 ⇔ PT | Press the ENTER key to save the changed parameter. PT and parameter set value "3" are displayed alternately. |

Warning:

When setting the V/F control mode selection parameter (Pt) to any number between 2 and 5, be sure to set at least the following parameters.

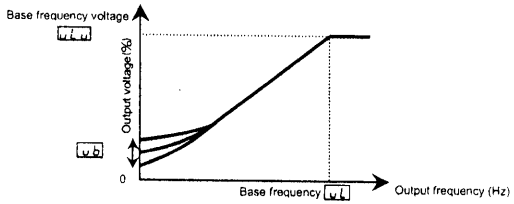
F415 (Motor rated current): See the motor's nameplate.
F416 (No-load current of motor): Refer to the motor test report.
F417 (Rated rotational speed of motor): See the motor's nameplate.

Set also other torque boost parameters (F401 to F495), as required.

### 1) Constant torque characteristics

Setting of V/F control mode selection Pt to 0 (V/F constant)

This is applied to loads with equipment like conveyors and cranes that require the same torque at low speeds as at rated speeds.



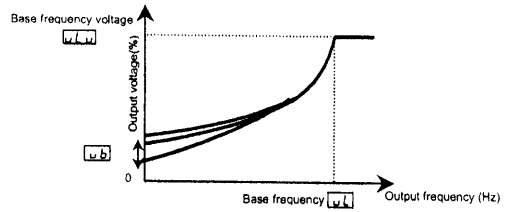

* To increase the torque further, increase the setting value of the manual torque boost vb.

⇒ For more details, see 5.12.

### 2) Setting for fans and pumps

Setting of V/F control mode selection Pt to 1 (variable torque)

This is appropriate for load characteristics of such things as fans, pumps and blowers in which the torque in relation to load rotation speed is proportional to its square.



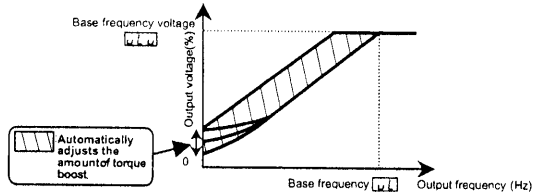





### 3) Increasing starting torque

Setting of V/F control mode selection Pt to 2 (automatic torque boost control)

Detects load current in all speed ranges and automatically adjusts voltage output (torque boost) from inverter. This gives steady torque for stable runs.




Note: This control system can oscillate and destabilize runs depending on the load. If that should happen, set V/F control mode selection Pt to 0 (V/F constant) and increase torque manually.

### ★ Motor constant must be set

If the motor you are using is a 4P Toshiba standard motor and if it has the same capacity as the inverter, there is basically no need to set the motor constant. In any other case, be sure to set the parameters F415 to F417 properly.

Be sure to set F415 (rated current of motor) and F417 (rated speed of motor) correctly, as specified on the motor's nameplate. For the setting of F416 (no-load current of motor), refer to the motor test report.

There are three procedures for setting the other motor constants.

1) Auto torque boost and a motor constant (auto-tuning) can be set at once.
   To do so, set the basic parameter AU2 to 1. ⇒For details, see 1 in 5.2.
2) The motor constant can be automatically set (auto-tuning). Set the extended parameter F400 to 2.
   ⇒ For details, see selection 2 in 6.17.
3) Each motor constant can be set individually. ⇒ For details, see selection 3 in 6.17.

### 4) Vector control - increasing starting torque and achieving high-precision operation.

Setting of V/F control mode selection Pt to 3 (Vector control)

Using sensor-less vector control with a Toshiba standard motor will provide the highest torque at the low speed ranges.

(1) Provides large starting torque.
(2) Effective when stable operation is required to move smoothly up from the low speeds.
(3) Effective in elimination of load fluctuations caused by motor slippage.

★ Motor constant must be set

If the motor you are using is a 4P Toshiba standard motor and if it has the same capacity as the inverter, there is basically no need to set the motor constant. In any other case, be sure to set the parameters F415 to F417 properly.

Be sure to set F415 (rated current of motor) and F417 (rated speed of motor) correctly, as specified on the motor's nameplate. For the setting of F416 (no-load current of motor), refer to the motor test report.

There are three procedures for setting the other motor constants.

1) The sensorless vector control and motor constants (auto-tuning) can be set at a time.
   Set the basic parameter AU2 to 2. ⇒ For details, see 1 in 5.2.
2) The motor constant can be automatically set (auto-tuning).
   Set the extended parameter F400 to 2. ⇒ For details, see selection 2 In 6.17.
3) Each motor constant can be set individually. ⇒ For details, see selection 3 in 6.17.

5) Energy-saving

Setting of V/F control mode selection Pt to 4 (Energy-saving)

Energy can be saved in all speed areas by detecting load current and flowing the optimum current that fits the load.

★ Motor constant must be set

If the motor you are using is a 4P Toshiba standard motor and if it has the same capacity as the inverter, there is no need to set the motor constant. In any other case, be sure to set the parameters F415 to F417 properly.

Be sure to set F415 (rated current of motor) and F417 (rated speed of motor) correctly, as specified on the motor's nameplate. For the setting of F416 (no-load current of motor), refer to the motor test report.

There are three procedures for setting the other motor constants.

1) Automatic energy-saving operation and a motor constant can be set at once. Set the basic parameter AU2 to 3.
   ⇒ For details, see 1 in 5.2.
2) The motor constant can be automatically set (auto-tuning). Set the extended parameter F400 to 2.
   ⇒ For details, see selection 2 In 6.17.
3) Each motor constant can be set individually. ⇒ For details, see selection 3 in 6.17.

6) Achieving further energy savings

Setting of V/F control mode selection Pt to 5 (Dynamic energy-saving)

More substantial energy savings than those provided by setting Pt to 4 can be achieved in any speed range by keeping track of the load current and passing a current appropriate to the load. The inverter cannot respond to rapid load fluctuations, so that this feature should be used only for loads, such as fans and pumps, that are free of violent load fluctuations.





★ Motor constant must be set

If the motor you are using is a 4P Toshiba standard motor and if it has the same capacity as the inverter, there is no need to set the motor constant. In any other case, be sure to set the parameters F415 to F417 properly.

Be sure to set F415 (rated current of motor) and F417 (rated speed of motor) correctly, as specified on the motor's nameplate. For the setting of F416 (no-load current of motor), refer to the motor test report.

For other types of motors, there are two ways to set a motor constant.

1) The motor constant can be set automatically (auto-tuning). Set the extended parameter F400 to 2.
   ⇒ For details, see selection 2 In 6.17.
2) Each motor constant can be set individually ⇒ For details, see selection 3 in 6.17.

7) Operating a permanent magnet motor

Setting of V/F control mode selection Pt to 6 (PM motor control)

Permanent magnet motors (PM motors) that are light, small in size and highly efficient, as compared to induction motors, can be operated in sensor-less operation mode.

Note that this feature can be used only for specific motors. For more information, contact your Toshiba dealer.

8) Precautions on vector control

1) When exercising vector control, be sure to set the extended parameters F415 to F417 properly. Be sure to set F415 (rated current of motor) and F417 (rated speed of motor) correctly, as specified on the motor's nameplate. For the setting of F416 (no-load current of motor), refer to the motor test report.
2) The sensorless vector control exerts its characteristics effectively in frequency areas below the base frequency (uL). The same characteristics will not be obtained in areas above the base frequency.
3) Set the base frequency to anywhere from 40 to 120Hz during vector control (Pt=3).
4) Use a general purpose squirrel-cage motor with a capacity that is the same as the inverter's rated capacity or one rank below.
   The minimum applicable motor capacity is 0.1kW.
5) Use a motor that has 2-8 P.
6) Always operate the motor in single operation (one inverter to one motor). Sensorless vector control cannot be used when one inverter is operated with more than one motor.
7) The maximum length of wires between the inverter and motor is 30 meters. If the wires are longer than 30 meters, set standard auto-tuning with the wires connected to improve low-speed torque during sensorless vector control.
   However the effects of voltage drop cause motor-generated torque in the vicinity of rated frequency to be somewhat lower.
8) Connecting a reactor or surge voltage suppression filter between the inverter and the motor may reduce motor-generated torque. Setting auto-tuning may also cause a trip (Etn 1) rendering sensorless vector control unusable.

9) The following table shows the relationship between the V/F control mode selection (Pt) and the motor constant parameter.

Under normal conditions, be sure to set or adjust the parameters marked with ◉.
When making detailed settings, adjust the parameters marked with O as well, if necessary.
Do not adjust the parameters marked with ×, because they are invalid.
(For instructions about how to adjust the parameter F400 and later, see section 6.17.)

■ Relationship between V/F control mode selection (Pt) and Motor constant parameter

◉&○ : Valid, × : Invalid

| Title | Function | Parameter Pt (V/F control mode selection) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0 V/F constant | 1 Variable torque | 2 Automatic torque boost control | 3 Vector control | 4 Energy-saving | 5 Dynamic energy-saving |
| AU2 | Torque boost setting macro function | × | × | ○ | ○ | ○ | × |
| UL | Base frequency 1 | ◉ | ◉ | ◉ | ◉ | ◉ | ◉ |
| ULV | Base frequency voltage 1 | ◉ | ◉ | ◉ | ◉ | ◉ | ◉ |
| Ub | Torque boost value 1 | ◉ | ◉ | × | × | × | × |
| F170 | Base frequency 2 | ○ | × | × | × | × | × |
| F171 | Base frequency voltage 2 | ○ | × | × | × | × | × |
| F172 | Torque boost value 2 | ○ | × | × | × | × | × |
| F400 | Auto-tuning | × | × | ○ | ○ | ○ | ○ |
| F401 | Slip frequency gain | × | × | × | ○ | × | × |
| F402 | Automatic torque boost value | × | × | ◉ | ◉ | ◉ | ◉ |
| F415 | Motor rated current | ○ | ○ | ◉ | ◉ | ◉ | ◉ |
| F416 | Motor no-load current | × | × | ○ | ○ | ○ | ○ |
| F417 | Motor rated speed | ○ | ○ | ◉ | ◉ | ◉ | ◉ |
| F418 | Speed control response coefficient | × | × | ○ | ○ | ○ | ○ |
| F419 | Speed control stability coefficient | × | × | ○ | ○ | ○ | ○ |
| F480 | Exciting current coefficient | × | × | ○ | ○ | × | × |
| F485 | Stall prevention control coefficient 1 | ○ | ○ | ○ | ○ | ○ | ○ |
| F492 | Stall prevention control coefficient 2 | ○ | ○ | ○ | ○ | ○ | ○ |
| F494 | Motor adjustment coefficient | ○ | ○ | ○ | ○ | ○ | ○ |
| F495 | Maximum voltage adjustment coefficient | ○ | ○ | ○ | ○ | ○ | ○ |
| F496 | Waveform switching adjustment coefficient | ○ | ○ | ○ | ○ | ○ | ○ |

◉ : Be sure to set and adjust the parameters.
○ : Adjust the parameters if necessary.

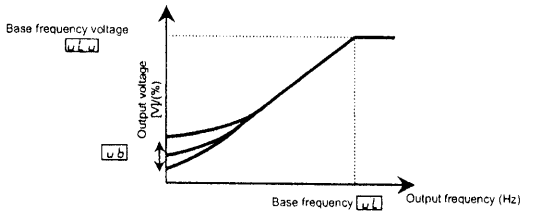




## 5.12 Manual torque boost - increasing torque boost at low speeds

Ub : Torque boost 1

- Function
  If torque is inadequate at low speeds, increase torque by raising the torque boost rate with this parameter.




[Parameters]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| Ub | Torque boost 1 | 0.0 - 30.0 (%) | According to model (See Chapter 11, K-15 ) |

★ Valid when Pt is set to 0 (V/F constant) or 1 (square reduction)

Note 1: The optimum value is programmed for each inverter capacity. Be careful not to increase the torque boost rate too much because it could cause an overcurrent trip at startup.

## 5.13 Setting the electronic thermal

EHr : Motor electronic-thermal protection level 1

OLM : Electronic thermal protection characteristic selection

F173 : Motor electronic-thermal protection level 2

F607 : Motor 150%-overload time limit

- Function
  This parameter allows selection of the appropriate electronic thermal protection characteristics according to the particular rating and characteristics of the motor.

■ Parameter setting

| Title | Function | Adjustment range | | | | Default setting |
|---|---|---|---|---|---|---|
| tHr | Motor electronic thermal protection level 1 | 10 – 100 (%) / (A) | | | | 100 |
| OLn | Electronic-thermal protection characteristic selection | Setting value | | Overload protection | Overload stall | ○ |
| | | 0 | Standard motor | ○ | × | |
| | | 1 | | ○ | ○ | |
| | | 2 | | × | × | |
| | | 3 | | × | ○ | |
| | | 4 | VF motor (special motor) | ○ | × | |
| | | 5 | | ○ | ○ | |
| | | 6 | | × | × | |
| | | 7 | | × | ○ | |
| F173 | Motor electronic-thermal protection level 2 | 10 – 100 (%) / (A) | | | | 100 |
| F607 | Motor 150%-overload time limit | 10 – 2400 (s) | | | | 300 |

* ○ : valid, × : invalid

1) Setting the electronic thermal protection characteristics selection [OLn] and motor electronic thermal protection level 1 [tHr], 2 [F173]

The electronic thermal protection characteristics selection OLn is used to enable or disable the motor overload trip function (OL2) and the overload stall function.
While the inverter overload trip (OL1) will be in constant detect operation, the motor overload trip (OL2) can be selected using the parameter OLn.

Explanation of terms

Overload stall: This is an optimum function for equipment such as fans, pumps and blowers with variable torque characteristics that the load current decreases as the operating speed decreases.
When the inverter detects an overload, this function automatically lowers the output frequency before the motor overload trip OL2 is activated. This function operates a motor at frequencies that allow the load current to keep its balance so that the inverter can continue operation without being tripped.

Note: Do not use the overload stall function with loads having constant torque characteristics (such as conveyor belts in which load current is fixed with no relation to speed).

[Using standard motors (other than motors intended for use with inverters)]

When a motor is used in the lower frequency range than the rated frequency, that will decrease the cooling effects for the motor. This speeds up the start of overload detection operations when a standard motor is used in order to prevent overheating.





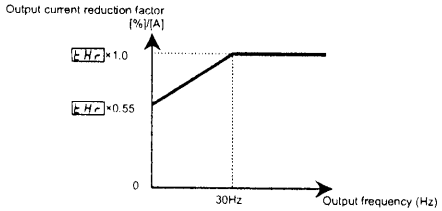
■ Setting of electronic thermal protection characteristics selection OLn

| Setting value | Overload protection | Overload stall |
|---|---|---|
| 0 | ○ | × |
| 1 | ○ | ○ |
| 2 | × | × |
| 3 | × | ○ |

○ : valid, × : invalid

■ Setting of motor electronic thermal protection level 1 [tHr] (Same as [F173])

If the capacity of the motor is smaller than the capacity of the inverter, or the rated current of the motor is smaller than the rated current of the inverter, adjust the electronic thermal protection level 1 tHr so that it fits the motor's rated current.




Note: The motor overload protection start level is fixed at 30Hz.

[Example of setting: When the VFS11-2007PM is running with a 0.4kW motor having 2A rated current]

| Key operated | LED display | Operation |
|---|---|---|
| | 0.0 | Displays the operation frequency. (Perform during operation stopped.) (When standard monitor display selection F710 is set to 0 [Operation frequency]) |
| MODE | AUH | The first basic parameter "AUH" (history function) is displayed. |
| ▲ ▼ | tHr | Press either the △ key or the ▽ key to change the parameter to tHr. |
| ENT | 100 | Press the ENTER key to display the parameter setting. (Standard default setting: 100%) |
| ▲ ▼ | 42 | Press the △ key to change the parameter to 42 % (=motor rated current/inverter output rated current x 100=2.0//4.8×100). |
| ENT | 42 ⇔ tHr | Press the ENTER key to save the changed parameter. tHr and the parameter are displayed alternately. |

Note: The rated output current of the inverter should be calculated from the rated current for frequencies below 4kHz, regardless of the setting of the PWM carrier frequency parameter (F300).

[Using a VF motor (motor for use with inverter)]

■ Setting of electronic thermal protection characteristics selection OLn

| Setting value | Overload protection | Overload stall |
|---|---|---|
| 4 | O | × |
| 5 | O | O |
| 6 | × | × |
| 7 | × | O |

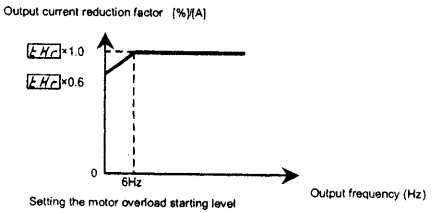
O : valid, × : invalid

VF motors (motors designed for use with inverters) can be used in frequency ranges lower than those for standard motors, but their cooling efficiency decreases at frequencies below 6Hz.

■ Setting of motor electronic thermal protection level 1 [EHr] (Same as [F173])

If the capacity of the motor is smaller than the capacity of the inverter, or the rated current of the motor is smaller than the rated current of the inverter, adjust the electronic thermal protection level 1 EHr so that it fits the motor's rated current.

* If the indications are in percentages (%), then 100% equals the inverter's rated output current (A).




Setting the motor overload starting level

2) Motor 150%-overload time limit [F607]

Parameter F607 is used to set the time elapsed before the motor trips under a load of 150% (overload trip OL2) within a range of 10 to 2400 seconds.

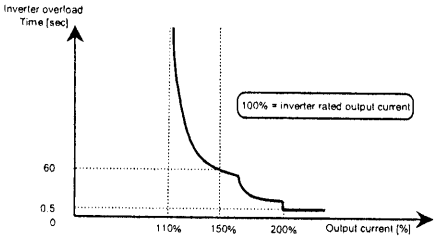
3) Inverter over load characteristics

Set to protect the inverter unit. Cannot be changed or turned off by parameter setting.

To prevent the inverter overload trip function (OL1) from being activated too easily, lower the stall prevention level (F601) or increase the acceleration time (ACC) or deceleration time (dEC).








* To protect the inverter, overload trip or overcurrent trip activate in a short period of time when output current reaches 150% or higher.

Inverter overload protection characteristics

## 5.14 Preset-speed operation (speeds in 15 steps)

[Sr1] - [Sr7]: Preset-speed operation frequencies 1-7

[F287] - [F294]: Preset-speed operation frequencies 8-15

- Function
  A maximum of 15 speed steps can be selected just by switching an external contact signal. Multi-speed frequencies can be programmed anywhere from the lower limit frequency LL to the upper limit frequency UL.

When fire-speed control is assigned to the terminal board, the function of setting fire-speed operation frequencies is assigned to F294. See 6.11.2, "Fire-speed control.

[Setting method]

1) Run/stop

The starting and stopping control is done from the terminal board.

| Title | Function | Adjustment range | Setting value |
|---|---|---|---|
| CNOd | Command mode selection | 0: Terminal board<br>1: Operation panel | 0 |

Note: If speed commands (analog signal or digital input) are switched in line with preset-speed operations, select the terminal board using the frequency setting mode selection FNOd. ⇒ See 3) or 5.4

2) Preset-speed frequency setting

Set the speed (frequency) of the number of steps necessary.

Setting from speed 1 to speed 7

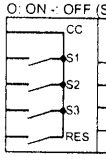
| Title | Funtion | Adjustment range | Setting value |
|---|---|---|---|
| Sr1 - Sr7 | Preset-speed operation frequencies 1-7 | LL - UL (Hz) | 0.0 |

Setting from speed 8 to speed 15

| Title | Function | Adjustment range | Setting value |
|---|---|---|---|
| F287 - F294 | Preset-speed operation frequencies 8-15 | LL - UL (Hz) | 0.0 |

Examples of preset-speed contact input signals: Slide switch SW1 set to sink logic

O: ON - : OFF (Speed commands other than preset-speed commands are valid when all are OFF)




| Terminal | Preset-speed | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| S1-CC | O | - | O | - | O | - | O | - | O | - | O | - | O | - | O |
| S2-CC | - | O | O | - | - | O | O | - | - | O | O | - | - | O | O |
| S3-CC | - | - | - | O | O | O | O | - | - | - | - | O | O | O | O |
| RES-CC | - | - | - | - | - | - | - | O | O | O | O | O | O | O | O |

☆ Terminal functions are as follows.

Terminal S1..... Input terminal function selection 4 (S1)
F114=6 (Preset-speed command 1: SS1)

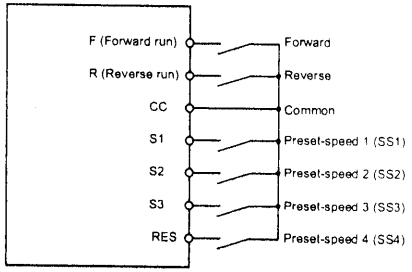
Terminal S2..... Input terminal function selection 5 (S2)
F115=7 (Preset-speed command 2: SS2)

Terminal S3..... Input terminal function selection 6 (S3)
F116=8 (Preset-speed command 3: SS3)

Terminal RES..... Input terminal function selection 3 (RES)
F113=9 (Preset-speed command 4: SS4)

☆ SS4 is not allocated to standard default setting. Use the input terminal function selection to allocate SS4 an idle terminal. In the above example the RES terminal is used for SS4.

[Example of a connection diagram]
(SW1 set to sink logic)





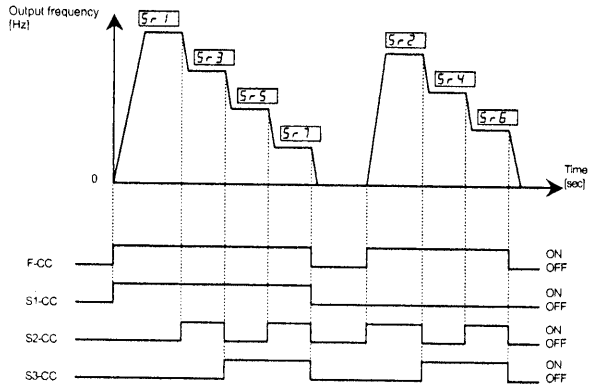



3) Using other speed commands with preset-speed command

| Command mode selection CMOd | 0: Terminal board | | | | 1: Operation panel | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency setting mode selection FMOd | 0: Built-in potentio meter | 1: VIA 2: VIB 5: UP/DOWN or 6: VIA + VIB | 3: Operation panel | 4:Communication | 0: Built-in potentio meter | 1: VIA 2: VIB 5: UP/DOWN or 6: VIA + VIB | 3: Operation panel | 4:Communication |
| Preset-speed command: Entered | Preset-speed command valid Note) | | | | Potentiometer command valid | Terminal command valid | Operation panel command valid | Communication command valid |
| Preset-speed command: Not entered | Potentiometer command valid | Terminal command valid | Operation panel command valid | Communication command valid | (The inverter doesn't accept Preset-speed command.) | | | |

Note) The preset-speed command is always given priority when other speed commands are input at the same time.

Below is an example of 7-step speed operation with standard default setting.




Example of 7-step speed operation

# 6. Extended parameters

Extended parameters are provided for sophisticated operation, fine adjustment and other special purposes. Modify parameter settings as required. See Section 11, Table of extended parameters.

## 6.1 Input/output parameters

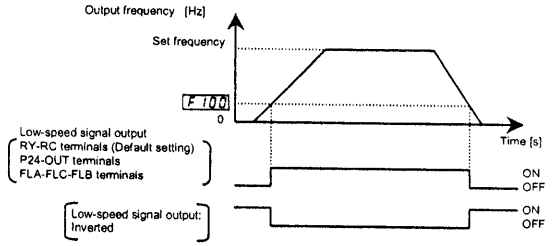
### 6.1.1 Low-speed signal

F100: Low-speed signal output frequency

- Function
  When the output frequency exceeds the setting of F100 an ON signal will be generated. This signal can be used as an electromagnetic brake excitation/release signal.
  This signal can also be used as an operation signal when F100 is set to 0.0Hz, because an ON signal is put out if the output frequency exceeds 0.0Hz.
  ★ Relay output (250Vac-1A (cosϕ=1), 30Vdc-0.5A, 250Vac-0.5A (cosϕ=0.4) at RY-RC, FLA-FLC-FLB terminals (Default setting: RY-RC).
  ★ If the inverter is so set, the signal will be put out through the open collector OUT and NO output terminals (24 Vdc-Max. 50 mA).

[Parameter setting]

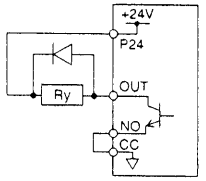
| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F100 | Low-speed signal output frequency | 0.0 ~ FH (Hz) | 0.0 |



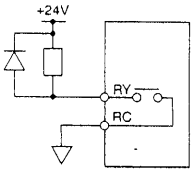





An example of the connection of the open collector OUT terminal




An example of the connection of the relay output terminals




- Output terminal setting
  Output of the low-speed signal (ON signal) between the RY and RC terminals is the factory default setting of the output terminal selection parameter. This setting must be changed to invert the polarity of the signal.

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F130 | Output terminal selection 1A (RY-RC) | 0-255 (See Section 11, K-18) | 4 (ON signal) or 5 (OFF signal) |

Set F131 to output to OUT-NO terminals.

### 6.1.2 Output of designated frequency reach signal

F102: Speed reach detection band

- Function
  When the output frequency becomes equal to the setting by designated frequency ±F102, an ON or OFF signal is generated.

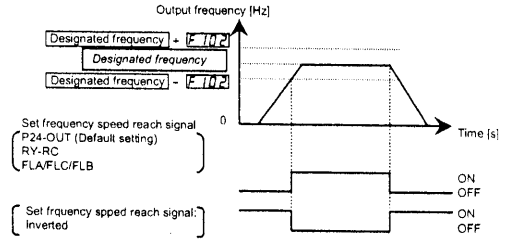
■ Parameter setting of designated frequency and detection band

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F102 | Speed reach detection band | 0.0 ~ FH (Hz) | 2.5 |

■ Parameter setting of output terminal selection

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F131 | Output terminal selection 2A (OUT-NO) | 0-255 (See Section 11, K-18) | 6: RCH (designated frequency - ON signal), or 7: RCHN (designated frequency - OFF signal) |

Note: Select the F130 parameter to specify RY-RC terminal output, or the F132 parameter to specify FLA-FLC-FLB terminal output.




## 6.1.3 Output of set frequency speed reach signal

F101: Speed reach setting frequency

F102: Speed reach detection band

- Function
  When the output frequency becomes equal to the frequency set by F101±F102, an ON or OFF signal is generated.

6

■ Parameter setting of frequency and detection band

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F101 | Speed reach setting frequency | 0.0 ~ FH (Hz) | 0.0 |
| F102 | Speed reach detection band | 0.0 ~ FH (Hz) | 2.5 |

■ Parameter setting of output terminal selection

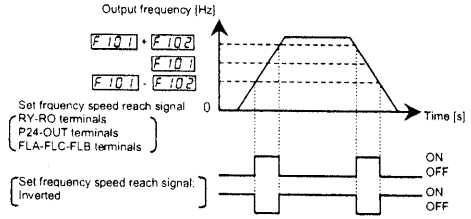
| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F131 | Output terminal selection 2A (OUT-NO) | 0-255 (See Section 11, K-18) | 8: RCHF (designated frequency - ON signal), or 9: RCHFN (designated frequency - OFF signal) |

Note: Select the F130 parameter to specify RY-RC terminal output, or set the F132 parameter function No. to 8 or 9 to specify FLA-FLC-FLB terminal output.





If the detection band value + the set frequency is less than the designated frequency




# 6.2 Input signal selection

## 6.2.1 Priority selection (both F-CC, R-CC are ON)

6

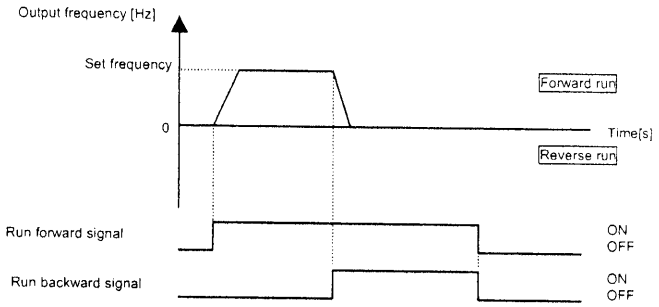
F105: Priority selection (both F-CC, R-CC are ON)

- Function
  This parameter allows you to select the direction in which the motor runs when a forward run (F) command and a reverse run (R) command are entered simultaneously.
  1) Reverse
  2) Slowdown stop

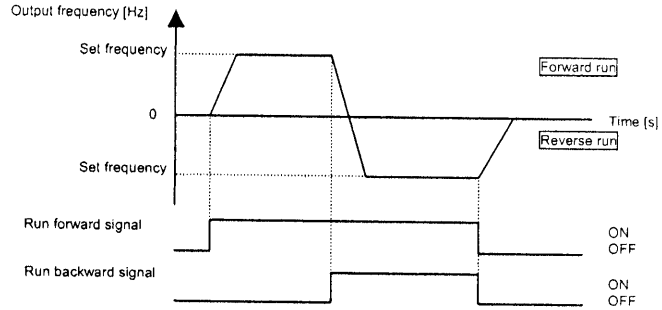
■ Parameter setting

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F105 | Priority selection (both F-CC, R-CC are ON) | 0: Reverse<br>1: Slowdown stop | 1 |

[F 105 = 1 (Stop)]: If an F command and an R command are entered simultaneously, **the motor will slow down to a stop.**




[F 105 = 0 (Reverse)]: If an F command and an R command are entered simultaneously, **the motor will run in the reverse direction.**




6





## 6.2.2 Changing the functions of VIA and VIB terminals

F 109: VIA/VIB terminal function selection

- Function
  This parameter allows you to choose between signal input and contact signal input for the VIA and VIB terminals.

■ Parameter setting

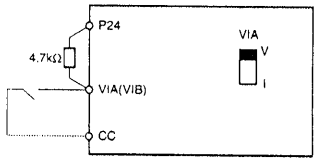
| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F 109 | Analog/contact input function selection (VIA/VIB terminal) | 0: VIA - analog input<br>VIB - anolog input<br>1: VIA - anolog input<br>VIB - contact input (Sink)<br>2: VIA - analog input<br>VIB - contact input (Source)<br>3: VIA - contact input (Sink)<br>VIB - contact input (Sink)<br>4: VIA - contact input (Source)<br>VIB - contact input (Source) | 0 |

* When using the VIA and VIB terminals as contact input terminals in sink logic connection, be sure to insert a resistor between the P24 terminal and the VIA/VIB terminals. (Recommended resistance: 4.7kΩ-1/2W)

Note: When using the VIA terminal as a contact input terminal, be sure to turn the VIA slide switch to the V position.

☆ The figure on the right shows an example of the connection of input terminals VIA and VIB when they are used as contact input terminals. This example illustrates the connection when the inverter is used in sink logic mode.

☆ The figure on the right shows an example of the connection of input terminals VIA and VIB when they are used as contact input terminals. This example illustrates the connection when the inverter is used in sink (Negative) logic mode.




6

# 6.3 Terminal function selection

## 6.3.1 Keeping an input terminal function always active (ON)

F 108: Always-active function selection 1

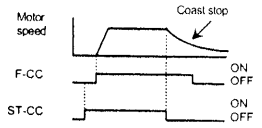
F 110: Always-active function selection 2

- Function
  This parameter specifies an input terminal function that is always to be kept active (ON).

■ Parameter setting

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F 108 | Always-active function selection 1 | 0-65 (See K-16) | 0 (No function) |
| F 110 | Always-active function selection 2 | 0-65 (See K-16) | 1 (Standby) |

* Coast stop
The standard default setting is for deceleration stop. To make a coast stop, assign a "1(ST)" terminal function to an idle terminal using the programmable terminal function.
Change to F 110=0.
For coast stop, open the ST-CC when stopping the motor in the state described at left. The monitor on the inverter at this time will display OFF.




## 6.3.2 Modifying input terminal functions

F 111: Input terminal selection 1 (F)

F 112: Input terminal selection 2 (R)

F 113: Input terminal selection 3 (RES)

F 114: Input terminal selection 4 (S1)

F 115: Input terminal selection 5 (S2)

F 116: Input terminal selection 6 (S3)

F 117: Input terminal selection 7 (VIB)

F 118: Input terminal selection 8 (VIA)





- Function
  Use the above parameters to send signals from an external programmable controller to various control input terminals to operate and/or set the inverter.
  The desired contact input terminal functions can be selected from 66 types (0 to 65). This gives system design flexibility. (Note, however, for F 117 and F 118, a function can be selected from among 13 functions (5 to 17).)

- Note that the setting 52 (forced operation) can be enabled only when the inverter is so configured at the factory. For more information, contact your local Toshiba dealer.
- The functions of the VIB and VIA terminals can be selected between analog input and contact input by changing parameter settings F 109.
  To use the VIA and VIB terminals as contact input terminals, you need to set F 109 to the number (1 to 4) that suits your needs, since analog input (voltage signal input) is assigned to the terminals by default.

■ Setting of contact input terminal function

| Terminal symbol | Title | Function | Adjustment range | Default setting |
|---|---|---|---|---|
| - | F 108 | Always-active function selection 1 | 0-65 (See K-16-18) | 0 |
| - | F 110 | Always-active function selection 2 | | 1 (ST) |
| F | F 111 | Input terminal selection 1 (F) | | 2 (F) |
| R | F 112 | Input terminal selection 2 (R) | | 3 (R) |
| RES | F 113 | Input terminal selection 3 (RES) | | 10 (RES) |
| S1 | F 114 | Input terminal selection 4 (S1) | | 6 (SS1) |
| S2 | F 115 | Input terminal selection 5 (S2) | | 7 (SS2) |
| S3 | F 116 | Input terminal selection 6 (S3) | | 8 (SS3) |
| VIB | F 117 | Input terminal selection 7 (VIB) | 5-17 (Note 2) | 9 (SS4) |
| VIA | F 118 | Input terminal selection 8 (VIA) | | 5 (AD2) |

Note 1. The function that has been selected using F 108 and F 110 (always-active function selection parameter) are always activated.

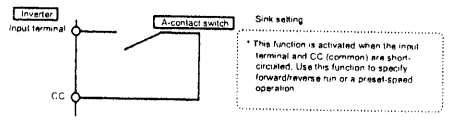
Note 2. When using the VIA and VIB terminals as contact input terminals in sink logic connection, be sure to insert a resistor between the P24 terminal and the VIA/VIB terminals. (Recommended resistance: 4.7kΩ-1/2W)
Be sure to turn the VIA slide switch to the V position.

Note 3. F 117 (VIB): Enabled only when F 109= 1 to 4
Disabled and the set value cannot be read out, if F 109 is set at 0.

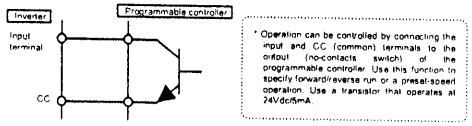
Note 4. F 118 (VIA): Enabled only when F 109=3 or 4
Disabled and the set value cannot be read out, if F 109 is set at 0 to 2.

■ Connection method

1) A-contact input



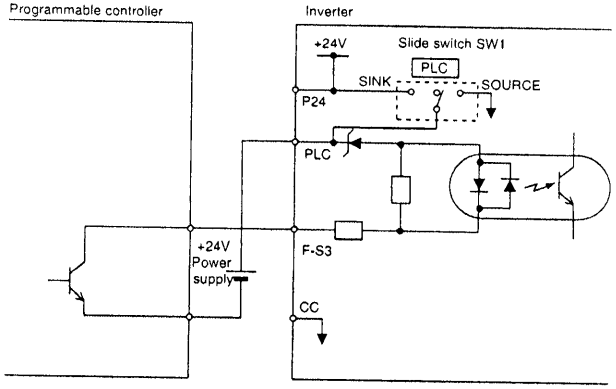

2) Connection with transistor output




* Interface between programmable controller and inverter

Note 1: When using a programmable controller with open collector outputs for control, connect it to the PCL terminal, as shown in the figure below, to prevent the inverter from malfunctioning because of a current that flows in.

**Also, be sure to turn the SW1 slide switch to the PLC position.**




6





3) Sink logic/source logic input

Sink logic/source logic (input/output terminal logic) switching is possible.
For more details, see 2.3.2.

## 6.3.3 Modifying output terminal functions

F130: Output terminal selection 1A (RY-RC)

F131: Output terminal selection 2A (OUT-NO)

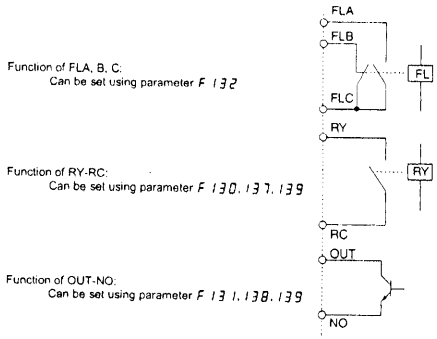
F132: Output terminal selection 3 (FLA, FLB, FLC)

- Function

Use the above parameters to send various signals from the inverter to external equipment.
By setting parameters for the RY-RC, OUT-NO and FL (FLA, FLB and FLC) terminals on the terminal board, you can use 58 functions and functions obtained by combining them.
To assign only one function to output terminals, assign the function to F130 and F131 while leaving F137 to F139 as they are set by default.

6

■ Examples of application



■ Assigning one function to an output terminal

| Terminal symbol | Title | Function | Adjustment range | Default setting |
|---|---|---|---|---|
| RY - RC | F130 | Output terminal selection 1A | 0-255 (See section 11.) | 4 (Low-speed detection signal) |
| OUT - NO | F131 | Output terminal selection 2A | | 6 (Designated frequency reach) |
| FL (A, B, C) | F132 | Output terminal selection 3 | | 10(Failure FL) |

☆ When assigning one function to each output terminal, set parameters F130 to F132 only.
Do not change but leave parameters F137 to F139 as they were set by default.
(Standard default setting: F137=255, F138=255, F139=0)

## 6.3.4 Assigning two functions to an output terminal

F130: Output terminal selection 1A (RY-RC)

F131: Output terminal selection 2A (OUT-NO)

F137: Output terminal selection 1B (RY-RC)

F138: Output terminal selection 2B (OUT-NO)

F139: Output terminal logic selection (RY-RC, OUT-NO)

- Function
  2 different functions can be assigned to the terminal board output terminals RY-RC and OUT-NO.
  Signals of 2 functions of the logical product (AND) or logical sum (OR) selected form 58 functions can be output to 1 output terminal.

Note. F138 (OUT-NO): Enabled only when F669=0.
Disabled and the set value cannot be read out, if F669 is set at 1.





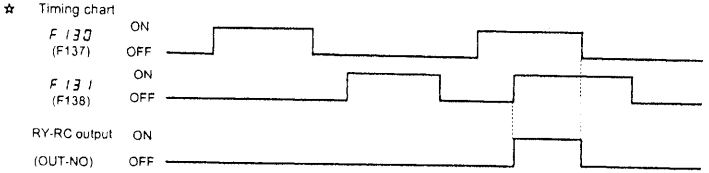
(1) A signal is sent out when the two functions assigned are activated simultaneously.

| Terminal symbol | Title | Function | Adjustment range | Default setting |
|---|---|---|---|---|
| RY-RC | F130 | Output terminal selection 1A | 0-255 (See section 11.) | 4 (Low-speed detection signal) |
| OUT-NO | F131 | Output terminal selection 2A | | 6 (Designated frequency reach) |
| RY-RC | F137 | Output terminal selection 1B | | 255 (Always ON) |
| OUT-NO | F138 | Output terminal selection 2B | | |

☆ Two different functions can be assigned to terminals RY-RC and terminals OUT-NO.

☆ If parameter F139 is set to 0 (default), a signal will be sent out when the two functions assigned are activated simultaneously.
Terminals RY-RC: Send out a signal when the functions assigned with F130 and F137 are activated simultaneously.
Terminals OUT-NO: Send out a signal when the functions assigned with F131 and F138 are activated simultaneously.

☆ Timing chart




☆ Only one function can be assigned to terminals FLA-FLB-FLC at a time.

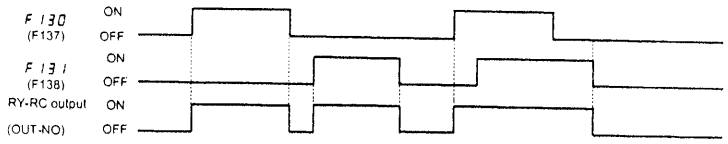
(2) A signal is sent out when either of the two functions assigned is activated.

| Terminal symbol | Title | Function | Adjustment range | Default setting |
|---|---|---|---|---|
| RY - RC | F130 | Output terminal selection 1A | 0~255 (See section 11.) | 4 (Low-speed detection signal) |
| OUT - NO | F131 | Output terminal selection 2A | | 6 (Designated frequency reach) |
| RY - RC | F137 | Output terminal selection 1B | | 255 (Always ON) |
| OUT - NO | F138 | Output terminal selection 2B | | 255 (Always ON) |
| RY - RC/ OUT - NO | F139 | Output terminal logic selection | 0: F130 and F137 F131 and F138<br>1: F130 or F137 F131 and F138<br>2: F130 and F137 F131 or F138<br>3: F130 or F137 F131 or F138 | 0 |

☆ Two different functions can be assigned to terminals RY-RC and terminals OUT-NO.

☆ If parameter F139 is set to 3, a signal will be sent out when either of the two functions assigned is activated.
Terminals RY-RC: Send out a signal when either of the functions set with F130 and F137 is activated.
Terminals OUT-NO: Send out a signal when either of the functions set with F131 and F138 is activated.

☆ Timing chart




☆ Only one function can be assigned to terminals FLA-FLB-FLC at a time.





(3) The logical product (AND) or logical sum (OR) of the two functions assigned is put out as a signal.

■ Setting of output terminal function

| Terminal symbol | Title | Function | Adjustment range | Default setting |
|---|---|---|---|---|
| RY-RC | F130 | Output terminal selection 1A | 0-255 (See Section 11) | 4 (Low-speed detection signal) |
| OUT-NO | F131 | Output terminal selection 2A | | 6 (Designated frequency reach) |
| FL (A,B,C) | F132 | Output terminal selection 3 | | 10 (Failure FL) |
| RY-RC | F137 | Output terminal selection 1B | | 255 (Always active) |
| OUT-NO | F138 | Output terminal selection 2B | | 255 (Always active) |
| RY-RC/ OUT-NO | F139 | Output terminal logic selection | 0: F130 and F137 F131 and F138<br>1: F130 or F137 F131 and F138<br>2: F130 and F137 F131 or F138<br>3: F130 or F137 F131 or F138 | 0 |

Two different functions can be assigned to the output terminals (RY-RC and OUT-NO), and two logics with different functions can be selected using F139.
The logical product (AND) or logical sum (OR) of the two functions assigned is put out as a signal, depending on the setting of parameter F139.

If F139 = 0, the logical sum (AND) of F130 and F137 will be output to RY-RC.
The logical product (OR) of F131 and F138 will be output to OUT-NO.
If F139 = 1, the logical product (OR) of F130 and F137 will be output to RY-RC.
The logical sum (AND) of F131 and F138 will be output to OUT-NO.
If F139 = 2, the logical sum (AND) of F130 and F137 will be output to RY-RC.
The logical product (OR) of F131 and F138 will be output to OUT-NO.
If F139 = 3, the logical product (OR) of F130 and F137 will be output to RY-RC.
The logical product (OR) of F131 and F138 will be output to OUT-NO.

☆ To assign only one function to output terminals, assign the function to F130 and F131 while leaving F137 to F139 as they are set by default.

Note: F138 (OUT-NO): Enable only when F669=0
Disabled and the set value cannot be read out, if F669 is set to 1.

(4) Holding the output of signals in ON status

☆ If the conditions for activating the functions assigned to output terminals RY-RC and OUT-NO agree with and as a result the output of signals is put in ON status, the output of signals is held ON, even if the conditions change. (Output terminal holding function)

☆ Assign input terminal function 62 or 63 to a contact input terminal available.

■ Input terminal function

| Function No. | Code | Function | Action |
|---|---|---|---|
| 62 | HRDRY | Holding of RY-RC terminal output | ON: Once turned on, RY-RC are held on.<br>OFF: The status of RY-RC changes in real time according to conditions. |
| 63 | HDOUT | Holding of OUT-NO terminal output | ON: Once turned on, OUT-NO are held on.<br>OFF: The status of OUT-NO changes in real time according to conditions. |

☆ Once output terminal RY-RC or OUT-NO is turned on when the contact input terminal to which one of the above functions (function 62 or 63) is assigned is ON, output terminal RY-RC or OUT-NO is held ON.

## 6.3.5 Comparing the frequency command values

F167: Frequency command agreement detection range

FNOd: Frequency setting mode selection 1

F207: Frequency setting mode selection 2

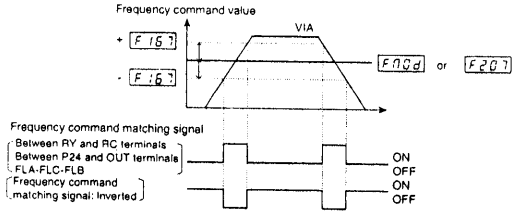
- Function
  If the frequency command value specified using FNOd (or F207) almost agrees with the frequency command value from the VA terminal with an accuracy of ± the setting of F167, an ON or OFF signal will be sent out.

6

■ Frequency command value and agreement detection range parameter setting

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F167 | Frequency command agreement detection range | 0.0 ~ FH (Hz) | 2.5 |
| FNOd | Frequency setting mode selection 1 | 0-6 (See Section 11, K-1, 5) | 0 |
| F207 | Frequency setting mode selection 2 | | 1 |

Note: To put out signals to RY-RC, OUT or FLA-FLB-FLC, set F130, F131, or F132 respectively to 52 or 53.




Note: This function can be used, for example, to send out a signal indicating whether the amount of processing and the amount of feedback agree with each other when the PID function is in use. For an explanation of the PID function, see 6.16.





# 6.4 Basic parameters 2

## 6.4.1 Switching motor characteristics via terminal input

F170: Base frequency 2

F171: Base frequency voltage 2

F172: Torque boost 2

F173: Motor electronic-thermal protection level 2

F185: Stall prevention level 2

- Function
  Use the above parameters to switch the operation of two motors with a single inverter and to select motor V/F characteristics (two types) according to the particular needs or operation mode.

  Note: The Pt (V/F control mode selection) parameter is enabled only for motor1.
  If motor 2 is selected, V/F control will be given constant torque characteristics.

6

■ Parameter setting

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F170 | Base frequency 2 | 25.0-500.0 (Hz) | 50.0 (WP type)<br>60.0 (WN, AN type) |
| F171 | Base frequency voltage 2 | 50-330 (V) : 240V class<br>50-660 (V) : 500 / 600V class | 230 (240V class)<br>460 (500V class)<br>575 (600V class) |
| F172 | Torque boost 2 | 0.0-30.0 (%) | Depending on model (See Section 11, K-15) |
| F173 | Motor electronic-thermal protection level 2 | 10-100 (%) / (A) | 100 |
| F185 | Stall prevention level 2 | 10-199 (%) / (A),<br>200 : Disabled | 150 |

■ Setting of switching terminals

The terminal for switching to motor 2 needs to be set, since this function is not assigned under the default setting. Assign this function to an idle terminal.

The parameters to be switched depend on the particular identification number of the input terminal selection function.

| Input terminal function number | | | | | Parameters used and applicable parameters |
|---|---|---|---|---|---|
| 5 AD2 | 39 VF2 | 40 MOT2 | 58 AD3 | 61 OCS2 | |
| OFF | OFF | OFF | OFF | OFF | Default setting: Pt, ul, ulu, ub, tHr, ACC, dEC, F502, F601 |
| ON | OFF | OFF | OFF | OFF | ACC → F500, dEC → F501, F502 → F503 |
| - | OFF | OFF | ON | OFF | ACC → F510, dEC → F511, F502 → F512 |
| OFF | OFF | OFF | OFF | ON | F601 → F185 |
| OFF | ON | OFF | OFF | OFF | Pt → 0, ul → F170, ulu → F171, ub → F172, tHr → F173 |
| - | - | ON | OFF | - | Pt → 0, ul → F170, ulu → F171, ub → F172, tHr → F173, F601 → F185, ACC → F500, dEC → F501, F502 → F503 |

Note. The parameters ul, ulu, Pt, F170 and F171 cannot be switched during operation. You need to stop operation when switching them.

6

## 6.5 Frequency priority selection

### 6.5.1 Using a frequency command according to the particular situation

F100: Frequency setting mode selection 1

F200: Frequency priority selection

F207: Speed setting mode selection 2

- Function

  These parameters are used to switch between two types of frequency command signals.
  - Setting by parameters
  - Switching by frequency
  - Switching via terminal board input





■ Parameter setting

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F100 | Frequency setting mode selection 1 | 0: Built-in potentiometer<br>1: VIA<br>2: VIB<br>3: Operation panel<br>4: Serial communication<br>5: UP/DOWN from external contact<br>6: VIA + VIB (Override) | 0 |
| F200 | Frequency priority selection | 0: F100 (Switchable to F207 by the input terminal)<br>1: F100 (F207 for output frequencies equal to or lower than 1.0 Hz) | 0 |
| F207 | Frequency setting mode selection 2 | 0: Built-in potentiometer<br>1: VIA<br>2: VIB<br>3: Operation panel<br>4: Serial communication<br>5: UP/DOWN from external contact<br>6: VIA + VIB (Override) | 1 |

6

1) External switching (Input terminal function 38 : FCHG enabled)

**Frequency priority selection parameter F200 = 0**

Switching between the command specified with F100 and F207 can be made by entering a command from a terminal board.

To do so, however, the frequency command forced switching function (input terminal function selection: 38) needs to be set beforehand to an input terminal board.

If an OFF command is entered to the input terminal board: The command specified with F100 will be selected.

If an ON command is entered to the input terminal board: The command specified with F207 will be selected.

2) Automatic switching by frequency command

Frequency priority selection parameter F200 = 1

The switching between the command specified with F100 and F207 is done automatically according to the frequency command entered.

If the frequency set with F100 is above 1Hz: The command specified with F100 will be selected.

If the frequency set with F100 is 1Hz or less: The command specified with F207 will be selected.

## 6.5.2 Setting frequency command characteristics

F201: VIA input point 1 setting
F202: VIA input point 1 frequency
F203: VIA input point 2 setting
F204: VIA input point 2 frequency
F210: VIB input point 1 setting
F211: VIB input point 1 frequency
F212: VIB input point 2 setting
F213: VIB input point 2 frequency
F811: Communication command point 1 setting
F812: Communication command point 1 frequency
F813: Communication command point 2 setting
F814: Communication command point 2 frequency

6

- Function
  These parameters adjust the output frequency according to the externally applied analog signal (0-10Vdc voltage, 4-20mAdc current) and the entered command for setting an external contact frequency.

☆ To fine adjust the frequency command characteristics for VIA/VIB input, use the parameters F470 to F473. (See section 6.5.4.)



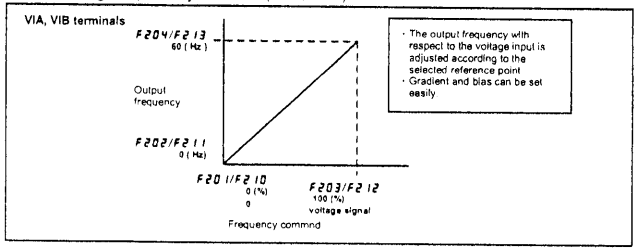


■ Parameter setting

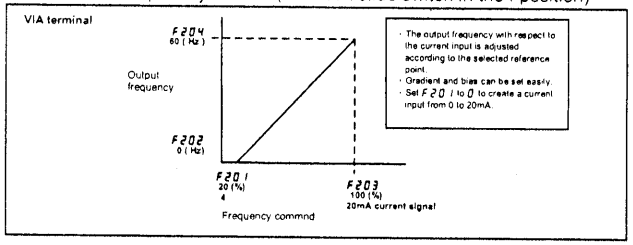
| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F201 | VIA input point 1 setting | 0-100 (%) | 0 |
| F202 | VIA input point 1 frequency | 0.0-500.0 (Hz) | 0.0 |
| F203 | VIA input point 2 setting | 0-100 (%) | 100 |
| F204 | VIA input point 2 frequency | 0.0-500.0 (Hz) | 50.0 (WP type)<br>60.0 (WN, AN type) |
| F210 | VIB input point 1 setting | 0-100 (%) | 0 |
| F211 | VIB input point 1 frequency | 0.0-500.0 (Hz) | 0.0 |
| F212 | VIB input point 2 setting | 0-100 (%) | 100 |
| F213 | VIB input point 2 frequency | 0.0-500.0 (Hz) | 50.0 (WP type)<br>60.0 (WN, AN type) |
| F811 | Communication command point 1 setting | 0-100 (%) | 0 |
| F812 | Communication command point 1 frequency | 0.0-500.0 (Hz) | 0.0 |
| F813 | Communication command point 2 setting | 0-100 (%) | 100 |
| F814 | Communication command point 2 frequency | 0.0-500.0 (Hz) | 60.0 |

Note 1: Don't set the same value between point 1 and point 2. If set the same falue, the Err1 is displayed.

1) 0-10Vdc voltage input adjustment (VIA, VIB)




2) 4-20mAdc current input adjustment (VIA: VIA slide switch in the I position)



## 6.5.3 Setting of frequency with the input from an external contact

F264: External contact input - UP response time

F265: External contact input - UP frequency steps

F266: External contact input - DOWN response time

F267: External contact input - DOWN frequency steps

F268: Initial up/down frequency

F269: Change of the initial up/down frequency

- Function

  These parameters are used to set an output frequency by means of a signal from an external device.

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F264 | External contact input - UP response time | 0.0 - 10.0 (S) | 0.1 |
| F265 | External contact input - UP frequency steps | 0.0 - FH (Hz) | 0.1 |
| F266 | External contact input - DOWN response time | 0.0 - 10.0 (S) | 0.1 |
| F267 | External contact input - DOWN frequency steps | 0.0 - FH (Hz) | 0.1 |
| F268 | Initial up/down frequency | LL - UL (Hz) | 0.0 |
| F269 | Change of the initial up/down frequency | 0: Not changed<br>1: Setting of F268 changed when power is turned off | 1 |

* These functions take effect when parameter FMOd (frequency setting mode selection 1) is set to S or parameter F207 (frequency setting mode selection 2) is set to S is enabled.

### ■ Adjustment with continuous signals (Parameter-setting example 1)

Set parameters as follows to adjust the output frequency up or down in proportion to the frequency adjustment signal input time:

Panel frequency incremental gradient = F265/F264 setting time

Panel frequency decremental gradient = F267/F266 setting time

Set parameters as follows to adjust the output frequency up or down almost in synchronization with the adjustment by the panel frequency command:

F264 = F266 = 1

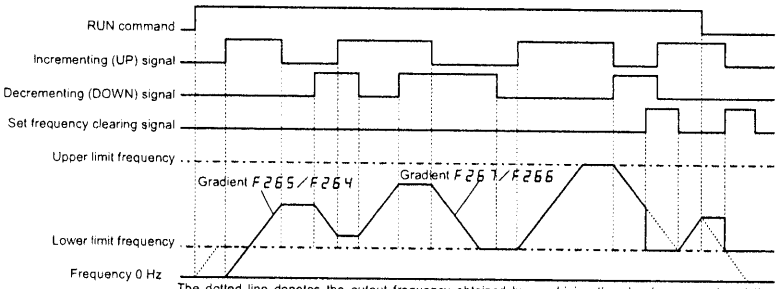
(FHIACC (or F500)) ≥ (F265/F264 setting time)

(FHIdEC (or F501)) ≥ (F267/F266 setting time)





<<Sample sequence diagram 1: Adjustment with continuous signals>>




The dotted line denotes the output frequency obtained by combining the slowdown speed and the panel frequency adjustment speed.

Note: If the operation frequency is set to the lower limit frequency, it will increase from 0Hz when power is turned on for the first time after the setting, and therefore the output frequency will not rise until the operation frequency reaches the lower limit frequency. (Operation at the lower limit frequency)
In this case, the time required for the operation frequency to reach the lower limit frequency can be shortened by setting fc to the lower limit frequency.

### ■ Adjustment with pulse signals (Parameter-setting example 2)

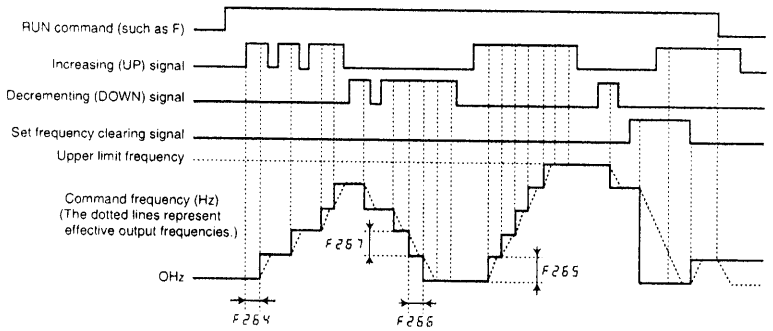
Set parameters as follows to adjust the frequency in steps of one pulse:

F264, F266 ≤ Pulse On time

F265, F267 = Frequency obtained with each pulse

* The inverter does not respond to any pulses with an ON time shorter than that set with F264 or F266. 12ms or more of clearing signal is allowed.

<<Sample sequence diagram 2: Adjustment with pulse signals>>




## ■ If two signals are impressed simultaneously

- If a clear single and an up or down signal are impressed simultaneously, priority will be given to the clear signal.
- If up and down signals are impressed simultaneously, The frequency will change at the specified up or down rate.

## ■ About the setting of the initial up/down frequency

To adjust the frequency starting at a specified frequency other than 0.0 Hz (default initial frequency) after turning on the inverter, specify the desired frequency using F268 (initial up/down frequency).

## ■ About the change of the initial up/down frequency

To make the Inverter automatically save the frequency immediately before it is turned off and start operation at that frequency next time power is turned on, set F269 (change of initial up/down frequency) to 1 (which changes the setting of F268 when power is turned off).
Keep in mind that the setting of F268 is changed each time power is turned off.

## ■ Frequency adjustment range

The frequency can be set from 0.0Hz to FH (Maximum frequency). The lower-limit frequency will be set as soon as the set frequency clearing function (function number 43, 44) is entered from the input terminal.

## ■ Minimum unit of frequency adjustment

If F702 (Frequency free unit magnification) is set to 1.00, the output frequency can be adjusted in steps of 0.01Hz.



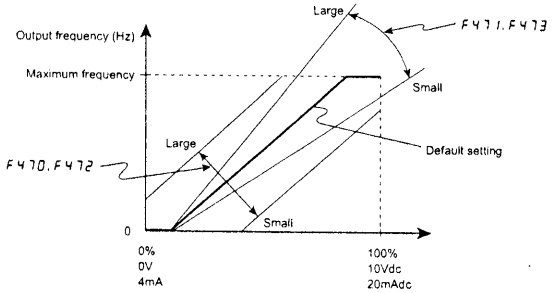


## 6.5.4 Fine adjustment of frequency setting signal

F470: VIA input bias
F471: VIA input gain
F472: VIB input bias
F473: VIB input gain

- Function
  These parameters are used to fine adjust the relation between the frequency setting signal input through the analog input terminals VIA and VIB and the output frequency.
  Use these parameters to make fine adjustments after making rough adjustments using the parameters F201 to F213.

The figure below shows the characteristic of the frequency setting signal input through the VIA and VIB terminals and that of the output frequency.




Frequency setting signal (VIA, VIB Input value)

- Bias adjustment of VIA and VIB input terminals (F470 and F472)
  To give leeway, the inverter is factory-adjusted by default so that it will not produce an output until a certain amount of voltage is applied to the VIA and VIB input terminals. If you want to reduce the leeway, set F470 or F472 to a larger value. Note that specifying a too large value may cause an output frequency to be output, even though the operation frequency is 0 (zero) Hz.
- Gain adjustment of VIA and VIB input terminals (F471 and F473)
  The inverter is factory-adjusted by default so that the operation frequency can reach the maximum frequency, even though the voltage and current to the VIA and VIB Input terminals are below the maximum levels. If you want to adjust the inverter so that it will output the maximum frequency at the maximum voltage and current, set F471 or F473 to a smaller value. Note that specifying a too small value may cause the operation frequency not to reach the maximum frequency, even though the maximum voltage and current are applied.

# 6.6 Operation frequency

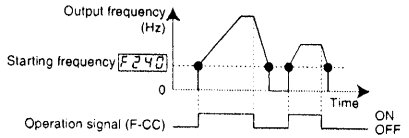
## 6.6.1 Starting frequency

F240: Starting frequency setting

- Function
  The frequency set with F240 is put out as soon as operation is started.
  Use the F240 parameter when a delay in response of starting torque according to the acceleration/deceleration time is probably affecting operation. Setting the starting frequency to a value from 0.5 to 3Hz is recommended. The occurrence of an overcurrent can be suppressed by setting this frequency below the rated slippage of the motor.

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F240 | Starting frequency setting | 0.5-10.0 (Hz) | 0.5 |




## 6.6.2 Run/stop control with frequency setting signals

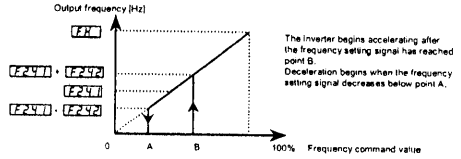
F241: Operation starting frequency

F242: Operation starting frequency hysteresis

- Function
  The Run/stop of operation can be controlled simply with frequency setting signals.

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F241 | Operation starting frequency | 0.0-FH (Hz) | 0.0 |
| F242 | Operation starting frequency hysteresis | 0.0-FH (Hz) | 0.0 |








# 6.7 DC braking

## 6.7.1 DC braking

F250: DC braking starting frequency

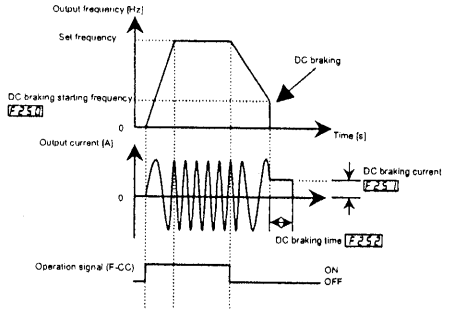
F251: DC braking current

F252: DC braking time

- Function
  A large braking torque can be obtained by applying a direct current to the motor. These parameters set the direct current to be applied to the motor, the application time and the starting frequency.

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F250 | DC braking starting frequency | 0.0-FH (Hz) | 0.0 |
| F251 | DC braking current | 0.0-100 (%) / (A) | 50 |
| F252 | DC braking time | 0.0- 20.0 (sec) | 1.0 |




Note1: During DC braking, the overload protection sensitivity of the inverter increases. The DC braking current may be adjusted automatically to prevent tripping.

Note 2: During DC braking, the carrier frequency is 4kHz or less irrespective of the setting of parameter F300 (PWM carrier frequency).

## 6.7.2 Motor shaft fixing control

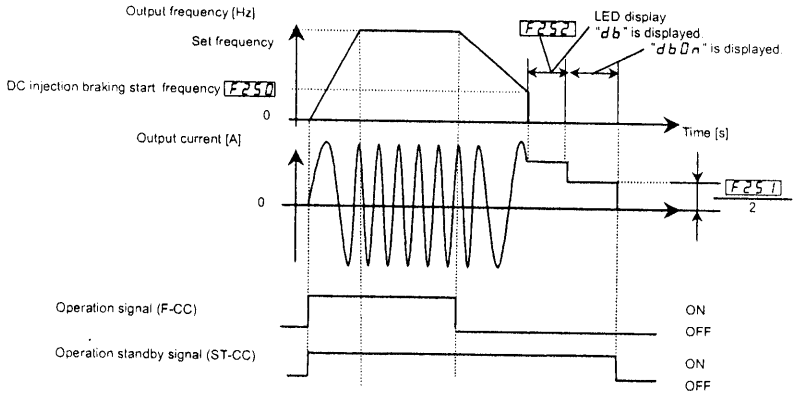
F254: Motor shaft fixing control

- Function
  This function is used to prevent the motor from running unexpectedly because its shaft is not restrained or to preheat the motor.

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F254 | Motor shaft fixing control | 0: Disabled, 1: Enabled | 0 |

If the motor shaft fixing control F254 is set to 1, half the braking force set with F251 (DC braking rate) will be applied to the motor to continue DC braking even after the completion of ordinary DC braking. To stop motor shaft fixing control, turn off the standby command (ST signal).




Note1: About the same motor shaft fixing control can be exercised by entering a DC braking command from external contacts.

Note2: If a power failure occurs during motor shaft fixing control and the motor starts to coast, motor shaft fixing control will be canceled.
Also, if the inverter trips during motor shaft fixing control and is restored to working order by the retry function, motor shaft fixing control will be canceled.

Note 3: During shaft fixing control, the carrier frequency is 4kHz or less irrespective of the setting of parameter F300 (PWM carrier frequency).





# 6.8 Auto-stop in case of lower-limit frequency continuous operation

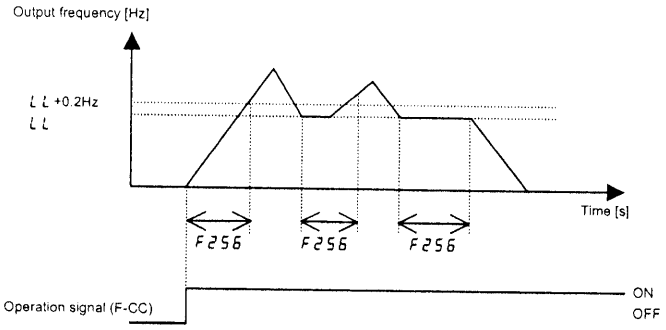
## 6.8.1 Auto-stop in case of lower-limit frequency continuous operation

F256: Auto-stop in case of lower-limit frequency continuous operation

- Function
  If operation is carried out continuously at a frequency below the lower-limit frequency (LL) for the period of time set with F256, the inverter will automatically slow down the motor to a stop. At that time, "LStP" is displayed (alternately) on the operation panel.
  This function will be canceled if a frequency command above the lower-limit frequency (LL) +0.2Hz.

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F256 | Auto-stop in case of lower-limit frequency continuous operation time | 0.0: None<br>0.1-600.0 (sec.) | 0.0 |




Note: This function is enabled even at the start of operation and during switching between forward and reverse run.

# 6.9 Jog run mode

F260: Jog run frequency

F261: Jog run stopping pattern

F262: Panel jog run mode

- Function
  Use the jog run parameters to operate the motor in jog mode. Input of a jog run signal fenerates a jog run frequency output at once, irrespective of the designated acceleration time.
  Also, you can choose an operation panel start/stop mode between the ordinary start/stop mode and the jog run start/stop mode.

The jog run function needs to be assigned to an input terminal. When assigning it to the RES terminal, set F113 to 4.

The motor can be operated in jog mode while the jog run setting terminals are connected (RES-CC ON). (Setting F113 to 4.)

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F260 | Jog run frequency | F240-20.0 (Hz) | 5.0 |
| F261 | Jog run stopping pattern | 0: Slowdown stop<br>1: Coast stop<br>2: DC braking | 0 |
| F262 | Panel jug run mode | 0: Disabled<br>1: Panel jog run mode enabled | 0 |

[Setting of jog run setting terminal (RES-CC)]

Assign control terminal RES ([4: reset signal] in default setting) as the jog run setting terminal.

| Title | Function | Adjustment range | Setting |
|---|---|---|---|
| F113 | Input terminal selection (RES) | 0-65 | 4<br>(jog run setting terminal) |

Note 1: During the jog run mode, there is LOW (low speed detection signal) output but no RCH (designated frequency reach signal) output, and PID control does not work.

Note 2: When the operation panel only is used for operation in jog run mode, the jog run function does not need to be assigned to any input terminal.

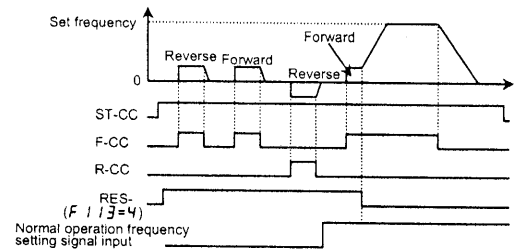
<Examples of jog run>

- RES-CC (JOG) ON + F-CC ON: Forward jog run
- RES-CC (JOG) ON + R-CC ON: Reverse jog run

(Normal operation frequency signal input + F-CC ON: Forward run
Normal operation frequency signal input + R-CC ON: Reverse run)





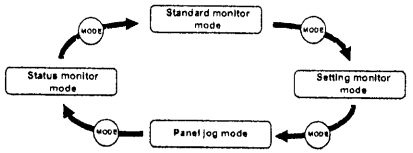



- The jog run setting terminal (RES-CC) is enabled when the operation frequency is below the jog run frequency.
  This connection does not function at an operation frequency exceeding the jog run frequency.
- The motor can be operated in jog mode while the jog run setting terminals are connnected (RES-CC).
- Jog run has priority, even when a new operation command is given during operation.
- Even for F261 = 0 or 1, an emergency DC braking becomes enabled when setting F603 = 2.
- No limits are imposed to the jog run frequency by the upper-limit frequency (parameter UL).

## ■ Panel jog mode (if F262 is set to 1)

- When the inverter is in panel jog mode, pressing the (▲) key displays FJOG, while pressing the (▼) key displays rJOG.
- When FJOG is displayed, the inverter will be placed in forward jog run mode as long as the (RUN) key is held down.
- When rJOG is displayed, the inverter will be placed in reverse jog run mode as long as the (RUN) key is held down.
- During jog run, the direction of rotation can be changed using the (▲) and (▼) keys. Press the (▲) key to run the motor in the forward direction, or press the (▼) key to run it in the reverse direction.
- If you press and hold down the (RUN) key for 20 seconds or more, the key failure alarm "E - 17" will be displayed.

Here is the sequence in which modes change each time you press the (MODE) key.




Note: When the inverter is in operation (RUN lamp is blinking) or when an operation command is issued (RUN lamp is lit), the inverter cannot be switched to panel jog mode.

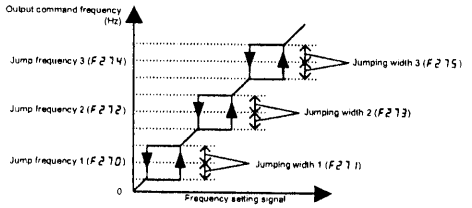


12.2.5

## 6.10 Jump frequency - jumping resonant frequencies

F270: Jump frequency 1
F271: Jumping width 1
F272: Jump frequency 2
F273: Jumping width 2
F274: Jump frequency 3
F275: Jumping width 3

- Function
  Resonance due to the natural frequency of the mechanical system can be avoided by jumping the resonant frequency during operation. During jumping, hysteresis characteristics with respect to the jump frequency are given to the motor.




[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F270 | Jump frequency 1 | 0.0-FH (Hz) | 0.0 |
| F271 | Jumping width 1 | 0.0-30.0 (Hz) | 0.0 |
| F272 | Jump frequency 2 | 0.0-FH (Hz) | 0.0 |
| F273 | Jumping width 2 | 0.0-30.0 (Hz) | 0.0 |
| F274 | Jump frequency 3 | 0.0-FH (Hz) | 0.0 |
| F275 | Jumping width 3 | 0.0-30.0 (Hz) | 0.0 |

☆ Do not set the jump parameters, if multiple jump frequency setting width overlap.
☆ During acceleration or deceleration, the jumping function is disabled for the operation frequency.





## 6.11 Preset-speed operation frequencies

### 6.11.1 Preset-speed operation frequency 8 to 15

F281 - F294: Preset-speed operation frequency 8 to 15

See Section 5.14 for details.

### 6.11.2 Fire-speed control

F294: Preset-speed operation frequency 15 (fire-speed)

- Function
  Fire-speed control is used when operating the motor at the specified frequency in case of an emergency. If fire-speed control is assigned to the terminal board selection parameter and a fire-speed control signal is given, the motor will be operated at the frequency specified with F294 (preset-speed operation frequency 15). (When the terminal board selection parameter is set to 52 or 53).

## 6.12 PWM carrier frequency

F300: PWM carrier frequency
F312: Random mode
F316: Carrier frequency control mode selection

- Function
  1) The F300 parameter allows the tone of the magnetic noise from the motor to be changed by switching the PWM carrier frequency. This parameter is also effective in preventing the motor from resonating with its load machine or its fan cover.
  2) In addition, the F300 parameter reduces the electromagnetic noise generated by the inverter. Reduce the carrier frequency to reduce electromagnetic noise. Note: Although the electromagnetic noise level is reduced, the acoustic noise of the motor is increased.
  3) The random mode reduces motor electromagnetic noise by changing the pattern of the reduced carrier frequency.

Note: If you are using 600V models by over 40m cable, the carrier frequency (F300) should be set preferably below 4kHz.

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F300 | PWM carrier frequency | 2.0-16.0 (kHz) (*) | 12.0 |
| F312 | Random mode | 0: Disabled, 1: Enabled | 0 |
| F316 | Carrier frequency control mode selection | 0: Carrier frequency not reduced automatically<br>1: Carrier frequency reduced automatically<br>2: Carrier frequency not reduced automatically<br>Support for 500V/600V models<br>3: Carrier frequency reduced automatically<br>Support for 500V/600V models. | 1 |

* Reduction of rated current will be required if the PWM carrier frequency is modified for each applicable motor model. Refer to the following table.
* When the PWM carrier frequency is set high, selecting "Carrier frequency not reduced automatically" causes the inverter to be tripped more easily than selecting "Carrier frequency reduced automatically."

Reduction of rated current.

[240V Class]

| VFS11S-<br>VFS11- | Carrier frequency | | |
|---|---|---|---|
| | 4kHz or less | 12kHz or less | 16kHz or less |
| 2002PL/M | 1.5A | 1.5A | 1.5A |
| 2004PL/M | 3.3A | 3.3A | 3.3A |
| 2005PM | 3.7A | 3.3A | 3.3A |
| 2007PL/M | 4.8A | 4.4A | 4.2A |
| 2015PL/M | 8.0A | 7.9A | 7.1A |
| 2022PL/M | 11.0A | 10.0A | 9.1A |
| 2037PM | 17.5A | 16.4A | 14.6A |
| 2055PM | 27.5A | 25.0A | 25.0A |
| 2075PM | 33.0A | 33.0A | 29.8A |
| 2110PM | 54.0A | 49.0A | 49.0A |
| 2150PM | 66.0A | 60.0A | 54.0A |

[500V Class]

| Input voltage | 480V or less | | | more than 480V | | |
|---|---|---|---|---|---|---|
| VFS11- | Carrier frequency | | | Carrier frequency | | |
| | 4kHz or less | 12 kHz or less | 16kHz or less | 4kHz or less | 12kHz or less | 16kHz or less |
| 4004PL | 1.5A | 1.5A | 1.5A | 1.5A | 1.5A | 1.2A |
| 4007PL | 2.3A | 2.1A | 2.1A | 2.1A | 1.9A | 1.9A |
| 4015PL | 4.1A | 3.7A | 3.3A | 3.8A | 3.4A | 3.1A |
| 4022PL | 5.5A | 5.0A | 4.5A | 5.1A | 4.6A | 4.2A |
| 4037PL | 9.5A | 8.6A | 7.5A | 8.7A | 7.9A | 6.9A |
| 4055PL | 14.3A | 13.0A | 13.0A | 13.2A | 12.0A | 12.0A |
| 4075PL | 17.0A | 17.0A | 14.8A | 15.6A | 14.2A | 12.4A |
| 4110PL | 27.7A | 25.0A | 25.0A | 25.5A | 23.0A | 23.0A |
| 4150PL | 33.0A | 30.0A | 26.0A | 30.4A | 27.6A | 24.0A |





[600V Class]

| VFS11- | Carrier frequency | | |
|---|---|---|---|
| | 4kHz or less | 12kHz or less | 16kHz or less |
| 6007P | 1.7 | 1.5 | 1.4 |
| 6015P | 2.7 | 2.4 | 2.2 |
| 6022P | 3.9 | 3.5 | 3.1 |
| 6037P | 6.1 | 5.5 | 4.9 |
| 6055P | 9 | 8.1 | 7.2 |
| 6075P | 11 | 9.9 | 8.8 |
| 6110P | 17 | 15.3 | 13.6 |
| 6150P | 22 | 19.8 | 17.6 |

* The currents in the above table are used as the basis to make calculations for inverter overload trip (OL1).
* Default setting of PWM carrier frequency is 12kHz, but rated output current of rating label display at 4kHz.
  If F316 is set to 1 or 3, however, the carrier frequency will decrease automatically with increase in current in order to secure the rated current at frequencies of 4 kHz or less.
* If F316 is set to 0 or 2, OCP trip will occur when the current increases and reaches the level above which the carrier frequency is decreased automatically.
* Random control is exercised when the motor is operated in a low-frequency range where it produces annoying magnetic noise.
  If the carrier frequency (F300) is set above 7.1 kHz, the random control function will not be performed, because the level of motor magnetic noise is low at high frequencies.
* When the carrier frequency control mode selection (F316) is set to 2 or 3, the carrier frequency (F300) should be set preferably below 4 kHz. Otherwise the output voltage may drop.

## 6.13 Trip-less intensification

### 6.13.1 Auto-restart (Restart of coasting motor)

F301: Auto-restart control selection

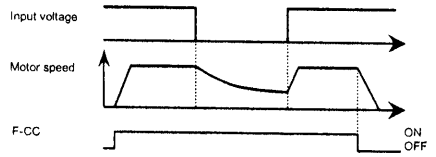
| Caution | |
|---|---|
| Mandatory | • Stand clear of motors and mechanical equipment<br>If the motor stops due to a momentary power failure, the equipment will start suddenly when power is restored.<br>This could result in unexpected injury.<br>• Attach warnings about sudden restart after a momentary power failure on inverters, motors and equipment for prevention of accidents in advance. |

• Function
The F301 parameter detects the rotating speed and rotational direction of the motor during coasting ing the event of momentary power failure, and then after power haas been restored, restarts the motor smoothly (motor speed search function). This parameter also allows commercial power operation to be switched to inverter operation without stopping the motor.
During operation, "crch" is displayed.

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F301 | Auto-restart control selection | 0: Disabled<br>1: At auto-restart after momentary stop<br>2: When turning ST-CC on or off<br>3: At auto-restart or when turning ST-CC on or off<br>4: At start-up | 0 |

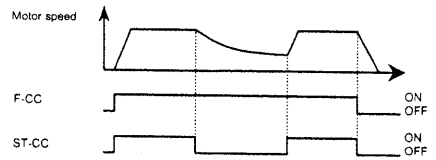
* If the motor is restarted in retry mode, this function will operate, regardless of the setting of this parameter.

1) Auto-restart after momentary power failure (Auto-restart function)




★ Setting F301 to 1, (3): This function operates after power has been restored following detection of an undervoltage by the main circuits and control power.

2) Restarting motor during coasting (Motor speed search function)




★ Setting F301 to 2 or 3: This function operates after the ST-CC terminal connection has been opened first and then connected again.

Note: The terminal function ST needs to be assigned to an input terminal, using the parameters F111 to F118.





3) DC braking during restart

When F301 is set to 4, a motor speed search is performed each time operation is started.
This function is useful especially when the motor is not operated by the inverter but it is running because of external force.

Warning!!

- At restart, it takes about 300 ms for the inverter to check to see the number of revolutions of the motor.
  For this reason, the start-up takes more time than usual.
- Use this function when operating a system with one motor connected to one inverter.
  This function may not operate properly in a system configuration with multiple motors connected to one inverter.

**Application to a crane or hoist**

**The crane or hoist may have its load moved downward during the above waiting time from input of the operation starting command to the restart of the motor. To apply the inverter to such machines, therefore, set the auto-restart control mode selection parameter to "F301 1=0" (Disabled), Do not use the retry function, either.**

## 6.13.2 Regenerative power ride-through control/Deceleration stop

F302: Regenerative power ride-through control/Deceleration stop

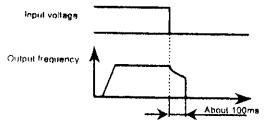
- Function
  1) Regenerative power ride-through control continues the operation of the motor by utilizing motor regenerative energy in the event of momentary power failure.
  2) Slowdown stop in the event of momentary power failure: If a momentary power failure occurs during operation, the inverter stops forcibly. (Deceleration time varies with control.) When operation is stopped, the message "StOP" is displayed (alternately) on the operation panel. After the forced stop, the inverter remains static until you put off the operation command momentarily.

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F302 | Regenerative power ride-through control / Deceleration stop | 0: Disabled<br>1: Enabled<br>2: Slowdown stop | 0 |

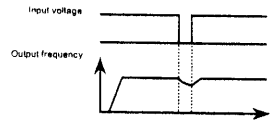
Note: Even when this parameter is set, the particular load conditions may cause the motor to coast. In this case, use the auto-restart function F301 along with this parameter function.

[When power is interrupted]




* The time for which the operation of the motor can be continued depends on the machine inertia and load conditions. Before using this function, therefore, perform verification tests.

[If momentary power failure occurs]




## 6.13.3 Retry function

F303: Retry selection (Selecting the number of times)

6

| ⚠ Caution | |
|---|---|
| Mandatory | • Do not go near the motor in alarm-stop status when the retry function is selected. The motor may suddenly restart, which could result in injury.<br>• Take measures for safety, e.g. attach a cover to the motor, to prevent accidents if the motor suddenly restarts. |

- Function
  This parameter resets the inverter automatically when the inverter gives an alarm. During the retry mode, the motor speed search function operated automatically as required and thus allows smooth motor restarting.

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F303 | Retry selection (number of times) | 0: None, 1-10 times | 0 |





6

The likely causes of tripping and the corresponding retry processes are listed below.

| Cause of tripping | Retry process | Canceling conditions |
|---|---|---|
| Momentary power failure<br>Overcurrent<br>Overvoltage<br>Overload<br>Overheating | Up to 10 times in succession<br>1st retry: About 1 sec after tripping<br>2nd retry: About 2 sec after tripping<br>3rd retry: About 3 sec after tripping<br>:<br>10th retry: About 10 sec after tripping | The retry function will be canceled at once if tripping is caused by an unusual event other than: momentary power failure, overcurrent, overvoltage or overload.<br>This function will also be canceled if retrying is not successful within the specified number of times. |

★ The retry function is disabled in the following unusual events:

- OCA : Arm overcurrent at start-up
- OCL : Overcurrent on the load side at start-up
- EPHO : Output phase failure
- OH2 : External thermal trip
- Ot : Overtorque trip
- E : External trip stop
- UC : Small-current operation trip
- UP1 : Undervoltage trip (main circuit)
- EF2 : Ground fault trip
- EPH1 : Input phase failure
- EtyP : Inverter type error
- Err2 : Main unit RAM fault
- Err3 : Main unit ROM fault
- Err4 : CPU fault trip
- Err5 : Remote control error
- Err7 : Current detector fault
- Err8 : Control circuit board format error
- EEP1 : EEPROM fault 1
- EEP2 : EEPROM fault 2
- EEP3 : EEPROM fault 3
- Etn1 : Auto-tuning error
- E-18 : VIA input detection error
- E-19 : Main unit CPU communication error
- E-20 : Excessive torque boost
- E-21 : CPU fault 2

★ Protective operation detection relay signals (FLA, FLB, FLC terminal signals) are not sent during use of the retry function. (Default setting)

★ To allow a signal to be sent to the protective action detection relay (FLA, B and C terminals) even during the retry process, assign the function 36 or 37 to F132.

★ A virtual cooling time is provided for overload tripping (OL1, OL2, OLr).
In this case, the retry function operates after the virtual cooling time and retry time.

★ In the event of tripping caused by an overvoltage (OP1 - OP3), the retry function will not be activated until the voltage in the DC section comes down to a normal level.

★ In the event of tripping caused by overheating (OH), the retry function will not be activated until the temperature in the inverter comes down low enough for it to restart operation.

★ Keep in mind that when F602 is set to 1 (trip retained), the retry function will not be performed, regardless of the setting of F303.

★ During retrying, the blinking display will alternate between rtry and the monitor display specified by status monitor display mode selection parameter F710.

★ The number of retries will be cleared if the inverter is not tripped for the specified period of time after a successful retry.
"A successful retry" means that the inverter output frequency reaches the command frequency without causing the inverter to re-trip.



8.2.5

## 6.13.4 Dynamic (regenerative) braking - For abrupt motor stop

F304: Dynamic braking selection

F308: Dynamic braking resistance

F309: Dynamic braking resistor capacity

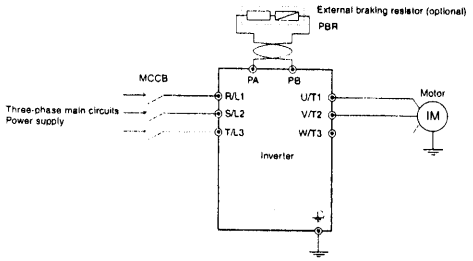
- Function
  The VFS11 does not contain a braking resistor. Connect an external braking resistor in the following cases to enable dynamic braking function:
  1) when decelerating the motor abruptly or if overvoltage tripping (OP) occurs during deceleration stop
  2) when a continuous regenerative status occurs during downward movement of a lift or the winding-out operation of a tension control machine
  3) when the load fluctuates and a continuous regenerative status results even during constant speed operation of a machine such as a press

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F304 | Dynamic braking selection | 0: Disabled<br>1: Enabled (Resistor overload protection enabled) | 0 |
| F308 | Dynamic braking resistance | 1.0-1000 (Ω) | Depending on models (See Section 11, K-15) |
| F309 | Dynamic braking resistor capacity | 0.01-30.00 (kW) | |

6

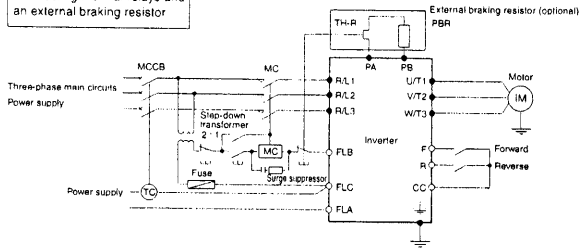
1) Connecting an external braking resistor (optional)
Separate-optional resistor (with thermal fuse)








Connecting thermal relays and an external braking resistor




Note 1: A TC (Trip coil) is connected, as shown in this figure, when an MCCB with a trip coil is used instead of an MC. A step-down transformer is needed for every 400V-class inverter, but not for any 200V-class inverter.

Note 2: As a last resort to prevent fire, be sure to connect a thermal relay (THR). Although the inverter has a means of preventing overload and overcurrent to protect the braking resistor, the thermal relay is activated in case the protection function fails to work. Select and connect a thermal relay (THR) appropriate to the capacity (wattage) of the braking resistor.

6

[Parameter setting]

| Title | Function | Default setting |
|---|---|---|
| F304 | Dynamic braking selection | 1 |
| F305 | Overvoltage limit operation | 1 |
| F308 | Dynamic braking resistance | Any value |
| F309 | Dynamic braking resistor capacity | Any value |

☆ To connect a dynamic braking resistor, set the overvoltage limit operation parameter F305 to "1" (Disabled).

☆ To use this inverter in applications that create a continuously regenerative status (such as downward movement of a lift, a press or a tension control machine), or in applications that require slowdown stopping of a machine with a significant load inertial moment, increase the dynamic braking resistor capacity according to the operation rate required.

☆ To connect an external dynamic braking resistor, select one with a resultant resistance value greater than the minimum allowable resistance value. Be sure to set the appropriate operation rate in F308 and F309 to ensure overload protection.

☆ When using a braking resistor with no thermal fuse, connect and use a thermal relay as a control circuit for cutting power off.

### 2) Optional dynamic braking resistors

Optional dynamic braking resistors are listed below. All these resistors are 3%ED in operation rate

| Inverter type | Braking resistor/Braking unit | |
|---|---|---|
| | Type-form | Rating |
| VFA11S-2002PI to 2007PL<br>VFS11-2002PM to 2007PM | PBR-2007 | 120W-200Ω |
| VFS11S-2015PL to 2022PL<br>VFS11-2015PM to 2022PM | PBR-2022 | 120W-75Ω |
| VFS11-2037PM | PBR-2037 | 120W-40Ω |
| VFS11-2055PM | PBR3-2055 | 240W-20Ω (120W-40Ωx2P) |
| VFS11-2075PM | PBR3-2075 | 440W-15Ω (220W-30Ωx2P) |
| VFS11-2110PM | PBR3-2110 | 660W-10Ω (220W-30Ωx3P) |
| VFS11-2150PM | PBR3-2150 | 880W-7.5Ω (220W-30Ωx4P) |
| VFS11-4004PL to 4022PL | PBR-2007 | 120W-200Ω |
| VFS11-4037PL | PBR-4037 | 120W-160Ω |
| VFS11-4055PL | PBR3-4055 | 240W-80Ω (120W-160Ωx2P) |
| VFS11-4075PL | PBR3-4075 | 440W-60Ω (220W-120Ωx2P) |
| VFS11-4110PL | PBR3-4110 | 660W-40Ω (220W-120Ωx3P) |
| VFS11-4150PL | PBR3-4150 | 880W-30Ω (220W-120Ωx4P) |
| VFS11-6007 | - | 62W-2850Ω |
| VFS11-6015 | - | 124W-1450Ω |
| VFS11-6022 | - | 186W-950Ω |
| VFS11-6037 | - | 371W-480Ω |
| VFS11-6055 | - | 618W-290Ω |
| VFS11-6075 | - | 928W-190Ω |
| VFS11-6110 | - | 1237W-140Ω |
| VFS11-6150 | - | 1546W-115Ω |

Note 1: The data in Rating above refer to the resultant resistance capacities (watts) and resultant resistance values (Ω).
The numeric values inside parentheses refer to the internal compositions of resistors.

Note 2: Braking resistors for frequent regenerative braking are optionally available. For more information, contact your nearest Toshiba inverter distributor.

Note 3: Type-form of "PBR-" indicate "with thermal fuse" type.
"PBR3-" indicate "with thermal relay" type".





### 3) Minimum resistances of connectable braking resistors

The minimum allowable resistance values of the externally connectable braking resistors are listed in the table below.

Do not connect braking resistors with smaller resultant resistances than the listed minimum allowable resistance values.

| Inverter rated output capacity (kW) | [240V Class] | | [500V Class] | | [600V Class] | |
|---|---|---|---|---|---|---|
| | Resistance of standard option | Minimum allowable resistance | Resistance of standard option | Minimum allowable resistance | Resistance of standard option | Minimum allowable resistance |
| 0.2 | 200Ω | 55Ω | - | - | - | - |
| 0.4 | 200Ω | 55Ω | 200Ω | 114Ω | - | - |
| 0.55 | 200Ω | 55Ω | - | - | - | - |
| 0.75 | 200Ω | 55Ω | 200Ω | 114Ω | 2850Ω | 115Ω |
| 1.5 | 75Ω | 44Ω | 200Ω | 67Ω | 1450Ω | 68Ω |
| 2.2 | 75Ω | 33Ω | 200Ω | 67Ω | 950Ω | 68Ω |
| 4.0 | 40Ω | 16Ω | 160Ω | 54Ω | 480Ω | 54Ω |
| 5.5 | 20Ω | 12Ω | 80Ω | 43Ω | 290Ω | 44Ω |
| 7.5 | 15Ω | 12Ω | 60Ω | 28Ω | 190Ω | 28Ω |
| 11 | 10Ω | 5Ω | 40Ω | 16Ω | 140Ω | 16Ω |
| 15 | 7.5Ω | 5Ω | 30Ω | 16Ω | 115Ω | 16Ω |

Note: Be sure to set F308 (Dynamic braking resistance) at the resistance of the dynamic braking resistor connected.

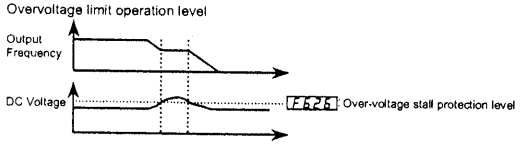
## 6.13.5 Avoiding overvoltage tripping

F305: Overvoltage limit operation

F626: Overvoltage stall protection level

- Function
  These parameters are used to keep the output frequency constant or increase it to prevent overvoltage tripping in case the voltage in the DC section rises during deceleration or varying speed operation. The deceleration time during overvoltage limit operation may increase above the designated time.

Overvoltage limit operation level



[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F305 | Overvoltage limit operation (Slowdown stop mode selection) | 0: Enabled<br>1: Disabled<br>2: Enabled (Quick deceleration)<br>3: Enabled (Dynamic quick deceleration) | 2 |
| F626 | Overvoltage limit operation level | 100-150% | 240V/600V: 134%<br>500V models: 140% |

☆ If F305 is set to 2 (quick deceleration), the inverter will increase the voltage to the motor (over-excitation control) to increase the amount of energy consumed by the motor when the voltage reaches the overvoltage protection level, and therefore the motor can be decelerated more quickly than normal deceleration.

☆ If F305 is set to 3 (dynamic quick deceleration), the inverter will increase the voltage to the motor (over-excitation control) to increase the amount of energy consumed by the motor as soon as the motor begins to slow down, and therefore the motor can be decelerated still more quickly than quick deceleration.

## 6.13.6 Output voltage adjustment/Supply voltage correction

6

ULU: Base frequency voltage 1

F307: Supply voltage correction (output voltage adjustment)

- Function

Base frequency voltage1

The F307 parameter adjusts the voltage corresponding to the base frequency 1 UL so that no voltage exceeding the ULU set value is put out. (This function is enabled only when F307 is set to either "0" or "1".)

Supply voltage correction

The F307 parameter maintains a constant V/F ratio, even when the input voltage decreases. The torque during low-speed operation is prevented from decreasing.

Maintains a constant V/F ratio, even when the input voltage fluctuates.

Output voltage adjustment..... Limits the voltage at frequencies exceeding the base frequency. Applied when operating a special motor with low induced voltage.

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| ULU | Base frequency voltage1 | 50-330 (V) : 240V class<br>50-660 (V) : 500 / 600V class | 230 (240V class)<br>460 (500V class)<br>575 (600V class) |
| F307 | Supply voltage correction (output voltage limited) | 0: Supply voltage uncorrected, output voltage limited<br>1: Supply voltage corrected, output voltage limited<br>2: Supply voltage uncorrected, output voltage unlimited<br>3: Supply voltage corrected, output voltage unlimited | 2 (WP, WN)<br>3 (AN) |





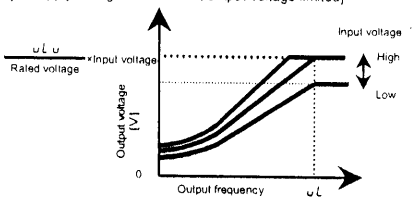
☆ If F307 is set to "0" or "2", the output voltage will change in proportion to the input voltage.

☆ Even if the base frequency voltage (ULU parameter ) is set above the input voltage, the output voltage will not exceed the input voltage.

☆ The rate of voltage to frequency can be adjusted according to the rated motor capacity. For example, setting F307 to "0" or "1" prevents the output voltage from increasing, even if the input voltage changes when operation frequency exceeds the base frequency.

☆ When the V/F control mode selection parameter (Pt) is set to any number between 2 and 5, the supply voltage is corrected regardless of the setting of F307.

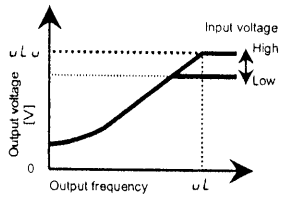
[0: Supply voltage uncorrected, output voltage limited]



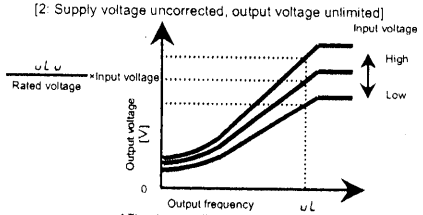

* The above applies when V/F control mode selection parameter Pt is set to "0" or "1".

ULU / Rated voltage >1 the output voltage can be prevented from exceeding the input voltage.

[1: Supply voltage corrected, output voltage limited]



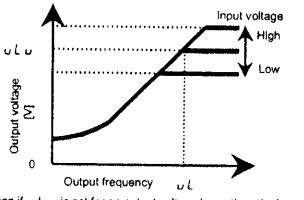

[2: Supply voltage uncorrected, output voltage unlimited]




* The above applies when V/F control mode selection parameter Pt is set to "0" or "1".

ULU / Rated voltage >1 the output voltage can be prevented from exceeding the input voltage.

[3: Supply voltage corrected, output voltage unlimited]




* Even if ULU is set for an output voltage lower than the input voltage, the output voltage will exceed the voltage adjusted by ULU when the output frequency is higher than the base frequency 1 UL.

### 6.13.7 Canceling the operation command

F311: Reverse-run prohibition

- Function
  This function prevents the motor from running in the forward or reverse direction when it receives the wrong operation signal.

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F311 | Reverse-run prohibition | 0: Forward/reverse run permitted<br>1: Reverse run prohibited<br>2: Forward run prohibited | 0 |

## 6.14 Droop control

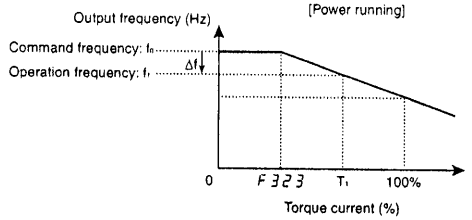
F320: Droop gain

F323: Droop insensitive torque band

- Function
  Droop control has the function of preventing loads from concentrating at a specific motor because of a load imbalance when multiple inverters are used to operate one machine.
  These parameters are used to allow the motor to "slip" according to the load torque current. Using these parameters, the insensitive torque band and the gain can be adjusted.

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F320 | Droop gain | 0-100% | 0% |
| F323 | Droop insensitive torque band | 0-100% | 10% |








☆ The droop control function refers to the function of operating the power-running motor at operating frequency $f_1$ (Hz) that is lower than command frequency $f_0$ (Hz) by droop frequency $\Delta f$ (Hz) when the torque current is $T_1$ (%). (See the above figure.)

- The droop frequency $\Delta f$ can be calculated, using the following expression.
  Droop frequency $\Delta f$ (Hz)=base frequency UL × F320 × (Torque current $T_1$ - F323)
- When the torque current is above the specified droop insensitive torque band (F323), the frequency is reduced during power running or increased during regenerative braking. The above figure shows an example of the operating frequency during power running. During regenerative braking, control is performed in such a way as to increase the frequency.
- The droop function is activated above the torque current set with F323.
- The amount of droop frequency $\Delta f$ varies depending on the amount of torque current $T_1$.

Note: If the base frequency UL exceeds 100Hz, count it as 100Hz.
Control is exercised between the starting frequency (F240) and the maximum frequency (FH).

[An example of calculation]
Parameter setting: Base frequency UL =60 (Hz), droop gain F320=10 (%)
Droop insensitive torque band F323=30 (%)
Droop frequency $\Delta f$ (Hz) and operating frequency $f_1$ when command frequency $f_0$ is 50 (Hz) and torque current $T_1$ is 100 (%) are as follows.

Droop frequency $\Delta f$ (Hz)=UL × F320 × ($T_1$ - F323)
=60 (Hz) × 10 (%) × (100 (%) - 30 (%))
=4.2 (Hz)
Operation frequency $f_1$ (Hz) = $f_0$ - $\Delta f$ = 50 (Hz) - 4.2 (Hz)=45.8 (Hz)

## 6.15 Braking setting functions

F342: Braking mode selection

F343: Release frequency

F344: Release time

F345: Creeping frequency

F346: Creeping time

- Function
  Setting functions to control braking timing.

Note: For these parameters, contact your nearest Toshiba inverter distributor.

## 6.16 Conducting PID control

F359: PID control waiting time

F360: PID control

F362: Proportional gain

F363: Integral gain

F366: Differential gain

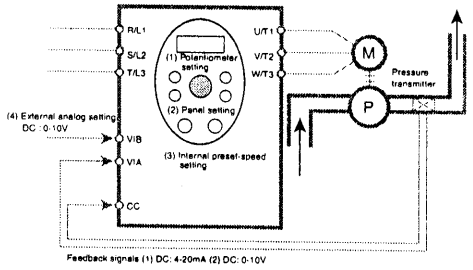
- Function
  Using feedback signals (4 to 20mA, 0 to 10V) from a detector, process control can be exercised, for example, to keep the airflow, amount of flow or pressure constant.

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F359 | PID control waiting time | 0-2400 [sec] | 0 |
| F360 | PID control | 0: Disabled, 1: Enabled | 0 |
| F362 | Proportional gain | 0.01-100.0 | 0.30 |
| F363 | Integral gain | 0.01-100.0 | 0.20 |
| F366 | Differential gain | 0.00-2.55 | 0.00 |

6

### 1) External connection








### 2) Types of PID control interfaces

Process quantity input data (frequency) and feedback input data can be combined as follows for the PID control of the VF-S11:

| Process quantity input data (frequency setting) | | Feedback input data |
|---|---|---|
| Setting method | Frequency setting mode selection 1 F001 / F207 / F200 | |
| (1) Internal potentiometer setting | 0 | External analog input VIA (DC:4-20V / DC:0-10V) |
| (2) Panel input setting | 3 | |
| (3) Internal preset-speed setting | -(CM0d=0) | |
| (4) External analog setting VIB (DC: 0-10V) | 2 | |

Note 1: About the setting of F001, F207 and F200: Do not enable VIA using these parameters, because the VIA terminal is used for feedback signals.

Note 2: To make the inverter send out a signal that indicates whether the amount of feedback agree with (or reaches) the amount of processing, assign the function 52 or 53 to an unassigned output terminal. You can also specify a frequency agreement detection range (F167). For more information, see 6.3.4.

6

### 3) Setting PID control

Set "1" in the extended parameter F360 (PID control).

(1) Set parameters ACC (acceleration time), and dEC (deceleration time) to the system fitting values.

(2) To limit the output frequency, set parameters UL (upper limit frequency) and LL (lower limit frequency). If process quantities are set from the operation panel, however, the process quantity setting range will be limited by the settings of UL and LL.

### 4) Adjusting the PID control gain level

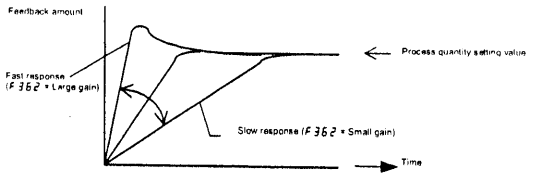
Adjust the PID control gain level according to the process quantities, the feedback signals and the object to be controlled.

The following parameters are provided for gain adjustment:

| Parameter | Setting range | Default setting |
|---|---|---|
| F362 (P-gain) | 0.01-100.0 | 0.30 |
| F363 (I-gain) | 0.01-100.0 | 0.20 |
| F366 (D-gain) | 0.00-2.55 | 0.00 |

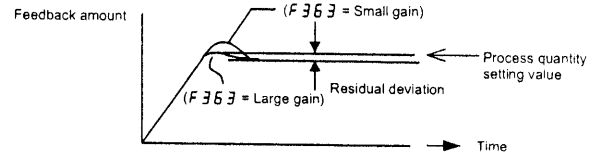
### F362 (P-gain adjustment parameter)

This parameter adjusts the proportional gain level during PID control. A correction value proportional to the particular deviation (the difference between the set frequency and the feedback value) is obtained by multiplying this deviation by the parameter setting.
A larger P-gain adjustment value gives faster response. Too large an adjustment value, however, results in an unstable event such as hunting.




### F363 (I-gain adjustment parameter)

This parameter adjusts the integral gain level during PID control. Any deviations remaining unremoved during proportional action are cleared to zero (residual deviation offset function).
A larger I-gain adjustment value reduces residual deviations. Too large an adjustment value, however, results in an unstable event such as hunting.



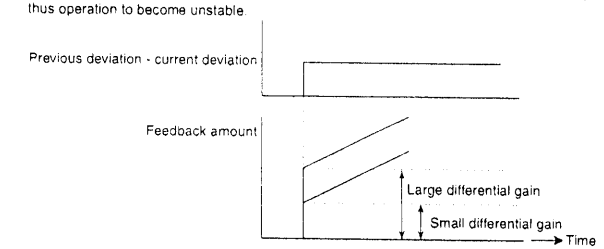

☆ If one of input terminals is assigned input terminal function 65 (PID control integral value clear), integral value is always 0 (zero) during the input terminal on.





### F366 (D-gain adjustment parameter)

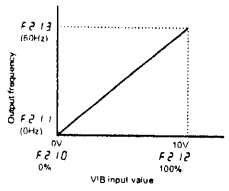
This parameter adjusts the differential gain level during PID control. This gain increases the speed of response to a rapid change in deviation (difference between the frequency setting and the amount of feedback).
Note that setting the gain more than necessary may cause great fluctuations in output frequency, and thus operation to become unstable.



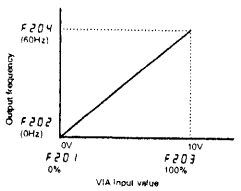

### 5) Adjusting analog command voltages

To use external analog setting (VIB) or feedback input (VIA), perform voltage-scaling adjustments (input point setting) as required. See Section 6.5.2 for further details.
If the feedback input data is too small, voltage-scaling adjustment data can also be used for gain adjustment.

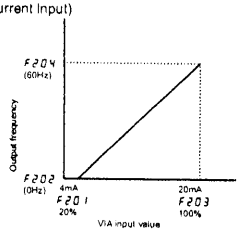
Example of VIB terminal setting




Example of VIA terminal setting (voltage input)




Example of VIA terminal setting (current input)




### 6) Setting the time elapsed before PID control starts

You can specify a waiting time for PID control to prevent the inverter from starting PID control before the control system becomes stable, for example, after start-up.
The inverter ignores feedback input signals, carries out operation at the frequency determined by the amount of processing for the period of time specified with F359 and enters the PID control mode after a lapse of the specified time.

# 6.17 Setting motor constants

## 6.17.1 Setting motor constants 1

F400: Auto-tuning

F401: Slip frequency gain

F402: Autmatic torque boost value

F415: Motor rated current

F416: Motor no-load current

F417: Motor rated speed

F418: Speed control response coefficient

F419: Speed control stable coefficient

To use vector control, automatic torque boost and automatic energy saving, motor constant setting (motor tuning) is required. The following three methods are available to set motor constants.

1) Using the torque boost setting macro function (AU2) for setting the V/F control mode selection (Pt) and auto-tuning (F400) at the same time
2) Setting V/F control mode selection (Pt) and auto-tuning (F400) independently
3) Combining the V/F control mode selection (Pt) and manual tuning

☆ Check to be sure that the setting of the parameter UL and that of the parameter ULV agree with the base frequency (rated rotational speed) and base frequency voltage (rated voltage) of the motor to be operated, respectively. If not, set the parameters correctly.

☆ When using the inverter to control the operation of a motor smaller in capacity by one grade or more, be sure to set the motor rated current setting parameter (F415) properly.

☆ Vector control may not operate properly if the motor capacity differs from the applicable rated capacity of the inverter by more than two grades.
If current waveforms oscillate during operation, increase the speed control stability factor (F419). This is effective in suppressing oscillation.





[Selection 1: Setting by parameter setting macro torque boost]

This is the easiest of the available methods. It conducts vector control and auto-tuning at the same time.

Set AU2 to 1
(Automatic torque boost + auto-tuning)

Set AU2 to 2
(Vector control + auto-tuning).

Set AU2 to 3
(Energy-saving + auto-tuning)

See Section 5.2 for details of the setting method.

[Selection 2: Setting vector control and auto-tuning independently]

This method sets sensorless vector control or automatic torque boost, and auto-tuning independently.
Specify the control mode selection parameter (Pt) and then set auto-tuning.

Set the auto-tuning parameter F400 to 2
(Auto-tuning enabled)

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F400 | Auto-tuning | 0: Auto-tuning disabled (use of internal parameters)<br>1: Application of individual settings of F402 (after execution: 0)<br>2: Auto-tuning enabled (after execution: 0) | 0 |

Set F400 to 2 to before the start of operation. Tuning is performed at the start of the motor.

☆ Precautions on auto-tuning

(1) Conduct auto-tuning only after the motor has been connected and operation completely stopped. If auto-tuning is conducted immediately after operation stops, the presence of a residual voltage may result in abnormal tuning.

(2) Voltage is applied to the motor during tuning even though it barely rotates. During tuning, "AEn 1" is displayed on the operation panel.

(3) Tuning is performed when the motor starts for the first time after F400 is set to 2. Tuning is usually completed within three seconds. If it is aborted, the motor will trip with the display of EEn 1 and no constants will be set for that motor.

(4) High-speed motors, high-slip motors or other special motors cannot be auto-tuned. For these motors, perform manual tuning using Selection 3 described below.

(5) Provide cranes and hoists with sufficient circuit protection such as mechanical braking. Without sufficient circuit protection, the resulting insufficient motor torque during tuning could create a risk of machine stalling/falling.

(6) If auto-tuning is impossible or an "EEn 1" auto-tuning error is displayed, perform manual tuning with Selection 3.

(7) If the inverter is tripped during auto-tuning because of an output phase failure (EPHO), check if the inverter is connected to the correctly. A check for output phase failures is made during auto-tuning, regardless of the setting of the output phase failure detection mode selection parameter (F605).

6

## [Selection 3: Setting vector control and manual tuning independently]

If an "EEn" tuning error is displayed during auto-tuning or when vector control characteristics are to be improved, independent motor constants can be set.

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F401 | Slip frequency gain | 0-150 (%) | 50 |
| F402 | Automatic torque boost value | 0.0-30.0 (%) | Depends on the capacity (See Section 11, K-15) |
| F415 | Motor rated current | 0.1-100.0 (A) | |
| F416 | Motor no-load current | 10-90 (%) | |
| F417 | Motor rated rotational speed | 100-32000 ($min^{-1}$) | 1410 (WP) 1710 (WN, AN) |
| F418 | Speed control response coefficient | 1-150 | 40 |
| F419 | Speed control stability coefficient | 1-100 | 20 |
| tHr | Motor electronic thermal protection level 1 | 10-100 (%) / (A) | 100 |





6

Setting procedure Adjust the following parameters:

F401: Set the compensation gain for the slipping of the motor. A higher slip frequency reduces motor slipping correspondingly. After setting F417, set F401 to adjust in detail.

F402: Adjust the primary resistive component of the motor. Decreases in torque due to a possible voltage drop during low-speed operation can be suppressed by setting a large value in this parameter. (Perform adjustments according to the actual operation.)

F415: Set the rated current of the motor. For the rated current, see the motor's nameplate or test report.

F416: Set the ratio of the no-load current of the motor to the rated current. Enter the value in % that is obtained by dividing the no-load current specified in the motor's test report by the rated current.

F417: Set the rated rotational speed of the motor. For the rated current, see the motor's nameplate or test report.

F418: Using this parameter along with F419, adjust the speed of response to the frequency command.

F419: Using this parameter along with F418, adjust the speed of response to the frequency command.

* How to make adjustments according to the moment of inertia of the load

The moment of inertia of the load (including that of the motor shaft) was set at the factory on the assumption that it would be three times as large as that of the motor shaft.

If this assumption does not hold, calculate the values to be entered in F418 and F419, using the following equations.

$$F418 = 40 \times \sqrt{a/3}$$

$$F419 = 20 \times \sqrt{a/3}$$

Where a is the times by which the moment of inertia of the load is larger than that of the motor.

After the above adjustments, if necessary, make fine adjustments as described below.

- To increase the response speed: Increase the setting of F418.
- To reduce the response speed: Decrease the setting of F418.
- If overshooting or hunting occurs: Increase the setting of F419.
- If reduction gears or the like squeak: Increase the setting of F419.
- If an over-voltage trip occurs on completion of acceleration: Increase the setting of F419.

When making the above adjustments, increase or decrease settings in steps of 10% or so while checking how things change.

Note also that, depending on the settings of F418 and F419, the frequency may exceed the upper-limit frequency if the inverter is set so as to accelerate the load in the shortest possible time.

tHr : If the rated capacity of the motor is one size smaller than that of the inverter, lower the thermal protective level according to the rated current of the motor.

* Sensorless vector control may not operate properly if the motor capacity differs from the applicable rated capacity of the inverter by more than two grades.

## 6.17.2 Setting motor constants 2 (Details)

F480: Exciting current coefficient

F485: Stall prevention control coefficient 1

F492: Stall prevention control coefficient 2

F494: Motor adjustment coefficient

F495: Maximam voltage adjustment coefficient

F496: Waveform switching adjustment coefficient

- The following parameters enables you to make adjustments more finely.

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F480 | Exciting current coefficient | 100-130 (%) | 100 |
| F485 | Stall prevention control coefficient 1 | 10-250 | 100 |
| F492 | Stall prevention control coefficient 2 | 50-150 | 100 |
| F494 | Motor adjustment coefficient | 0-200 | Depends on the capacity |
| F495 | Maximam voltage adjustment coefficient | 90-110 (%) | 104 |
| F496 | Waveform switching adjustment coefficient | 0.1-14.0(kHz) | 0.2 |

F480: Used to fine adjust the magnetic field increase rate in low-speed range. To increase the torque in low-speed range, specify a larger value for F480. Note that this parameter should be adjusted only when enough torque cannot be obtained, even though auto-tuning (F400=2) was made after the setting of the parameters F401 through F419. Note also that adjusting this parameter may cause an increase in the no-load current in low-speed range. If the no-load current exceeds the rated current, do not adjust this parameter.

F485: Using this parameter along with F492 adjusts characteristics in a region in which the frequency is above the base frequency (region where the field is weak).

F492: Using this parameter along with F485 adjusts characteristics in a region in which the frequency is above the base frequency (region where the field is weak).

* How to make adjustments in a region (region where magnetic field is weak) above the base frequency

If a heavy load is applied instantaneously (or transiently), the motor may stall before the load current reaches the current set with the stall prevention level 1 parameter (F601). In many cases, this kind of stall can be avoided by gradually reducing the setting of F485.

A drop in supply voltage may cause fluctuations of the load current or vibration of the motor. In some cases, such phenomena can be eliminated by changing the setting of F492 to between 80 and 90. However, this may cause an increase in load current, so that it is also necessary to adjust the setting of the electronic thermal protective level 1 parameter (tHr) properly according to the motor capacity.

F494: There is no need to adjust this parameter under normal conditions. (Do not change the setting, unless otherwise instructed by Toshiba technical staff)

F495: Specify a larger value for F495 to secure as high an output voltage as possible in a region (region where magnetic field is weak) above the base frequency. Setting F495 to a larger value may cause the motor to vibrate or gears to squeak. If such a phenomenon occurs, do not adjust this parameter.

F496: Specify a larger value for F496 if switching from a waveform to another results in a considerable increase in vibration and noise in middle-speed range (region between the start frequency and the base frequency). If no improvement can be made by specifying a larger value, do not adjust this parameter.





# 6.18 Acceleration/deceleration patterns 2 and 3

## 6.18.1 Selecting an acceleration/deceleration pattern

F502: Acceleration/deceleration 1 pattern

F506: S-pattern lower-limit adjustment amount

F507: S-pattern upper-limit adjustment amount

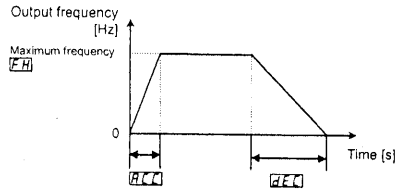
- Function

These parameters allow you to select an acceleration/deceleration pattern that suits the intended use.

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F502 | Acceleration/ deceleration 1 pattern | 0: Linear, 1: S-pattern 1, 2: S-pattern 2 | 0 |
| F506 | S-pattern lower-limit adjustment amount | 0-50% | 10% |
| F507 | S-pattern upper-limit adjustment amount | 0-50% | 10% |

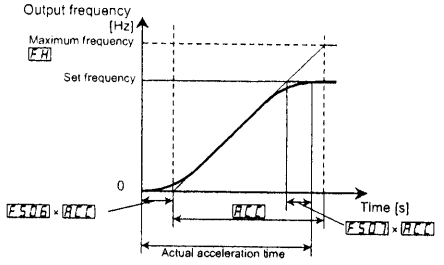
1) Linear acceleration/deceleration

A general acceleration/deceleration pattern. This pattern can usually be used.

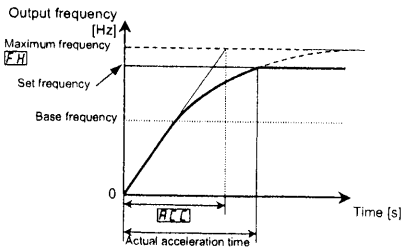



2) S-pattern acceleration/deceleration 1

Select this pattern to accelerate/decelerate the motor rapidly to a high-speed region with an output frequency of 60Hz or more or to minimize the shocks applied during acceleration/deceleration. This pattern is suitable for pneumatic transport machines.



3) S-pattern acceleration/deceleration
Select this pattern to obtain slow acceleration in a demagnetizing region with a small motor acceleration torque. This pattern is suitable for high-speed spindle operation.




## 6.18.2 Selecting an acceleration/deceleration pattern

F500: Acceleration time 2
F501: Deceleration time 2
F503: Acceleration/deceleration 2 pattern
F504: Selecting an acceleration/deceleration pattern
F505: Acceleration/deceleration 1 and 2 switching frequency
F510: Acceleration time 3
F511: Deceleration time 3
F512: Acceleration/deceleration 3 pattern
F513: Acceleration/deceleration 2 and 3 switching frequency

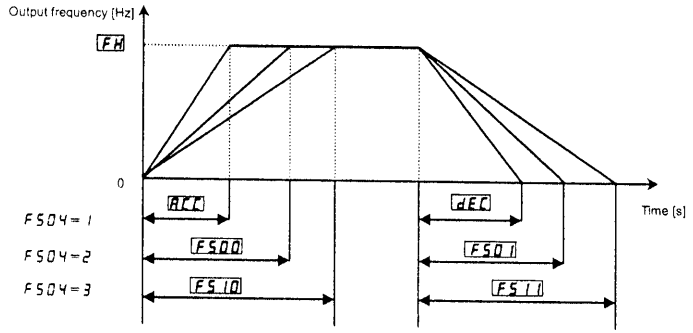
- Function
  Three acceleration times and three deceleration times can be specified individually. A method of selection or switching can be selected from among the following:
  1) Selection by means of parameters
  2) Switching by changing frequencies
  3) Switching by means of terminals





| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F500 | Acceleration time 2 | 0.0-3200 [sec] | 10.0 |
| F501 | Deceleration time 2 | 0.0-3200 [sec] | 10.0 |
| F504 | Selecting an acceleration/deceleration pattern | 1: Acc / dec 1<br>2: Acc / dec 2<br>3: Acc / dec 3 | 1 |
| F510 | Acceleration time 3 | 0.0-3200 [sec] | 10.0 |
| F511 | Deceleration time 3 | 0.0-3200 [sec] | 10.0 |

1) Selection using parameters

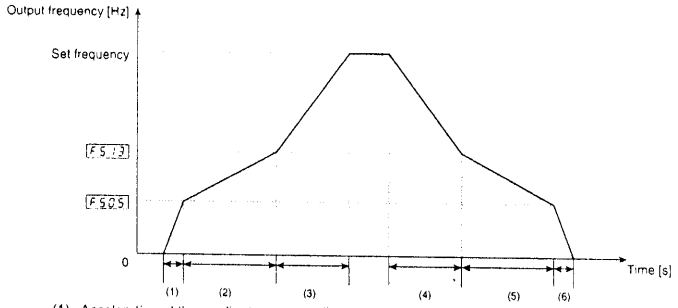



Acceleration/deceleration time 1 is initially set as the default. Acceleration/deceleration time 2 and 3 can be selected by changing the setting of the F504.
Enabled if CMOd=1 (panel input enabled)

2) Switching by frequencies - Switching the acceleration/deceleration time automatically at the frequency setting of F505.

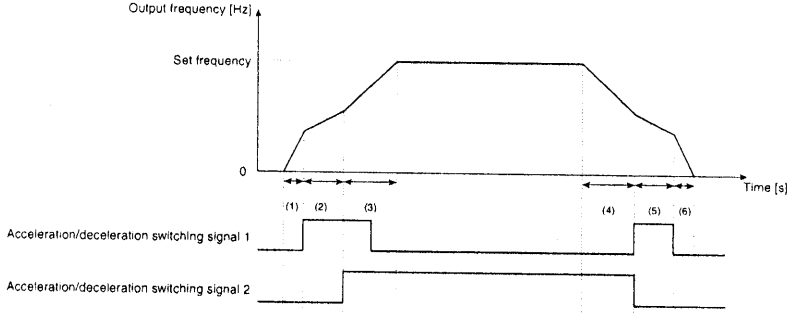
| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F505 | Acceleration/deceleration 1 and 2 switching frequency | 0.0-UL | 0.0 |
| F513 | Acceleration/deceleration 2 and 3 switching frequency | 0.0-UL | 0.0 |

Note: Acceleration/deceleration patterns are changed from pattern 1 to pattern 2 and from pattern 2 to pattern 3 in increasing order of frequency, regardless of the order in which frequencies are changed. (For example, if F505 is larger than F513, F513 pattern 1 is selected in the frequency range below the frequency set with F505.)




(1) Acceleration at the gradient corresponding to acceleration time ACC
(2) Acceleration at the gradient corresponding to acceleration time F500
(3) Acceleration at the gradient corresponding to acceleration time F510
(4) Deceleration at the gradient corresponding to deceleration time F511
(5) Deceleration at the gradient corresponding to deceleration time F501
(6) Deceleration at the gradient corresponding to deceleration time dEC

3) Switching using external terminals - Switching the acceleration/deceleration time via external terminals




(1) Acceleration at the gradient corresponding to acceleration time ACC
(2) Acceleration at the gradient corresponding to acceleration time F500
(3) Acceleration at the gradient corresponding to acceleration time F510
(4) Deceleration at the gradient corresponding to deceleration time F511
(5) Deceleration at the gradient corresponding to deceleration time F501
(6) Deceleration at the gradient corresponding to deceleration time dEC



6



■ How to set parameters

a) Operating method: Terminal input
Set the operation control mode selection CMOd to 0.

b) Use the S2 and S3 terminals for switching. (Instead, other terminals may be used.)

S2: Acceleration/deceleration switching signal 1
S3: Acceleration/deceleration switching signal 2

| Title | Function | Adjustment range | Setting value |
|---|---|---|---|
| F115 | Input terminal selection 5 (S2) | 0-65 | 5 (the second acceleration/deceleration mode selection) |
| F116 | Input terminal selection 6 (S3) | 0-65 | 58 (the third acceleration/deceleration mode selection) |

■ Acceleration/ deceleration pattern

Acceleration/deceleration patterns can be selected individually, using the acceleration/deceleration 1, 2 and 3 parameters.

1) Linear acceleration/deceleration
2) S-pattern acceleration/deceleration 1
3) S-pattern acceleration/deceleration 2

| Title | Function | Adjustment range | Setting value |
|---|---|---|---|
| F502 | Acceleration/ deceleration 1 pattern | 0: Linear<br>1: S-pattern 1<br>2: S-pattern 2 | 0 |
| F503 | Acceleration/ deceleration 2 pattern | | 0 |
| F512 | Acceleration/ deceleration 3 pattern | | 0 |

★ For an explanation of acceleration/deceleration patterns, see 6.18.1.
★ Both the settings of the S-pattern lower-limit and upper-limit adjustment parameters (F506 and F507) are applied to any acceleration/deceleration S-pattern.



6

12.2.5

# 6.19 Protection functions

## 6.19.1 Setting motor electronic thermal protection

[EHr]: Motor electronic thermal protection level 1

[F173]: Motor electronic thermal protection level 2

[F607]: Motor 150%-overload time limit

- Function
  This parameter allows selection of the appropriate electronic thermal protection characteristics according to the particular rating and characteristics of the motor.

■ Parameter setting

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| EHr | Motor electronic thermal protection level 1 | 10-100 (%) / (A) | 100 |
| F173 | Motor electronic thermal protection level 2 | 10-100 (%) / (A) | 100 |
| F607 | Motor 150%-overload time limit | 10-2400 (s) | 300 |

For more details, see 5.13.

Note. The 100% standard value is the rated output current indicated on the nameplate.

## 6.19.2 Setting current stall

[F601]: Stall prevention level 1

[F185]: Stall prevention level 2

**Caution**

Prohibited

- Do not set the stall prevention level (F601) extremely low.
  If the stall prevention level parameter (F601) is set at or below the no-load current of the motor, the stall preventive function will be always active and increase the frequency when it judges that regenerative braking is taking place.
  Do not set the stall prevention level parameter (F601) below 30% under normal use conditions.

- Function
  This parameter adjusts the output frequency by activating a current stall prevention function against a current exceeding the F601-specified level.

■ Parameter setting

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F601 | Stall prevention level 1 | 10-199 (%) / (A), 200: Deactivated | 150 |
| F185 | Stall prevention level 2 | | |





[Display during operation of the stall prevention]

During an OC alarm status, (that is , when there is a current flow in excess of the stall prevention level), the output frequency changes. At the same time, to the left of this value, "C" is displayed flashing on and off.

Example of display

[C 50]

★ The switching from F601 to F185 can be performed by entering a command through terminals. For more details, see 6.4.1.

Note. The 100% standard value is the rated output current indicated on the nameplate.

## 6.19.3 Inverter trip retention

[F602]: Inverter trip retention selection

- Function
  If the inverter trips, this parameter will retain the corresponding trip information. Trip information that has thus been stored into memory can be displayed, even after power has been reset.

[Parameter setting]

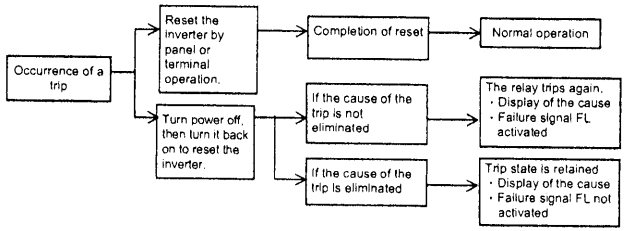
| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F602 | Inverter trip retention selection | 0: Cleared if power is turned off<br>1: Retained even if power is turned off | 0 |

★ The causes of up to four trips that occurred in the past can be displayed in status monitor mode.

★ Data displayed in status monitor mode when the inverter is tripped is cleared when power is turned off. Past trip records can be displayed.

★ Trip records are retained even if power is turned off and turned back on during retry operation.

■ Flow of operation when F602 = 1



## 6.19.4 Emergency stop

F603: Emergency stop

F604: Emergency DC braking time

- Function
  These parameters allow you to specify how to stop operation using an external control device when an external trip occurs. When operation is stopped, the trip E and the FL relay also are activated.
  When setting F603 to 2 (emergency DC braking), set also F251 (DC braking rate) and F604 (emergency braking time)

### 1) External trip stop via terminals

The external trip stop function can be executed via the a-contact. Proceed as follows to assign an external stopping terminal and select the stopping method:

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F603 | Emergency stop selection | 0: Coast stop<br>1: Slowdown stop<br>2: Emergency DC braking | 0 |
| F604 | Emergency DC braking time | 0.0 ~ 20.0 [sec] | 1.0 |
| F251 | DC braking current | 0-100 (%) | 50 |

(Example of terminal assignment): Assigning the trip stop function to the RES terminal

| Title | Function | Adjustment range | Setting |
|---|---|---|---|
| F113 | Input terminal selection 3 (RES) | 0-65 | 11 (External trip stop) |

Note 1) Emergency stopping via the specified terminal is possible, even during panel operation.
Note 2) If DC braking is not needed to bring the motor to a stop under normal conditions, although F603 is set to 2 (emergency DC braking), set the DC braking starting frequency (F250) at 0.0 Hz.

### 2) Emergency stopping from the operation panel

Emergency stopping from the operation panel is possible by pressing the STOP key on the panel twice while the inverter is not in the panel control mode.

(1) Press the STOP key ..... "EOFF" will blink.
(2) Press the STOP key once again ..... Operation will come to a trip stop in accordance with the setting of the F603 parameter.
After this, "E" will be displayed and a failure detection signal generated (FL relay deactivated).





## 6.19.5 Output phase failure detection

F605: Output phase failure detection mode selection

- Function
  This parameter detects inverter output Phase failure. If the Phase failure status persists for one second or more, the tripping function and the FL relay will be activated. At the same time, a trip information EPHO will also be displayed.
  Set F605 to 5 to open the motor-inverter connection by switching commercial power operation to inverter operation.
  Detection errors may occur for special motors such as high-speed motors.

F605=0: No tripping (FL relay deactivated).
F605=1: With the power on, the phase failure detection is enabled only at the start of the first operation. The inverter will trip if the Phase failure status persists for one second or more.
F605=2: The inverter checks for output phase failures each time it starts operation. The inverter will trip if the Phase failure status persists for one second or more.
F605=3: The inverter checks for output phase failures during operation. The inverter will trip if the Phase failure status persists for one second or more.
F605=4: The inverter checks for output phase failures at the start of and during operation. The inverter will trip if the Phase failure status persists for one second or more.
F605=5: If it detects an all-phase failure, it will restart on completion of reconnection. The inverter does not check for output phase failures when restarting after a momentary power failure.

Note: A check for output phase failures is made during auto-tuning, regardless of the setting of this parameter.

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F605 | Output phase failure detection mode selection | 0: Disabled<br>1: At start-up (Only one time after power is turned on)<br>2: At start-up (each time)<br>3: During operation<br>4: At start-up + during operation<br>5: Detection of cutoff on output side | 0 |

## 6.19.6 Input phase failure detection

F608: Input phase failure detection mode selection

- Function
  This parameter detects inverter input Phase failure. If the abnormal voltage status of main circuit capacitor persists for few minutes or more, the tripping function and the FL relay will be activated. Therefore, input phase failures cannot always be detected. A trip information EPH1 will be displayed.
  If the power capacity is larger than the inverter capacity (more than 200kVA or more than 10 times), detection errors may occur. If this actually happens, install an AC or DC reactor .

F608=0: No tripping (Failure signal FL not activated)
F608=1: Phase failure detection is enabled during operation. The inverter will trip if the abnormal voltage status of main circuit capacitor persists for ten minutes or more. (Failure signal FL activated)

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F608 | Input phase failure detection mode selection | 0: Disabled, 1: Enabled | 1 |

Note1: Setting F608 to 0 (input phase failure detection: disabled) may result in a breakage of the capacitor in the inverter main circuit if operation is continued under a heavy load in spite of the occurrence of an input phase failure.
Note2: Parameter F608 is invalid for single-phase input model.

## 6.19.7 Control mode for small current

F609: Small current detection current hysteresis
F610: Small current trip/alarm selection
F611: Small current detection current
F612: Small current detection time

- Function
  The F610 parameter allows the inverter to be tripped if a current smaller than the F611-specified value flows for more than the F612-specified time. When tripping is selected, enter the detection time to tripping. Trip information is displayed as "UC".

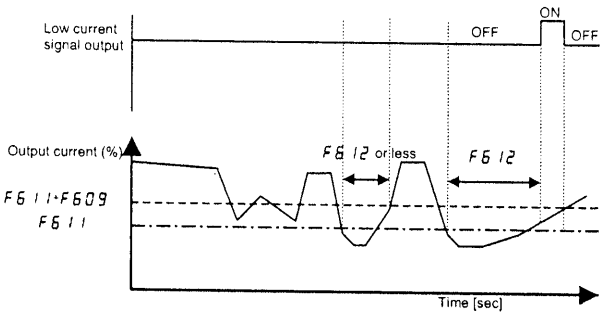
F610=0: No tripping (Failure signal FL not activated).
A small current alarm can be put out by setting the output terminal function selection parameter.
F610=1: The inverter will trip (Failure signal FL activated) if a current below the current set with F611 flows for the period of time specified with F612.





| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F609 | Small current detection current hysteresis | 1-20 (%) | 10 |
| F610 | Small current trip/alarm selection | 0: Alarm only<br>1: Tripping | 0 |
| F611 | Small current detection current | 0-100 (%) / (A) | 0 |
| F612 | Small current detection time | 0-255 [sec] | 0 |

<Example of operation>
Output terminal function: 24 (UC) Low current detection
F610 = 0 (Alarm only)




- When setting F610 to 1 (Trip), trip after low current detection time setting of F612. After tripping, the low current signal remains ON.

## 6.19.8 Detection of output short-circuit

F613: Detection of output short-circuit during start-up

- Function
  This parameter detects inverter output short-circuit. It can be usually detected in the length of the standard pulse. When operating low-impedance motor such as high-speed motor, however, the short-time pulse should be selected.

F613=0: Detection is executed in the length of the standard pulse every time you start up the inverter.
F613=1: Detection is executed in the length of standard pulse only during the first start-up after putting on the power or after resetting.
F613=2: Detection is executed with the short-time pulse every time you start up the inverter.
F613=3: Detection is executed with the short-time pulse only for the first time after putting power on or after resetting.

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F6 13 | Detection of output short-circuit during start-up | 0: Each time (standard pulse)<br>1: Only one time after power is turned on (standard pulse)<br>2: Each time (short-time pulse)<br>3: Only one time after power is turned on (short-time pulse) | 0 |

## 6.19.9 Over-torque trip

F6 15: Over-torque trip/alarm selection

F6 16: Over-torque detection level

F6 18: Over-torque detection time

F6 19: Over-torque detection level hysteresis

- Function
  Use the F6 15 parameter to trip the inverter or to output the alarm if a torque currrent exceeding the F6 16-specified level flows for more than the F6 18-specified time. Trip information is displayed as "0L".

6

F6 15=0: ..... No tripping (FL relay deactivated).
An over-torque alarm can be put out by setting the output terminal function selection parameter.

F6 15= 1: ..... The inverter is tripped (FL relay activated) only after a torque current exceeding the F6 16-specified level has been detected for more than the F6 18-specified time.

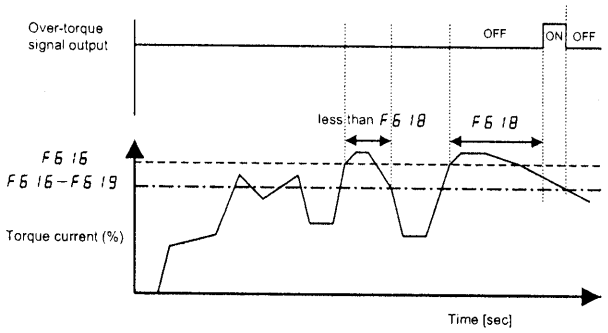
| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F6 15 | Over-torque trip/alarm selection | 0: Alarm only<br>1: Tripping | 0 |
| F6 16 | Over-torque detection level | 0-250 (%) | 150 |
| F6 18 | Over-torque detection time | 0.0-10.0 [sec] | 0.5 |
| F6 19 | Over-torque detection level hysteresis | 0-100 (%) | 10 |





<Example of operation>

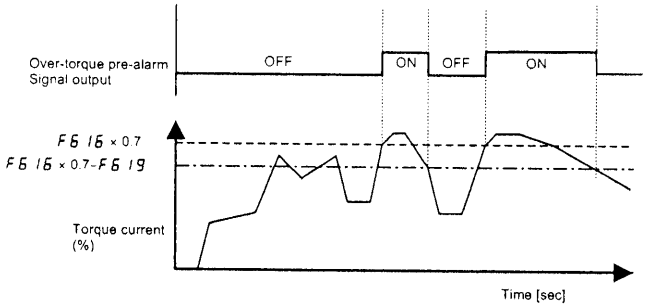
1) Output terminal function: 12 (OT) Over-torque detection
F6 15=0 (Alarm only)




6

When F6 15 = 1 (tripping), the inverter will trip if over-torque lasts for the period of time set with F6 18. In such a case, the over-torque signal remains ON.

2) Output terminal function: 20 (POT) Over-torque detection pre-alarm




## 6.19.10 Cumulative operation time alarm setting

F621: Cumulative operation time alarm setting

• Function
This parameter allows you to set the inverter so that it will put out an alarm signal after a lapse of the cumulative operation time set with F621.

* "0.1" displayed on the monitor refers to 10 hours, and therefore "1" denotes 100 hours.
Ex.: 38.5 displayed on the monitor = 3850 (hours)

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F621 | Cumulative operation time alarm setting | 0.0-9.999 | 610.0 |

■ Setting of output signal I
Ex.: When assigning the cumulative operation alarm signal output function to the OUT terminal

| Title | Function | Adjustment range | Setting |
|---|---|---|---|
| F131 | Output terminal selection 2A (OUT-NO) | 0-255 | 42 (negative logic 43) |

## 6.19.11 Over-voltage stall protection level

F626: Over-voltage stall protection level

* For more details, see 6.13.5.

## 6.19.12 Undervoltage trip

F627: Undervoltage trip/alarm selection

• Function
This parameter is used for selecting the control mode when an undervoltage is detected. Trip information is displayed as "UP 1".

F627=0: The inverter is stopped. However, it is not tripped (Failure signal FL not activated).
The inverter is stopped when the voltage does not exceed 60 % or less of its rating.
F627=1: Inverter is stopped. It is also tripped (Failure signal FL activated), only after detection of a voltage not exceeding 60% or less of its rating.
F627=2: Inverter is stopped. However, it is not tripped (Failure signal FL not activated). The inverter stop (Failure signal FL not activated.), only after detection of a voltage not exceeding 50% of its rating.
Be sure to connect the DC reactor specified in 10.4.

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F627 | Undervoltage trip/alarm selection | 0: Alarm only (detection level below 60%)<br>1: Tripping (detection level below 60%)<br>2: Alarm only (detection level below 50%, DC reactor needed) | 0 |





## 6.19.13 Trip at VIA low level input mode

F633: Trip at VIA low level input mode

• Function
The inverter will trip if the VIA value remains below the specified value for about 0.3 seconds. In such a case, "E-18" is displayed.

F633=0: Disabled ..... The detection function is disabled.
F633=1-100 ..... The inverter will trip if the VIA value remains below the specified value for about 0.3 seconds.

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F633 | Trip at VIA low level input mode | 0: Disabled<br>1-100% | 0 |

Note : The VIA input value may be judged earlier to be abnormal, depending on the degree of deviation of the analog data detected.

## 6.19.14 Parts replacement alarms

F634: Annual average ambient temperature (Parts replacement alarms)

• Function
You can set the inverter so that it will calculate the remaining useful lives of the cooling fan, main circuit capacitor and on-board capacitor from the ON time of the inverter, the operating time of the motor, the output current (load factor) and the setting of F634, and that it will display and send out an alarm through output terminals when each component is approaching the time of replacement.

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F634 | Annual average ambient temperature (parts replacement alarms) | 1: -10 to +10°C<br>2: 11-20°C<br>3: 21-30°C<br>4: 31-40°C<br>5: 41-50°C<br>6: 51-60°C | 3 |

☆ Display of part replacement alarm information
Part replacement alarm information (See page H-3) in the Status monitor mode allows you to check on the time of replacement.
An example of display: [1 . . . .]
☆ Output of part replacement alarm signal
Assign the part replacement alarm function (function No. 44 or 45. See page K-20) to an output terminal.
An example of setting: To assign the function to the RY-RC terminal
F130=44

Note 1: Using F634, enter the annual average temperature around the inverter. Be careful not to enter the annual highest temperature.
Note 2: Set F634 at the time of installation of the inverter, and do not change its setting after the start of use. Changing the setting may cause parts replacement alarm calculation error.

# 6.20 Adjustment parameters

## 6.20.1 Pulse train output for meters

F669: Logic output/pulse train output selection (OUT-NO)

F676: Pulse train output function selection (OUT-NO)

F677: Maximum nembers of pulse train

- Function
  Pulse trains can be sent out through the OUT-NO output terminals.
  To do so, it Is necessary to select a pulse output mode and specify the number of pulses.

Ex.: When operations frequencies (0 to 60Hz) are put out by means of 0 to 600 pulses
FH=60.0, F669=1, F676=0, F677=600

| Title | Function | Adjustment range | Reference of max value | Default setting |
|---|---|---|---|---|
| F669 | Logic output/pulse train output selection (OUT-NO) | 0: Logic output<br>1: Pulse train output | – | 0 |
| F676 | Pulse train output function selection (OUT-NO) | 0: Output frequency<br>1: Output current<br>2: Set frequency<br>3: DC voltage<br>4: Output voltage command value<br>5: Input power<br>6: Output power<br>7: Torque<br>8: Torque current<br>9: Motor cumulative load factor<br>10:Inverter cumulative load factor<br>11:PBR (braking reactor) cumulative load factor<br>12:Frequency setting value (after PID)<br>13:VIA Input value<br>14:VIB Input value<br>15:Fixed output 1 (Output current: 100%)<br>16:Fixed output 2 (Output current: 50%)<br>17:Fixed output 3 (Other than the output current: 100%) | FH<br>185%<br>FH<br>150%<br>150%<br>185%<br>185%<br>250%<br>250%<br>100%<br>100%<br>100%<br>FH<br>10V/20mA<br>10V<br>185%<br>185%<br>100% | 0 |
| F677 | Maximum numbers of pulse train | 500-1600 (pps) | – | 800 |

Note 1: When item of F676 reachs "Reference of max. value", the number of pulse train set by F677 are sent to output terminals (OUT-NO)

Note 2: The ON pulse width is maintained constant.
The ON pulse width is fixed at a width that causes the duty to reach 50% at the maximum pulse number set with F677.
Therefore, the duty is variable.
For example, the ON pulse width is approximately 0.6 ms when F677=800, approximately 0.5 ms when F677=1000, or approximately 0.3 ms when F677=1600.

Note 3: The minimum pulse output rate is 38 pps. Keep in mind that no pulses can be put out at any rate smaller than 38 pps.





## 6.20.2 Calibration of analog outputs

F691: Inclination characteristic of analog output

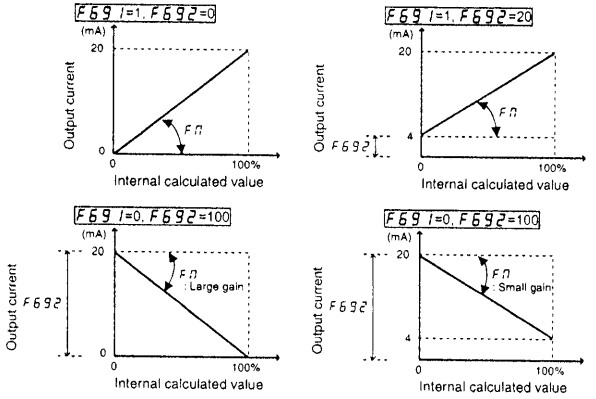
F692: Bias of analog output

- Function
  Output signals from FM terminals are analog voltage signals. Their standard setting range is from 0 to 7.5Vdc.
  Using the FM slide switch in the inverter, you can switch to 0-20mA output. Also, using these parameters, you can calibrate the output to 4-20mAdc or 20-4mAdc.

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F691 | Inclination characteristic of analog output | 0: Negative inclination (downward slope)<br>1: Positive Inclination (upward slope) | 1 |
| F692 | Bias of analog output | 0-100% | 0 |

Note: To switch to 0-20mAdc (4-20mAdc), turn the FM slide switch to the I position.

■ Example of setting




☆ The analog output inclination can be adjusted using the parameter Fn.

# 6.21 Operation panel parameter

## 6.21.1 Prohibition of key operations and parameter settings

F700: Prohibition of change of parameter setting

F730: Prohibition of panel operation (FC)

F733: Prohibition of panel operation (RUN/STOP keys)

F734: Prohibition of panel emergency stop operation

F735: Prohibition of panel reset operation

F736: Prohibition of change of CNOd/FNOd during operation

- Function
  These parameters allow you to prohibit the operation of the RUN and STOP keys on the operation panel and the change of parameters. Using these parameters, you can also prohibit various key operations.

6

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F700 | Prohibition of change of parameter setting | 0: Permitted, 1: Prohibited | 0 |
| F730 | Panel operation prohibition (FC) | 0: Permitted, 1: Prohibited | 0 |
| F733 | Prohibition of panel operation (RUN/STOP keys) | 0: Permitted, 1: Prohibited | 0 |
| F734 | Prohibition of panel emergency stop operation | 0: Permitted, 1: Prohibited | 0 |
| F735 | Prohibition of panel reset operation | 0: Permitted, 1: Prohibited | 0 |
| F736 | Prohibition of change of CNOd/FNOd during operation | 0: Permitted, 1: Prohibited | 1 |

■ Resetting method

Only the F700 parameter is designed so that its setting can be modified even if 1 (prohibited) is selected.





## 6.21.2 Changing the display unit to A/V/min$^{-1}$

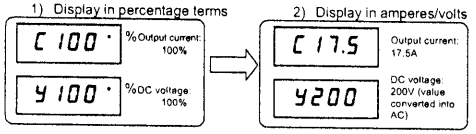
F701: Current/voltage display mode

- Function
  These parameters are used to change the unit of monitor display.
  % ⇔ A (ampere)/V (volt)

6

■ Example of setting

During the operation of the VFS11-2037PM (rated current: 17.5A) at the rated load (100% load), units are displayed as follows:




| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F701 | Current/voltage display mode | 0: %<br>1: A (ampere)/V (volt) | 0 |

- The F701 converts the following parameter settings:
  - A display Current monitor display
    Motor electronic-thermal protection level 1 and 2 (tHr, F173)
    DC braking current (F251)
    Stall prevention level 1 and 2 (F601, F185)
    Small current detection current (F611)
    Step-out detection current level (for PM motors) (F910)
  - V display Voltage monitor display

  Note) Base frequency voltage 1 and 2 (UL, F171)s always displayed in the unit of V.

## 6.21.3 Displaying the rotational speed of the motor or the line speed

F702: Frequency free unit magnification

F705: Inclination characteristic of free unit display

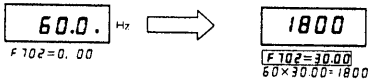
F706: Bias of free unit display

- Function
  The frequency or any other item displayed on the monitor can be converted freely into the rotational speed of the motor, the operating speed of the load, and so on.

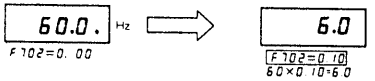
The value obtained by multiplying the displayed frequency by the F702-set value will be displayed as follows:

Value displayed = Monitor-displayed or parameter-set frequency × F702

1) Displaying the motor speed
To switch the display mode from 60Hz (default setting) to 1800min$^{-1}$ (the rotating speed of the 4P motor)




2) Displaying the speed of the loading unit
To switch the display mode from 60Hz (default setting) to 6m/min$^{-1}$ (the speed of the conveyer)




Note: This parameter displays the inverter output frequency as the value obtained by multiplying it by a positive number. This does not mean that the actual motor speed or line speed are indicated with accuracy.

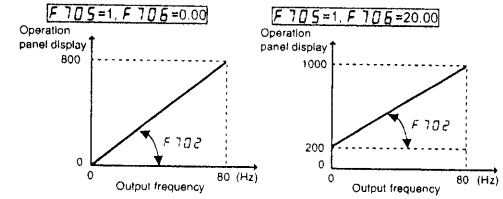


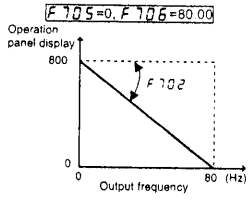


| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F702 | Frequency free unit magnification | 0.00: Free unit display disabled (display of frequency)<br>0.01-200.0 | 0.00 |
| F705 | Inclination characteristic of free unit display | 0: Negative inclination (downward slope)<br>1: Positive inclination (upward slope) | 1 |
| F706 | Bias of free unit display | 0.00-FH | 0.00 |

- The F702 to F706 converts the following parameter settings:
  - Free unit
    - Frequency monitor display: Operation frequency command, Operation frequency, PID feedback, Frequency command value (PID-computed), Operation frequency command at trip
    - Frequency-related parameters: FH, UL, LL, Sr1-Sr7, F100, F101, F102, F167, F202, F204, F211, F213, F240, F241, F242, F250, F260, F265, F267, F268, F270-F275, F287-F294, F343, F345, F505, F513, F812, F814

■ An example of setting when FH is 80 and F702 is 10.00



## 6.21.4 Changing the steps in which the value displayed changes

F707: Free step 1 (pressing a panel key once)

F708: Free step 2 (panel display)

- Function
  These parameters are used to specify steps in which the command value or standard monitor output frequency displayed on the panel changes each time you press the up or down key to set a frequency on the operation panel.

Note 1: The settings of these parameters have no effect when the free unit selection (F702) is enabled.

Note 2: If you press the Up key on the panel repeatedly to increase the frequency while F707 is set to any value other than 0, the "HI" alarm will appear immediately before the frequency exceeds the FH (maximum frequency) and the frequency will stop increasing. Similarly, if you press the Down key on the panel repeatedly to decrease the frequency, the "LO" alarm will appear immediately before the frequency decreases below the LL (lower-limit frequency) and the frequency will stop decreasing.

6

### ■ When F707 is not 0.00, and F708 is not 0 (disabled)

Under normal conditions, the frequency command value from the operation panel increases in steps of 0.1 Hz each time you press the ▲ key. If F707 is not 0.00, the frequency command value will increase by the value with F707 each time you press the ▲ key. Similarly, it will decrease by the value set with F707 each time you press the ▼ key.

In this case, the output frequency displayed in standard monitor mode changes in steps of 0.1 Hz, as usual.

### ■ When F707 is not 0.00, and F708 is not 0 (disabled)

The value displayed on the panel also can also be changed in steps.

$$\boxed{\text{Output frequency displayed in standard monitor mode}} = \boxed{\text{Internal output frequency}} \times \frac{F708}{F707}$$

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F707 | Free step 1 (pressing a panel key once) | 0.00: Disabled<br>0.01-FH (Hz) | 0.00 |
| F708 | Free step 2 (panel display) | 0: Disabled<br>1-255 | 0 |

### ■ Example of setting 1

When F707=10.00 (Hz):

The frequency (FC) set on the operation panel changes in steps of 10.0 Hz: 0.0 → 20.0 → ... 60.0 (Hz), each time you press the ▲ key. This function comes in very handy when operating the load at limited frequencies that change in steps of 1Hz, 5Hz, 10Hz, and so on.





### ■ Example of setting 2

When F707=1.00 (Hz), and F708=1:

Each time you press the ▲ key, the frequency setting FC changes in steps of 1Hz: 0→ 1 → 2 → ... → 60 (Hz) and also the value displayed on the operation panel changes in steps of 1. Use these settings to hide decimal fractions and also the value displayed on the operation panel changes in steps of 1. Use these settings to hide decimal fractions.

## 6.21.5 Changing the item displayed by default

F710: Standard monitor display selection

- Function
  This parameter specifies display format while power is on.

### ■ Changing the display format while power is on

When the power is on, the standard monitor mode displays the operation frequency (default setting) in the format of "0.0" or "OFF". This format can be changed to any other monitor display format by setting F710. This new format, however, will not display an assigned prefix such as b or C.

6

■ Parameter setting

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F710 | Standard monitor display selection | 0: Operation frequency (Hz/free unit/step)<br>1: Frequency command (Hz/free unit/step)<br>2: Output current (%/A)<br>3: Inverter rated current (A)<br>4: Inverter load factor (%)<br>5: Output power (kW)<br>6: Frequency command after PID control (Hz/free unit/step)<br>7: Optional item specified from an external control unit | 0 |

☆ For more information on the F710 option "7," refer to "Communications Function Instruction Manual."

## 6.21.6 Canceling the operation command

F719: Canceling of operation command when standby terminal (ST) is turned off

- Function
  When the standby (ST) terminal is turned off during panel operation, the inverter will restart operation if the ST terminal is turned back on. Using this parameter, you can also set the inverter so that, even if the ST is turned back on, it will not restart operation until you press the RUN key.

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F719 | Canceling of operation command when standby terminal (ST) is turned off | 0: Operation command canceled (cleared)<br>1: Operation command retained | 1 |

## 6.21.7 Selection of operation panel stop pattern

F721: Selection of operation panel stop pattern

- Function
  This parameter are used to select a mode in which the motor started by pressing the (RUN) key on the operation panel is stopped when the (STOP) key is pressed.

1) Slowdown stop
   The motor slows down to a stop in the deceleration time set with dEC (or F501 or F511).
2) Coast stop
   The inverter cuts off power supply to the motor. The motor comes to a stop after coasting for a while by inertia. Depending on the load, the motor may keep running for a good long time.

[Parameter setting]

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F721 | Selection of operation panel stop pattern | 0: Slowdown stop<br>1: Coast stop | 0 |





# 6.22 Communication function (Common serial)

## 6.22.1 Setting of common function

F800: Communication rate
F801: Parity
F802: Inverter number
F803: Communication error trip time
F805: Communication waiting time
F806: Setting of master and slave for communication between inverters
F811: Communication commmand point 1 setting
F812: Communication commmand point 1 frequency
F813: Communication commmand point 2 setting
F814: Communication commmand point 2 frequency
F829: Selection of communication protocol
F870: Block write data 1
F871: Block write data 2
F875: Block read data 1
F876: Block read data 2
F877: Block read data 3
F878: Block read data 4
F879: Block read data 5
F880: Free notes

- Function
  Function The VFS11 Series allows a data communication network to be constructed for exchanging data between a host computer or controller (referred to collectively as the computer) and the inverter by connecting an optional RS232C or RS485 communication conversion unit.
  <Computer-linking functions>
  The following functions are enabled by data communication between the computer and inverter
  (1) Monitoring inverter status (such as the output frequency, current, and voltage)
  (2) Sending RUN, STOP and other control commands to the inverter
  (3) Reading, editing and writing inverter parameter settings
  <RS232C communication>
  Data can be exchanged between one computer and one inverter.
  <RS485 communication>
  Data can be exchanged between the computer and each of the inverters connected.

☆ The following are available as common serial optional units:
- RS232C communications conversion cable (Model: RS20035)
- RS485 communication conversion unit with terminal board (Model: RS4001Z, RS4002Z)
  Communication cable (Model: CAB0011 (1m), CAB0013 (3m), CAB0015 (5m))
- Internal RS485 communication circuit board ( Model: RS4003Z)
- Internal DeviceNet communication circuit board ( Model: DEV001Z)
- Internal LONWORKS communication circuit board ( Model: LIU005Z)
  These Internal products require no interconnect cables, because of built-in type.

## ■ Communication function parameters (Common serial options)

The data transfer speed, parity type, inverter number, and communication error trip time can be set/edited by operation panel operation or communication function.

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F800 | Communication rate | 0: 1200bps<br>1: 2400bps<br>2: 4800bps<br>3: 9600bps<br>4: 19200bps | 3 |
| F801 | Parity | 0: NON (No parity)<br>1: EVEN (Even parity)<br>2: ODD (Odd parity) | 1 |
| F802 | Inverter number | 0-255 | 0 |
| F803 | Communication error trip time | 0: Desabled (*)<br>1-100 (s) | 0 |
| F805 | Communication waiting time | 0.00: Regular communication<br>0.01-2.00 (s) | 0.00 |
| F806 | Setting of master and slave for communication between inverters | 0: Slave (0 Hz command issued in case the master inverter fails)<br>1: Slave (Operation continued in case the master inverter fails)<br>2: Slave (Emergency stop tripping in case the master inverter fails)<br>3: Master (transmission of frequency commands)<br>4: Master (transmission of output frequency signals) | 0 |
| F811 | Communication command point 1 setting | 0-100 (%) | 0 |
| F812 | Communication command point 1 frequency | 0-500.0 (Hz) | 0.0 |
| F813 | Communication command point 2 setting | 0-100 (%) | 100 |
| F814 | Communication command point 2 frequency | 0-500.0 (Hz) | 50.0 (WP type)<br>60.0 (WN, AN type) |
| F829 | Selection of communication protocol | 0: Toshiba inverter protocol<br>1: ModbusRTU protocol | 0 |
| F870 | Block write data 1 | 0: No selection<br>1: Command 1<br>2: Command 2<br>3: Frequency command<br>4: Output data on the terminal board<br>5: Analog output for communications | 0 |
| F871 | Block write data 2 | | 0 |





| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F875 | Block read data 1 | 0: No selection<br>1: Status information<br>2: Output frequency<br>3: Output current<br>4: Output voltage<br>5: Alarm information<br>6: PID feedback value<br>7: Input terminal board monitor<br>8: Output terminal board monitor<br>9: VIA terminal board monitor<br>10: VIB terminal board monitor | 0 |
| F876 | Block read data 2 | | 0 |
| F877 | Block read data 3 | | 0 |
| F878 | Block read data 4 | | 0 |
| F879 | Block read data 5 | | 0 |
| F880 | Free notes | 0-65535 | 0 |

* Disabled ..... Indicates that the inverter will not be tripped even if a communication error occurs.
Trip ..... The inverter trips when a communication time-over occurs.
In this case a trip information Err5 flashes on and off on the operation panel.

## 6.22.2 Using the RS232C/RS485

### ■ Setting the communication functions

Setting commands and frequencies by communications has priority over sending commands from the operation panel or the terminal board. Command/frequency setting by communications can therefore be enabled, irrespective of the setting in the command mode (CMOd) or the frequency setting mode (FMOd). When inverters are connected to each others, however, in order for slave inverters to recognize frequency signals from the master inverter as frequency commands, the frequency setting mode selection 1 parameter (FMOd) provided for each slave inverter needs to be set to 4 (serial communications). Refer to the COMMUNICATIONS EQUIPMENT USER'S MANUAL for details.

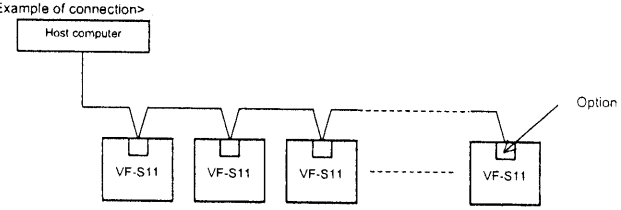
However, when the input terminal function selection parameter is set to 48: SC/LC (Serial/Local selection), the inverter can be operated with the settings of the command mode (CMOd) or the frequency setting mode (FMOd) by external input.

### ■ Transmission specifications

| Item | Specifications |
|---|---|
| Transmission scheme | Half-duplex |
| Connection scheme | Centralized control |
| Synchronization scheme | Asynchronous |
| Transmission rate | Default: 9600 baud (parameter setting)<br>Option: Either 1200, 2400, 4800, 9600, or 19200baud |
| Character transmission | ASCII code: JIS X 0201 8, 8-bit (fixed)<br>Binary code: Binary, 8-bit (fixed) |
| Stop bit length | Inverter receiving: 1 bit, Inverter sending: 2 bits |
| Error detection | Parity: Even, Odd, or None selectable by parameter setting;<br>check sum method |
| Character transmission format | Receiving: 11-bit, Sending: 12-bit |
| Order of bit transmission | Least significant bit first |
| Frame length | Variable to a maximum of 17 bytes |

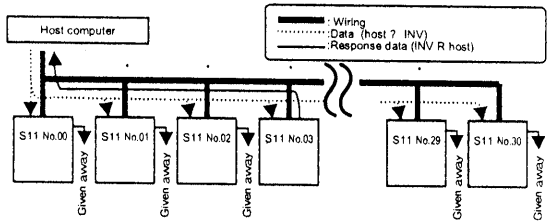
■ Example of connection for RS485-communication

<Example of connection>




<Independent communication>

Perform computer-inverter connection as follows to send operation frequency commands from the host computer to inverter No. 3:




"Given away": Only the inverter with the selected inverter number conducts data processing. All other inverters, even if they have received the data, give it away and stand by to receive the next data.

• : Use the terminal board to branch the cable.

(1) Data is sent from the host computer.
(2) Data from the computer is received at each inverter and the inverter numbers are checked.
(3) The command is decoded and processed only by the inverter with the selected inverter number.
(4) The selected inverter responds by sending the processing results, together with its own inverter number, to the host computer.
(5) As a result, only the selected inverter starts operating in accordance with the operation frequency command by communicating independently.

☆ For details of the communication function, refer to the separate instruction manual, "VF-S11 Serial Communication Function" (E6581156).

Note 1.: Limit the distance between the common serial optional units and the inverter to 5m.
2.: Set Data transfer speed to 9600 bps or less if data exchange between RS4001Z and the inverter.





## 6.23 Parameters for options

F890: Parameter for option 1
F891: Parameter for option 2
F892: Parameter for option 3
F893: Parameter for option 4
F894: Parameter for option 5

These parameters can be used only when specific optional parts are installed. Do not use these parameters unless such parts are installed.

## 6.24 Permanent magnetic motors

F910: Step-out detection current level
F911: Step-out detection time
F912: High-speed torque adjustment coefficient

• Function
If the permanent magnet motor (PM motor) steps out and if the exciting current increases (it increases in such a case) and remains above the value set with F910 for the period of time set with F911, the inverter will judge the motor to be stepping out and trip it. At that time, the trip message "SOUt" is displayed.

| Title | Function | Adjustment range | Default setting |
|---|---|---|---|
| F910 | Step-out detection current level | 10 ~ 150 (%) / (A) | 100 |
| F911 | Step-out detection time | 0.0 ~ 25.0 [sec] | 1.0 |
| F912 | High-speed torque adjustment coefficient | 0.0 ~ 650.0 | 0.00 |

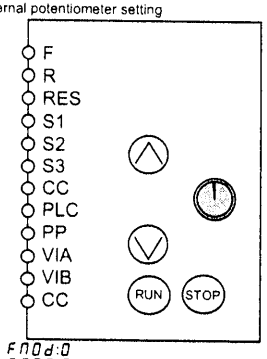
Note 1: When using an PM motor, consult your Toshiba dealer, since the inverter is not compatible with all types of PM motors.
Note 2: The inverter may fail to detect step-out in some cases, because it uses an electrical method to detect step-out. To avoid detection failures, you are recommended to install a mechanical step-out detector.
Note 3: There is no need adjust F912 under normal conditions. (Do not change the setting, unless otherwise instructed by Toshiba technical staff.)

# 7. Applied operation

## 7.1 Setting the operation frequency

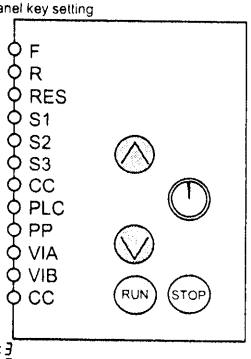
Applied operation can be performed by selecting the inverter frequency setting. To make settings for applied operation, use the basic parameter F N0d (selection of frequency setting mode 1), and the extended parameters F200 (frequency priority selection) and F207 (selection of frequency setting mode 2).

(1) Internal potentiometer setting




F N0d:0
F200:0

(2) Operation panel key setting

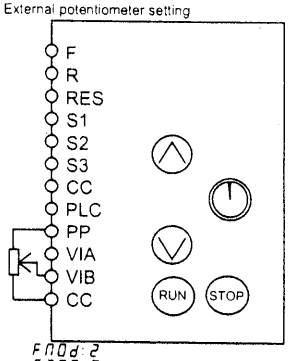



F N0d:3
F200:0
Enter the number with the operation panel keys, then press the ENT key to conform. (Save the setting)



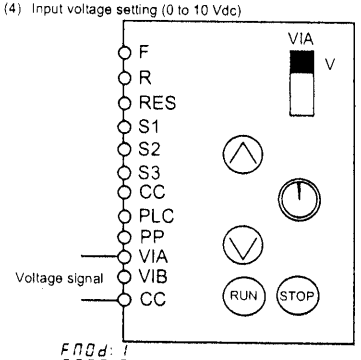


(3) External potentiometer setting



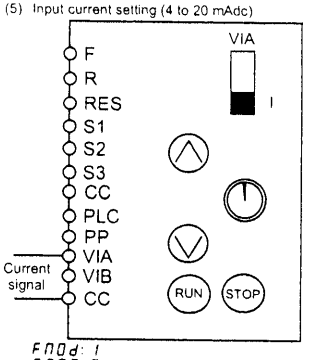

F N0d: 2
F200: 0
Use the parameters F210 to F213 for this setting.

(4) Input voltage setting (0 to 10 Vdc)



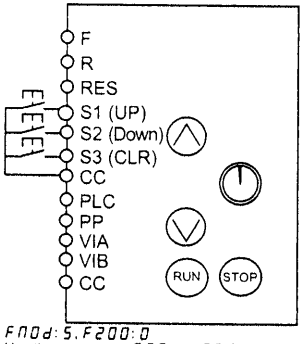

F N0d: 1
F200: 0
Use the parameters F201 to F204 for this setting.
(To use VIB, set F N0d at 2)

(5) Input current setting (4 to 20 mAdc)



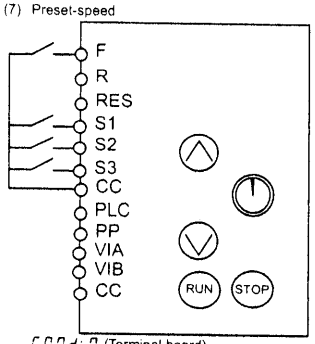

F N0d: 1
F200: 0
Use parameters F201 to F204 for this setting.
(F201: 20%)

(6) External contact UP/DOWN



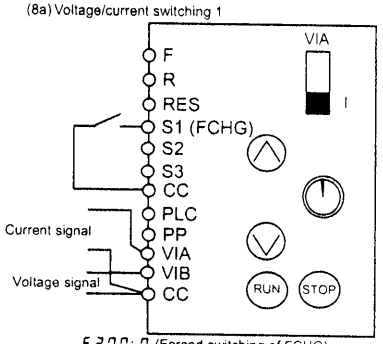

F N0d: 5, F200: 0
Use the parameters F264 to F268 for this setting.
To change the frequency when power is off, set F269: 1 (Rewriting of F268 when power is turned off.)
F114: 41 (Allocation of UP)
F115: 42 (Allocation of DOWN)
F116: 43 (Allocation of CLR)

(7) Preset-speed



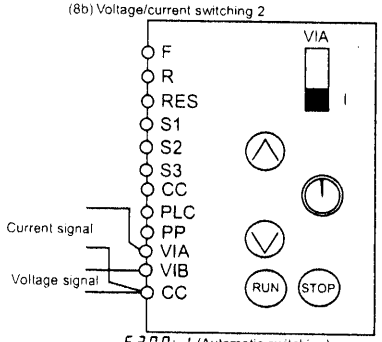

CnOd: 0 (Terminal board)
Sr 1 to Sr 7: 1-7-speed run
F287 to F294: 8-15-speed run
To select 7-speed run, use the terminals S1 to S3.
To select 15-speed run, allocate the input terminal function SS4.

(8a) Voltage/current switching 1



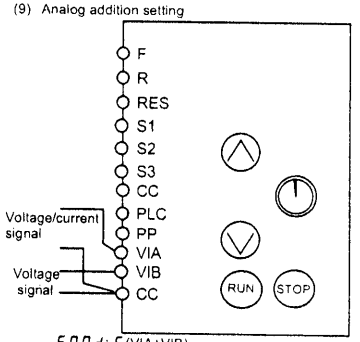

F200: 0 (Forced switching of FCHG)
F114: 38 (Allocation of FCHG)
FnOd: 2
F207: 1

(8b) Voltage/current switching 2




F200: 1 (Automatic switching)
FnOd: 2
F207: 1

(9) Analog addition setting

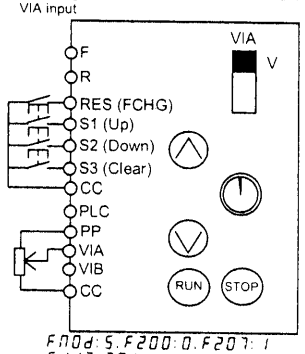



FnOd: 6 (VIA+VIB)
F200: 0



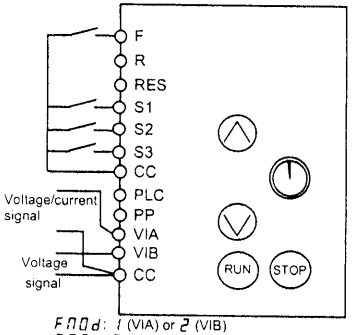


(10) Switching between external contact UP/DOWN and VIA input



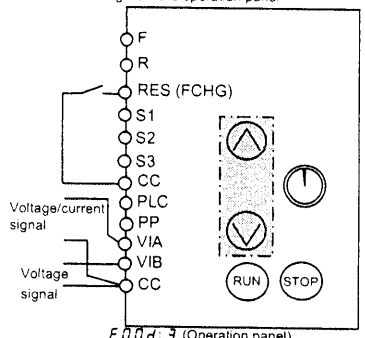

FnOd: 5, F200: 0, F207: 1
F113: 38 (Allocation of FCHG)
To switch to VIA setting, enter the command through FCHG.
F114: 41 (Allocation of UP)
F115: 42 (Allocation of DOWN)
F116: 43 (Allocation of CLR)

(11) Switching between analog setting and preset speed setting



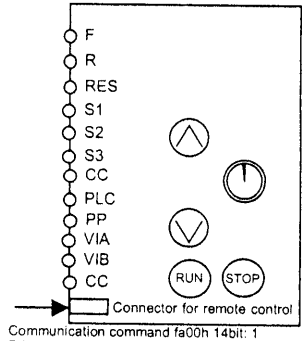

FnOd: 1 (VIA) or 2 (VIB)
CnOd: 0 (Terminal board)
F200: 0
To switch to preset-speed setting, use the external terminals S1 to S3

(12) Switching between analog setting and terminal setting from the operation panel



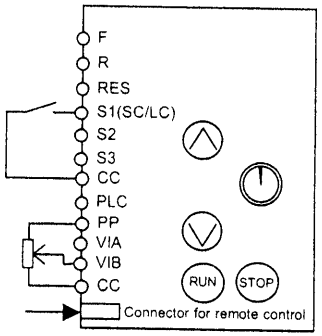

FnOd: 3 (Operation panel)
F113: 38 (Allocation of FCHG)
To switch to F207 setting, enter the command through FCHG.
F200: 0
F207: 1(VIA) or 2 (VIB).

(13) Setting by means of a remote input device




Communication command fa00h 14bit: 1
Priority on remote input device
(FnOd: 4)

(14) Switching between remote control and local control

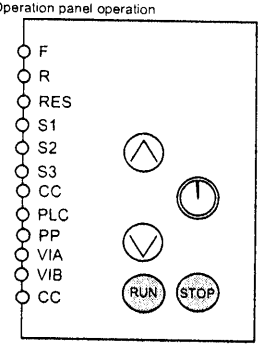



Communication command fa00h 14bit: 1
F114: 48 (Allocation of SL/LC)
Switched to local when a command is entered through SC and LC during operation by means of a remote input device
Activated if the parameter FNOd, F200 or F207 is so set

## 7.2 Setting the operation mode

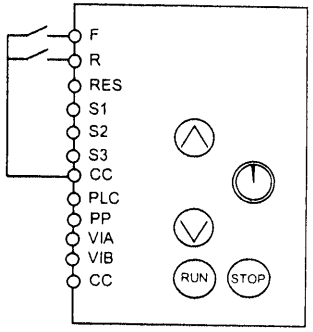
Applied operation can be performed by selecting the operation mode. To set the operation mode, use the basic parameter CNOd (command mode selection) and the input terminal selection parameter.

(1) Operation panel operation




CNOd: 1 (Operation panel)

(2) Terminal board operation

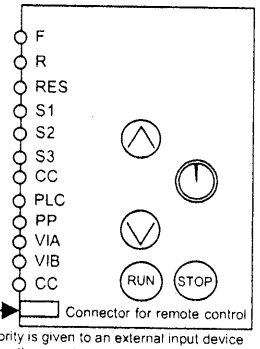



CNOd: 0 (Terminal board)



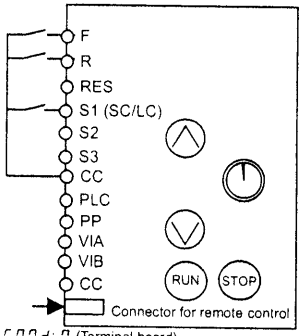


(3) Operation from an external input device



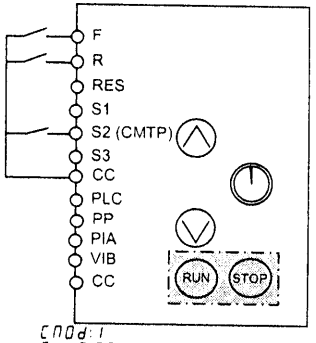

Priority is given to an external input device when the remote command fa00h 15-bit is set at 1.

(4) Switching from an external input device to the terminal board




CNOd: 0 (Terminal board)
F114: 48 (Allocation of SL/LC)
Remote control can be switched forcefully to local control from the external SC/LC by setting the remote command fa00h 15-bit at 1. Operation is controlled from the terminal board.

(5) Switching from the operation panel to the terminal board




CNOd: 1
F115: 50 (Allocation of CMTP)
To switch to terminal board operation, use the external CMTP input.

# 8. Monitoring the operation status

Refer to 4.1 about flow of monitor.

## 8.1 Status monitor mode

### 8.1.1 Status monitor under normal conditions

In this mode, you can monitor the operation status of the inverter.

To display the operation status during normal operation:

Press the (MODE) key twice.

Setting procedure (eg. operation at 60Hz)

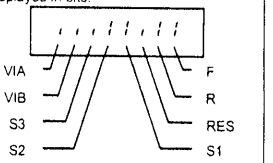
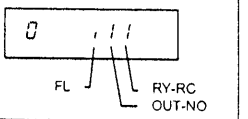
| | Item displayed | Key operated | LED display | Communication No. | Description |
|---|---|---|---|---|---|
| | | | 60.0 | | The operation frequency is displayed (Operation at 60Hz). (When standard monitor display selection F710 is set at 0 [operation frequency]) |
| | Parameter setting mode | MODE | AUH | | The first basic parameter "AUH" (history function) is displayed. |
| | Direction of rotation | MODE | Fr-F | FE01 | The direction of rotation is displayed. (Fr-F: forward run, Fr-r: reverse run) |
| Note 1 | Operation frequency command | ▲ | F60.0 | FE02 | The operation frequency command value (Hz/free unit) is displayed. |
| Note 2 | Load current | ▲ | C 80 | FE03 | The inverter output current (load current) (%/A) is displayed. |
| Note 3 | Input voltage | ▲ | V 100 | FE04 | The inverter input (DC) voltage (%/V) is displayed. |
| | Output voltage | ▲ | P 100 | FE05 | The inverter output voltage (%/V) is displayed. |
| | Torque | ▲ | q 60 | FE18 | The torque (%) is displayed. |
| | Torque current | ▲ | c 90 | FE20 | The torque current (%/A) is displayed. |
| | Inverter load factor | ▲ | L 70 | FE27 | The inverter load factor (%) is displayed. |
| | PBR cumulative load factor | ▲ | r 50 | FE25 | The cumulative load factor of the braking resistor (%) is displayed. |
| | Input power | ▲ | h 80 | FE29 | The inverter input power (kW) is displayed. |
| | Output power | ▲ | H 75 | FE30 | The inverter output power (kW) is displayed. |
| | Operation frequency | ▲ | o60.0 | FD00 | The operation frequency (Hz/free unit) is displayed. |

(Continued overleaf)





(Continued)

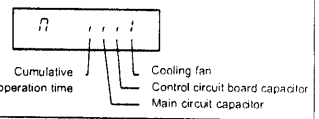
| | Item displayed | Key operated | LED display | Communication No. | Description |
|---|---|---|---|---|---|
| Note 4 | Input terminal | ▲ | ,,,!!,!! | FE06 | The ON/OFF status of each of the control signal input terminals (F, R, RES, S1, S2, S3, VIB and VIA) is displayed in bits. ON: 1 OFF: ,   |
| Note 5 | Output terminal | ▲ | 0 ,!! | FE07 | The ON/OFF status of each of the control signal output terminals (RY, OUT and FL) is displayed in bits. ON: 1 OFF: ,   |
| | CPU1 version | ▲ | u101 | FE08 | The version of the CPU1 is displayed. |
| | CPU2 version | ▲ | uc01 | FE73 | The version of the CPU2 is displayed. |
| | Memory version | ▲ | uE01 | FE09 | The version of the memory mounted is displayed. |
| | PID feedback | ▲ | d 50 | FE22 | The PID feedback value is displayed. (Hz/free unit) |
| | Frequency command value (PID-computed) | ▲ | b 70 | FE15 | The PID-computed frequency command value is displayed. (Hz/free unit) |
| Note 6 | Integral input power | ▲ | h 85 | FE76 | The integrated amount of power (kWh) supplied to the inverter is displayed. (0.01=1kWh, 1.00=100kWh) |
| Note 6 | Integral output power | ▲ | H 75 | FE77 | The integrated amount of power (kWh) supplied from the inverter is displayed. (0.01=1kWh, 1.00=100kWh) |
| | Rated current | ▲ | A 16.5 | FE70 | The rated current of the inverter (A) is displayed. |
| Note 7 | Past trip 1 | ▲ | OC3⇔1 | FE10 | Past trip 1 (displayed alternately) |
| Note 7 | Past trip 2 | ▲ | OH⇔2 | FE11 | Past trip 2 (displayed alternately) |
| Note 7 | Past trip 3 | ▲ | OP3⇔3 | FE12 | Past trip 3 (displayed alternately) |

(Continued overleaf)



12.2.5

(Continued)

| | Item displayed | Key operated | LED display | Communication No. | Description |
|---|---|---|---|---|---|
| Note 7 | Past trip 4 | ▲ | nErr⇔4 | FE13 | Past trip 4 (displayed alternately) |
| Note 8 | Parts replacement alarm information | ▲ | 0 ,,,, | FE79 | The ON/OFF status of each of the cooling fan, circuit board capacitor, main circuit capacitor of parts replacement alarm or cumulative operation time are displayed in bits.<br>ON: 1<br>OFF: ,<br>  |
| Note 9 | Cumulative operation time | ▲ | t0.10 | FE14 | The cumulative operation time is displayed. (0.01=1 hour, 1.00=100 hours) |
| | Default display mode | MODE | 60.0 | | The operation frequency is displayed (Operation at 60Hz). |

8

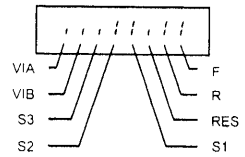
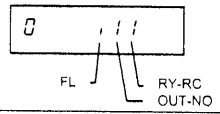




## 8.1.2 Display of detailed information on a past trip

Details on a past trip (of trips 1 to 4) can be displayed, as shown in the table below, by pressing the ENT key when the trip record is selected in the status monitor mode.

Unlike the "Display of detailed trip information at the occurrence of a trip" in 8.2.2, details on a past trip can be displayed, even after the inverter is turned off or reset.

| | Item displayed | Key operated | LED display | Description |
|---|---|---|---|---|
| Note 11 | Past trip 1 | | OC 1⇔1 | Past trip 1 (displayed alternately) |
| | Continuous trips | ENT | n 2 | The number of time the same trip occurred in succession is displayed. (Unit: times) |
| Note 1 | Operation frequency | ▲ | o60.0 | The operation frequency when the trip occurred is displayed. |
| | Direction of rotation | ▲ | Fr-F | The direction of rotation when the trip occurred is displayed. (Fr-F: Forward run, Fr-r: Reverse run) |
| | Operation frequency command | ▲ | F80.0 | The operation command value when the trip occurred is displayed. |
| Note 2 | Load current | ▲ | C150 | The inverter output current when the trip occurred is displayed. (%/A) |
| Note 3 | Input voltage | ▲ | V120 | The inverter input voltage (DC) when the trip occurred is displayed. (%/V). |
| | Output voltage | ▲ | P100 | The inverter output voltage when the trip occurred is displayed. (%/V) |
| Note 4 | Input terminal | ▲ | ,,,,,,,, | The ON/OFF statuses of the control input terminals (F, R, RES, S1, S2, S3, VIB and VIA) are displayed in bits.<br>ON: 1<br>OFF: ,<br>  |
| Note 5 | Output terminal | ▲ | 0 ,,, | The ON/OFF statuses of the control output terminals (RY, OUT and FL) are displayed in bits.<br>ON: 1<br>OFF: ,<br>  |
| Note 9 | Cumulative operation time | ▲ | t8.56 | The cumulative operation time when the trip occurred is displayed. (0.01=1 hour, 1.00=100 hours) |
| | Past trip 1 | MODE | OC 1⇔ 1 | Press this key to return to past trip 1. |

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# 8.2 Display of trip information

## 8.2.1 Trip code display

If the inverter trips, an error code is displayed to suggest the cause. Since trip records are retained, information on each trip can be displayed anytime in the status monitor mode.

■ Display of trip information

| Error code | Failure code | Description |
|---|---|---|
| nErr(*) | 0000 | No error |
| OC 1 | 0001 | Overcurrent during acceleration |
| OC2 | 0002 | Overcurrent during deceleration |
| OC3 | 0003 | Overcurrent during constant speed operation |
| OCL | 0004 | Load-side overcurrent during start-up |
| OCA | 0005 | Armature-side overcurrent during start-up |
| EPH1 | 0008 | Input phase failure or exhaustion of main circuit capacitor |
| EPHO | 0009 | Output phase failure |
| OP1 | 000A | Overvoltage during acceleration |
| OP2 | 000B | Overvoltage during deceleration |
| OP3 | 000C | Overvoltage during constant-speed operation |
| OL1 | 000D | Inverter overload trip |
| OL2 | 000E | Motor overload trip |
| OLr | 000F | Dynamic braking register overload trip |
| OH | 0010 | Overheating trip or thermal detector failure |
| E | 0011 | Emergency stop |
| EEP1 | 0012 | E²PROM fault 1 (writing error) |
| EEP2 | 0013 | E²PROM fault 2 (initialization error) or power-off during the setting of tYP |
| EEP3 | 0014 | E²PROM fault 3 (reading error) |
| Err2 | 0015 | Inverter RAM fault |
| Err3 | 0016 | Inverter ROM fault |
| Err4 | 0017 | CPU fault trip 1 |
| Err5 | 0018 | Communication error |
| Err7 | 001A | Current defector fault |
| Err8 | 001B | Optional circuit board format error |
| UC | 001D | Small-current trip |
| UP1 | 001E | Undervoltage trip |
| Ot | 0020 | Over-torque trip |
| EF2 | 0022 | Ground fault |

(Continued overleaf)





8



(Continued)

| Error code | Failure code | Description |
|---|---|---|
| OC 1P | 0025 | Overcurrent flowing in element during acceleration |
| OC2P | 0026 | Overcurrent flowing in element during deceleration |
| OC3P | 0027 | Overcurrent flowing in element during constant-speed operation |
| Etn1 | 0054 | Auto-tuning error |
| EtYP | 0029 | Inverter type error |
| OH2 | 002E | External thermal input |
| E-18 | 0032 | VIA cable break |
| E-19 | 0033 | Communication error between CPUs |
| E-20 | 0034 | V/F control error |
| E-21 | 0035 | CPU fault 2 |
| SOUt | 002F | Step-out (for PM motors only) |

(Note) Past trip records (trip records retained or trips that occurred in the past) can be called up.
(Refer to 8.1 "Status monitor mode" for the call-up procedure.)
(*) Strictly speaking, this code is not an error code; this code is displayed to show the absence of error when the past trip monitor mode is selected.

## 8.2.2 Display of trip information at the occurrence of a trip

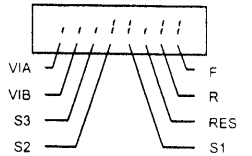
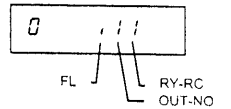
At the occurrence of a trip, the same information as that displayed in the mode described in 8.1.1, "Status monitor under normal conditions," can be displayed, as shown in the table below, if the inverter is not turned off or reset. To display trip information after turning off or resetting the inverter, follow the steps described in 8.1.2, "Display of detailed information on a past trip."

■ Example of call-up of trip information

| | Item displayed | Key operated | LED display | Communication No. | Description |
|---|---|---|---|---|---|
| | Cause of trip | | OP2 | | Status monitor mode (The code blinks if a trip occurs.) The motor coasts and comes to a stop (coast stop). |
| | Parameter setting mode | MODE | AUH | | The first basic parameter "AUH" (history function) is displayed. |
| | Direction of rotation | MODE | Fr-F | FE01 | The direction of rotation at the occurence of a trip is displayed. (Fr-F: forward run, Fr-r: reverser run) |
| Note 1 | Operation frequency command | ▲ | F60.0 | FE02 | The operation frequency command value (Hz/free unit) at the occurrence of a trip is displayed. |
| Note 2 | Load current | ▲ | C130 | FE03 | The output power of the inverter at the occurrence of a trip (%/A) is displayed. |
| Note 3 | Input voltage | ▲ | V141 | FE04 | The inverter input (DC) voltage (%/V) at the occurrence of a trip is displayed. |
| | Output voltage | ▲ | P100 | FE05 | The output voltage of the inverter at the occurrence of a trip (%/V) is displayed. |

(Continued overleaf)

(Continued)

| | Item displayed | Key operated | LED display | Communication No. | Description |
|---|---|---|---|---|---|
| | Torque | ▲ | 9 60 | FE18 | The torque at the occurrence of a trip (%) is displayed. |
| | Torque current | ▲ | c 90 | FE20 | The torque current (%/A) at the occurrence of a trip is displayed. |
| | Inverter load factor | ▲ | L 70 | FE27 | The inverter load factor (%) at the occurrence of a trip is displayed. |
| | PBR cumulative load factor | ▲ | r 50 | FE25 | The cumulative load factor (%) of the resistor at the occurrence of a trip is displayed. |
| | Input power | ▲ | h 80 | FE29 | The inverter input power (kW) at the occurrence of a trip is displayed. |
| | Output power | ▲ | H 75 | FE30 | The inverter output power (kW) at the occurrence of a trip is displayed. |
| | Operation frequency | ▲ | o60.0 | FE00 | The inverter output frequency (Hz/free unit) at the occurrence of a trip is displayed. |
| Note 4 | Input terminal | ▲ | , , , ! ! , ! ! | FE06 | The ON/OFF statuses of the control input terminals (F, R, RES, S1, S2, S3, VIB and VIA) are displayed in bits.<br>ON: !<br>OFF: ,<br>  |
| Note 5 | Output terminal | ▲ | 0 , ! ! | FE07 | The ON/OFF status of each of the control signal output terminals (RY, OUT and FL) at the occurrence of a trip is displayed in bits.<br>ON: !<br>OFF: ,<br>  |
| | CPU1 version | ▲ | u 10 1 | FE08 | The version of the CPU1 is displayed. |
| | CPU2 version | ▲ | uc0 1 | FE73 | The version of the CPU2 is displayed. |
| | Memory version | ▲ | uE0 1 | FE09 | The version of the memory mounted is displayed. |
| | PID feedback | ▲ | d 50 | FE22 | The PID feedback value at the occurrence of a trip is displayed. (Hz/free unit) |
| | Frequency command value (PID-computed) | ▲ | b 70 | FE15 | The PID-computed frequency command value at the occurrence of a trip is displayed. (Hz/free unit) |
| | Integral input power | ▲ | h 85 | FE76 | The integrated amount of power (kWh) supplied to the inverter is displayed. (0.01=1kWh, 1.00=100kWh) |

(Continued overleaf)

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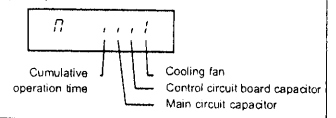
(Continued)

| | Item displayed | Key operated | LED display | Communication No. | Description |
|---|---|---|---|---|---|
| | Integral output power | ▲ | H 75 | FE77 | The integrated amount of power (kWh) supplied from the inverter is displayed. (0.01=1kWh, 1.00=100kWh) |
| | Rated current | ▲ | A 16.5 | FE70 | The inverter rated current (A) at the occurrence of a trip is displayed. |
| Note 7 | Past trip 1 | ▲ | 0P2 ⇔ 1 | FE10 | Past trip 1 (displayed alternately) |
| Note 7 | Past trip 2 | ▲ | 0H ⇔2 | FE11 | Past trip 2 (displayed alternately) |
| Note 7 | Past trip 3 | ▲ | 0P3 ⇔3 | FE12 | Past trip 3 (displayed alternately) |
| Note 7 | Past trip 4 | ▲ | nErr ⇔4 | FE13 | Past trip 4 (displayed alternately) |
| Note 8 | Parts replacement alarm information | ▲ | 0 , , , ! | FE79 | The ON/OFF status of each of the cooling fan, circuit board capacitor, main circuit capacitor of parts replacement alarm or cumulative operation time are displayed in bits.<br>ON: !<br>OFF: ,<br>  |
| Note 9 | Cumulative operation time | ▲ | t0.10 | FE14 | The cumulative operation time is displayed. (0.01=1 hour, 1.00=100 hours) |
| | Default display mode | MODE | 0P2 | | The cause of the trip is displayed. |

Note 1: Items displayed can be changed by pressing ▲ or ▼ key in the each monitor mode.

Note 2: You can switch between % and A (ampere)/V (volt), using the parameter F 70 1 (current/voltage unit selection).

Note 3: The input (DC) voltage displayed is 1.√2 times as large as the rectified d.c. input voltage.

Note 4: The number of bars displayed varies depending on the setting of F 109 (analog input/logic input function selection). The bar representing VIA or VIB is displayed only when the logic input function is assigned to the VIA or VIB terminal, respectively.
If F 109 = 0: Neither the bar representing VIA nor the bar representing VIB is displayed.
If F 109 = 1 or 2: The bar representing VIA is not displayed.
The bar representing VIB is displayed.
If F 109 = 3 or 4: Both the bar representing VIA and VIB are displayed.

Note 5: The number of bars displayed varies depending on the setting of F669 (logic output/pulse train output selection). The bar representing the OUT-NO terminal is displayed only when logic output function is assigned to it.
If F669 = 0: The bar representing OUT-NO is displayed.
If F669 = 1: The bar representing OUT-NO is not displayed.

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Note 6: The integrated amounts of input and output power will be reset to zero, if you press and hold down the (ENT) key for 3 seconds or more when power is off or when the input terminal function CKWH (input terminal function: 51) is turned on or displayed.

Note 7: Past trip records are displayed in the following sequence: 1 (latest trip record) ⇔2⇔3⇔4 (oldest trip record). If no trip occurred in the past, the message "nErr" will be displayed. Details on past trip record 1, 2, 3 or 4 can be displayed by pressing the (ENT) key when past trip 1, 2, 3 or 4 is displayed. For more information, see 8.1.2.

Note 8: Parts replacement alarm is displayed based on the value calculated from the annual average ambient temperature, the ON time of the inverter, the operating time of the motor and the output current ( load factor) specified using F634. Use this alarm as a guide only, since it is based on a rough estimation.

Note 9: The cumulative operation time increments only when the machine is in operation.

Note 10: At the occurrence of a trip, maximum values are not always recorded and displayed for reasons of detecting time.

Note11: If there is no trip record, nErr is displayed.

☆ Of the items displayed on the monitor, the reference values of items expressed in percent are listed below.

- Load current: The current monitored is displayed. The reference value (100% value) is the rated output current indicated on the nameplate. That is, it corresponds to the rated current at the time when the PWM carrier frequency (F300) is 4kHz or less. The unit can be switched to A (amperes).
- Input voltage: The voltage displayed is the voltage determined by converting the voltage measured in the DC section into an AC voltage. The reference value (100% value) is 200 volts for 240V models, 400 volts for 500V models or 575 volts for 600V models. The unit can be switched to V (volts).
- Torque: The torque generated by the drive motor is displayed. The reference value (100% value) is the rated torque of the motor.
- Torque current: The current required to generate torque is calculated from the load current by vector operations. The value thus calculated is displayed. The reference value (100% value) is the value at the time when the load current is 100%.
- Load factor of inverter: Depending on the PWM carrier frequency (F300) setting and so on, the actual rated current may become smaller than the rated output current indicated on the nameplate. With the actual rated current at that time (after a reduction) as 100%, the proportion of the load current to the rated current is indicated in percent. The load factor is also used to calculate the conditions for overload trip (OL 1).
- PBR cumulative load factor: The load factor of the braking resistor that may come up to the level at which an overload trip (OLr) occurs is indicated in percent. An overload trip occurs when it reaches 100%.





# 9. Measures to satisfy the standards

## 9.1 How to cope with the CE directive

In Europe, the EMC directive and the low-voltage directive, which took effect in 1996 and 1997, respectively, make it obligatory to put the CE mark on every applicable product to prove that it complies with the directives. Inverters do not work alone but are designed to be installed in a control panel and always used in combination with other machines or systems which control them, so they themselves are not considered to be subject to the EMC directive. However, the CE mark must be put on all inverters because they are subject to the low-voltage directive.

The CE mark must be put on all machines and systems with built-in inverters because such machines and systems are subject to the above directives. It is the responsibility of the manufacturers of such final products to put the CE mark on each one. If they are "final" products, they might also be subject to machine-related directives.
It is the responsibility of the manufacturers of such final products to put the CE mark on each one. In order to make machines and systems with built-in inverters compliant with the EMC directive and the low-voltage directive, this section explains how to install inverters and what measures should be taken to satisfy the EMC directive.

We have tested representative models with them installed as described later in this manual to check for conformity with the EMC directive. However, we cannot check all inverters for conformity because whether or not they conform to the EMC direction depends on how they are installed and connected. In other words, the application of the EMC directive varies depending on the composition of the control panel with a built-in inverter(s), the relationship with other built-in electrical components, the wiring condition, the layout condition, and so on. Therefore, please verify yourself whether your machine or system conforms to the EMC directive.

### 9.1.1 About the EMC directive

Inverters themselves are not subject to approval for CE marking.

The CE mark must be put on every final product that includes an inverter(s) and a motor(s). The VF-S11 series of inverters complies with the EMC directive if an EMI filter recommended by Toshiba is connected to it and wiring is carried out correctly.

- EMC directive 89/336/EEC

The EMC standards are broadly divided into two categories, immunity- and emission-related standards, each of which is further categorized according to the operating environment of each individual machine. Since inverters are intended for use with industrial systems under industrial environments, they fall within the EMC categories listed in Table 1 below. The tests required for machines and systems as final products are almost the same as those required for inverters.

Table 1 EMC standards

| Category | Subcategory | Product standards | Test standard and level |
|---|---|---|---|
| Emission | Radiation noise | IEC 61800-3 | EN55011 Class A Group 1 |
| | Transmission noise | | EN55011 Class A Group 1 |
| Immunity | Static discharge | | IEC61000-4-2 |
| | Radioactive radio-frequency magnetic contactor field | | IEC61000-4-3 |
| | First transient burst | | IEC61000-4-4 |
| | Lightning surge | | IEC61000-4-5 |
| | Radio-frequency induction/transmission interference | | IEC61000-4-6 |
| | Voltage dip/Interruption of power | | IEC61000-4-11 |

Emission standards other than the above are applied to inverters when used in a commercial environment but not an industrial environment.

| Category | Subcategory | Product standards | Test standard and level |
|---|---|---|---|
| Emission | Radiation noise | IEC 61800-3 | EN55011 Class B Group 1 |
| | Transmission noise | | EN55011 Class B Group 1 |

## 9.1.2 Measures to satisfy the EMC directive

This subsection explains what measures must be taken to satisfy the EMC directive.

(1) Insert a recommended EMI filter (Table 2) on the input side of the inverter to reduce and transmission noise and radiation noise from input cables.

In the combinations listed in Table 2, Inverters are tested in these combination to see if they comply with transmission noise standards. For inverters used in Japan, it is recommended to use the NF series of noise filters.

Table 2 lists noise filters recommended for the inverters.

Table 2 Combinations of inverter and EMI filter

Three-phase 240V class

| Inverter | Combination of inverter and filter | |
|---|---|---|
| | Transmission noise EN55011 Class A Group 1 Applicable filters (Length of motor connecting cable: Max. 5 m) | Transmission noise EN55011 Class B Group 1 Applicable filters (Length of motor connecting cable: Max. 1 m) |
| VFS11-2002PM | EMFS11-2007AZ | |
| VFS11-2004PM | EMFS11-2007AZ | |
| VFS11-2005PM | EMFS11-2007AZ | |
| VFS11-2007PM | EMFS11-2007AZ | |
| VFS11-2015PM | EMFS11-4015BZ | |
| VFS11-2022PM | EMFS11-4015BZ | |
| VFS11-2037PM | EMFS11-4025CZ | |
| VFS11-2055PM | EMFS11-4047DZ | |
| VFS11-2075PM | EMFS11-4047DZ | |
| VFS11-2110PM | EMFS11-2083EZ | |
| VFS11-2150PM | EMFS11-2083EZ | |





Three-phase 500V class

| Inverter | Combination of inverter and filter | | |
|---|---|---|---|
| | Transmission noise EN55011 Class A Group 1 Applicable filters (Length of motor connecting cable: Max. 5 m) | Transmission noise EN55011 Class B Group 1 Applicable filters (Length of motor connecting cable: Max. 20 m) | Transmission noise EN55011 Class A Group 1 Applicable filters (Length of motor connecting cable: Max. 50 m) |
| VFS11-4004PL | With a built-in filter | EMFS11-4015BZ | |
| VFS11-4007PL | With a built-in filter | EMFS11-4015BZ | |
| VFS11-4015PL | With a built-in filter | EMFS11-4015BZ | |
| VFS11-4022PL | With a built-in filter | EMFS11-4025CZ | |
| VFS11-4037PL | With a built-in filter | EMFS11-4025CZ | |
| VFS11-4055PL | With a built-in filter | EMFS11-4047DZ | |
| VFS11-4075PL | With a built-in filter | EMFS11-4047DZ | |
| VFS11-4110PL | With a built-in filter | EMFS11-4049EZ | |
| VFS11-4150PL | With a built-in filter | EMFS11-4049EZ | |

Single-phase 240V class

| Inverter | Combination of inverter and filter | | |
|---|---|---|---|
| | Transmission noise EN55011 Class A Group 1 Applicable filters (Length of motor connecting cable: Max. 5 m) | Transmission noise EN55011 Class B Group 1 Applicable filters (Length of motor connecting cable: Max. 20 m) | Transmission noise EN55011 Class A Group 1 Applicable filters (Length of motor connecting cable: Max. 50 m) |
| VFS11S-2002PL | With a built-in filter | EMFS11S-2009AZ | |
| VFS11S-2004PL | With a built-in filter | EMFS11S-2009AZ | |
| VFS11S-2007PL | With a built-in filter | EMFS11S-2009AZ | |
| VFS11S-2015PL | With a built-in filter | EMFS11S-2016BZ | |
| VFS11S-2022PL | With a built-in filter | EMFS11S-2022CZ | |

Note : For 600V models compliant with EU standards, contact your nearest Toshiba inverter distributor.

(2) Use shielded power cables, such as inverter output cables, and shielded control cables. Route the cables and wires so as to minimize their lengths. Keep a distance between the power cable and the control cable and between the input and output wires of the power cable. Do not route them in parallel or bind them together, instead cross at right angle.

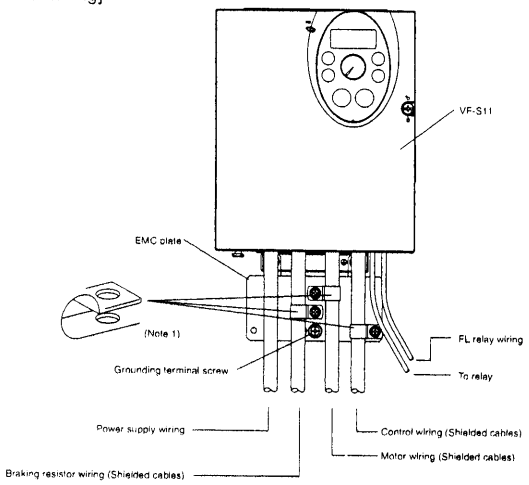
(3) Install the inverter and the filter on the same metal plate. It is more effective in limiting the radiation noise to install the inverter in a sealed steel cabinet. Using wires as thick and short as possible, earth the metal plate and the control panel securely with a distance kept between the earth cable and the power cable.

(4) Route the EMI filter input and output wires apart from each other.

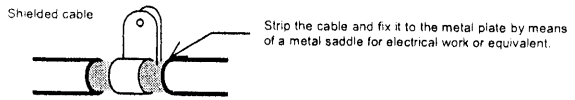
(5) To suppress radiation noise from cables, ground all shielded cables through a noise cut plate.
It is effective to earth shielded cables in the vicinity of the inverter, cabinet and filter (within a radius of 10cm from each of them). Inserting a ferrite core in a shielded cable is even more effective in limiting the radiation noise.

(6) To further limit the radiation noise, insert a zero-phase reactor in the inverter output line and insert ferrite cores in the earth cables of the metal plate and cabinet.

[Example of wiring]




Note 1: Strip and earth the shielded cable, following the example shown in Fig.




## 9.1.3 About the low-voltage directive

The low-voltage directive provides for the safety of machines and systems. All Toshiba inverters are CE-marked in accordance with the standard EN 50178 specified by the low-voltage directive, and can therefore be installed in machines or systems and imported without problem to European countries.

Applicable standard: EN50178
Electronic equipment for use in power installations
Electronic equipment for use in power installations
Pollution level: 2 (5.2.15.2)
Overvoltage category: 3
240V class - 3.0mm (5.2.16.1)
500V class - 5.5mm (5.2.16.1)





EN 50178 applies to electrical equipment intended specially for use in power installations, and sets out the conditions to be observed for electric shock prevention when designing, testing, manufacturing and installing electronic equipment for use in power installations.

## 9.1.4 Measures to satisfy the low-voltage directive

When incorporating the inverter into a machine or system, it is necessary to take the following measures so that the inverter satisfies the low-voltage directive.

(1) Install the inverter in a cabinet and ground the inverter enclosure. When doing maintenance, be extremely careful not to put your fingers into the inverter through a wiring hole and touch a charged part, which may occur depending on the model and capacity of the inverter used.
(2) Do not connect two or more wires to the main circuit earth terminal of the inverter. If necessary, install an additional earth terminal on the metal plate on which the inverter is installed and connect another cable to it. Or install the EMC plate (attached as standard) and another cable connect to earth terminal on the EMC plate. Refer to the table 10.1 for earth cable sizes.
(3) Install a non-fuse circuit breaker or a fuse on the input side of the inverter.

# 9.2 Compliance with UL Standard and CSA Standard

The VF-S11 models, that conform to the UL Standard and CSA Standard have the UL/CSA mark on the nameplate.

## 9.2.1 Compliance with Installation

The VF-S11 inverter must be installed in a panel, and used within the ambient temperature specification. (See section 1.4.4)

## 9.2.2 Compliance with Connection

Use the UL conformed cables (Rating 75 °C or more) to the main circuit terminals (R/L1, S/L2, T/L3, U/T1, V/T2, W/T3, PA/+, PB, PC/-, PO).
Refer to the table of next page about wire sizes.

## 9.2.3 Compliance with Peripheral devices

Use the UL listed fuses at connecting to power supply.
Short circuit test is performed under the condition of the power supply short-circuit currents in below.
These interrupting capacities and fuse rating currents depend on the applicable motor capacities.



12.2.5

■ AIC, Fuse and Wire sizes

| Voltage class | Capacity of applicable motor (kW) | Inverter model | AIC (A) (Interrupting capacity) | Fuse class and current (A) | Wire sizes of power circuit |
|---|---|---|---|---|---|
| Single-phase 240V class | 0.2 | VFS11S-2002PL | AIC 1000A | CC/J 6A max. | AWG14 |
| | 0.4 | VFS11S-2004PL | AIC 1000A | CC/J 10A max. | AWG14 |
| | 0.75 | VFS11S-2007PL | AIC 1000A | CC/J 15A max. | AWG14 |
| | 1.5 | VFS11S-2015PL | AIC 1000A | CC/J 20A max. | AWG12 |
| | 2.2 | VFS11S-2022PL | AIC 1000A | CC/J 30A max. | AWG10 |
| Three-phase 240V class | 0.4 | VFS11-2004PM | AIC 5000A | CC/J 6A max. | AWG14 |
| | 0.55 | VFS11-2005PM | AIC 5000A | CC/J 10A max. | AWG14 |
| | 0.75 | VFS11-2007PM | AIC 5000A | CC/J 10A max. | AWG14 |
| | 1.5 | VFS11-2015PM | AIC 5000A | CC/J 15A max. | AWG14 |
| | 2.2 | VFS11-2022PM | AIC 5000A | CC/J 20A max. | AWG12 |
| | 4.0 | VFS11-2037PM | AIC 5000A | J 35A max. | AWG10 |
| | 5.5 | VFS11-2055PM | AIC 22000A | J 50A max. | AWG8 |
| | 7.5 | VFS11-2075PM | AIC 22000A | J 60A max. | AWG6 |
| | 11 | VFS11-2110PM | AIC 22000A | J 80A max. | AWG4 |
| | 15 | VFS11-2150PM | AIC 22000A | J 110A max. | AWG6 x 2 |
| Three-phase 500V class | 0.4 | VFS11-4004PL | AIC 5000A | CC/J 3A max. | AWG14 |
| | 0.75 | VFS11-4007PL | AIC 5000A | CC/J 6A max. | AWG14 |
| | 1.5 | VFS11-4015PL | AIC 5000A | CC/J 10A max. | AWG14 |
| | 2.2 | VFS11-4022PL | AIC 5000A | CC/J 15A max. | AWG14 |
| | 4.0 | VFS11-4037PL | AIC 5000A | CC/J 20A max. | AWG12 |
| | 5.5 | VFS11-4055PL | AIC 22000A | CC/J 30A max. | AWG10 |
| | 7.5 | VFS11-4075PL | AIC 22000A | J 35A max. | AWG8 |
| | 11 | VFS11-4110PL | AIC 22000A | J 50A max. | AWG8 |
| | 15 | VFS11-4150PL | AIC 22000A | J 70A max. | AWG6 |
| Three-phase 600V class | 0.75 | VFS11-6007P | AIC 5000A | CC/J 6A max. | AWG14 |
| | 1.5 | VFS11-6015P | AIC 5000A | CC/J 6A max. | AWG14 |
| | 2.2 | VFS11-6022P | AIC 5000A | CC/J 10A max. | AWG14 |
| | 4.0 | VFS11-6037P | AIC 5000A | CC/J 15A max. | AWG14 |
| | 5.5 | VFS11-6055P | AIC 22000A | CC/J 20A max. | AWG10 |
| | 7.5 | VFS11-6075P | AIC 22000A | CC/J 25A max. | AWG10 |
| | 11 | VFS11-6110P | AIC 22000A | J 30A max. | AWG8 |
| | 15 | VFS11-6150P | AIC 22000A | J 45A max. | AWG8 |

## 9.2.4 Motor thermal protection

Selects the electronic thermal protection characteristics that fit with the ratings and characteristics of the motor. In case of multi motor operation with one inverter, thermal relay should be connected to each motor.





# 10. Peripheral devices

| Danger | |
|---|---|
| Mandatory | • When using switchgear for the inverter, it must be installed in a cabinet. Failure to do so can lead to risk of electric shock and can result in death or serious injury. |
| Prohibited | • Connect earth cables securely. Failure to do so can lead to risk of electric shock or fire in case of a failure or short-circuit or electric leak. |

## 10.1 Selection of wiring materials and devices

| Voltage class | Capacity of applicable motor (kW) | Inverter model | Wire size (See Note 4) Power circuit ($mm^2$) (Note 1.) | DC reactor (optional) ($mm^2$) | Braking resistor/ Braking unit (optional) ($mm^2$) | Earth cable ($mm^2$) |
|---|---|---|---|---|---|---|
| Single-phase 240V class | 0.2 | VFS11S-2002PL | 2.0 (2.0) | 2.0 | 2.0 | 3.5 |
| | 0.4 | VFS11S-2004PL | 2.0 (2.0) | 2.0 | 2.0 | 3.5 |
| | 0.75 | VFS11S-2007PL | 2.0 (2.0) | 2.0 | 2.0 | 3.5 |
| | 1.5 | VFS11S-2015PL | 2.0 (2.0) | 2.0 | 2.0 | 3.5 |
| | 2.2 | VFS11S-2022PL | 2.0 (2.0) | 3.5 | 2.0 | 3.5 |
| Three-phase 240V class | 0.4 | VFS11-2004PM | 2.0 (2.0) | 1.25 | 2.0 | 3.5 |
| | 0.55 | VFS11-2005PM | 2.0 (2.0) | 2.0 | 2.0 | 3.5 |
| | 0.75 | VFS11-2007PM | 2.0 (2.0) | 2.0 | 2.0 | 3.5 |
| | 1.5 | VFS11-2015PM | 2.0 (2.0) | 2.0 | 2.0 | 3.5 |
| | 2.2 | VFS11-2022PM | 2.0 (2.0) | 2.0 | 2.0 | 3.5 |
| | 4.0 | VFS11-2037PM | 2.0 (2.0) | 3.5 | 2.0 | 3.5 |
| | 5.5 | VFS11-2055PM | 5.5 (2.0) | 8.0 | 2.0 | 5.5 |
| | 7.5 | VFS11-2075PM | 8.0 (5.5) | 14 | 3.5 | 5.5 |
| | 11 | VFS11-2110PM | 14 (8.0) | 14 | 5.5 | 8.0 |
| | 15 | VFS11-2150PM | 22 (14) | 22 | 14 | 8.0 |
| Three-phase 500V class | 0.4 | VFS11-4004PL | 2.0 (2.0) | 2.0 | 2.0 | 3.5 |
| | 0.75 | VFS11-4007PL | 2.0 (2.0) | 2.0 | 2.0 | 3.5 |
| | 1.5 | VFS11-4015PL | 2.0 (2.0) | 2.0 | 2.0 | 3.5 |
| | 2.2 | VFS11-4022PL | 2.0 (2.0) | 2.0 | 2.0 | 3.5 |
| | 4.0 | VFS11-4037PL | 2.0 (2.0) | 2.0 | 2.0 | 3.5 |
| | 5.5 | VFS11-4055PL | 2.0 (2.0) | 3.5 | 2.0 | 3.5 |
| | 7.5 | VFS11-4075PL | 3.5 (2.0) | 5.5 | 2.0 | 3.5 |
| | 11 | VFS11-4110PL | 5.5 (2.0) | 8.0 | 2.0 | 5.5 |
| | 15 | VFS11-4150PL | 8.0 (5.5) | 14 | 3.5 | 5.5 |
| Three-phase 600V class | 0.75 | VFS11-6007P | 2.0 | 2.0 | 2.0 | 3.5 |
| | 1.5 | VFS11-6015P | 2.0 | 2.0 | 2.0 | 3.5 |
| | 2.2 | VFS11-6022P | 2.0 | 2.0 | 2.0 | 3.5 |
| | 4.0 | VFS11-6037P | 2.0 | 2.0 | 2.0 | 3.5 |
| | 5.5 | VFS11-6055P | 2.0 | 2.0 | 2.0 | 3.5 |
| | 7.5 | VFS11-6075P | 2.0 | 2.0 | 2.0 | 3.5 |
| | 11 | VFS11-6110P | 3.5 | 3.5 | 2.0 | 3.5 |
| | 15 | VFS11-6150P | 5.5 | 5.5 | 2.0 | 5.5 |

Note 1: Sizes of the wires connected to the input terminals R/L1, S/L2 and T/L3 and the output terminals U/T1, V/T2 and W/T3 when the length of each wire does not exceed 30m.
The numeric values in parentheses refer to the sizes of wires to be used when a DC reactor is connected.

Note 2: For the control circuit, use shielded wires 0.75 $mm^2$ or more in diameter.

Note 3: For grounding, use a cable with a size equal to or larger than the above.

Note 4: The wire sizes specified in the above table apply to HIV wires (cupper wires shielded with an insulator with a maximum allowable temperature of 75°C) used at an ambient temperature of 50°C or less.

Note 5: If there is a need to bring the inverter into UL compliance, use wires specified in Chapter 9.

## ■ Selection of wiring devices

| Voltage class | Capacity of applicable motor (kW) | Inverter model | Molded case circuit breaker (MCCB) Earth leakage circuit breaker (ELCB) Note 3) Rated current (A) | | Magnetic contactor (MC) Rated current (A) | | Overload relay (THR) Adjusted current (A) (For reference) |
|---|---|---|---|---|---|---|---|
| | | | Without reactor | With DC reactor | Without reactor | With DC reactor | |
| Single-phase 240V class | 0.2 | VFS11S-2002PL | 5 | 5 | 9 | 9 | 1.3 |
| | 0.4 | VFS11S-2004PL | 10 | 5 | 9 | 9 | 2.3 |
| | 0.75 | VFS11S-2007PL | 15 | 10 | 9 | 9 | 3.6 |
| | 1.5 | VFS11S-2015PL | 20 | 15 | 18 | 12 | 6.8 |
| | 2.2 | VFS11S-2022PL | 30 | 30 | 25 | 18 | 9.3 |
| Three-phase 240V class | 0.4 | VFS11-2004PM | 5 | 5 | 9 | 9 | 2.3 |
| | 0.55 | VFS11-2005PM | 10 | 5 | 9 | 9 | 2.7 |
| | 0.75 | VFS11-2007PM | 10 | 5 | 9 | 9 | 3.6 |
| | 1.5 | VFS11-2015PM | 15 | 10 | 9 | 9 | 6.8 |
| | 2.2 | VFS11-2022PM | 20 | 15 | 12 | 12 | 9.3 |
| | 4.0 | VFS11-2037PM | 30 | 30 | 25 | 18 | 15 |
| | 5.5 | VFS11-2055PM | 50 | 40 | 32 | 25 | 22 |
| | 7.5 | VFS11-2075PM | 60 | 50 | 38 | 38 | 28 |
| | 11 | VFS11-2110PM | 100 | 75 | 65 | 50 | 44 |
| | 15 | VFS11-2150PM | 125 | 100 | 80 | 65 | 57 |
| Three-phase 500V class (Note 4) | 0.4 | VFS11-4004PL | 5 | 5 | 9 | 9 | 1.0 |
| | 0.75 | VFS11-4007PL | 5 | 5 | 9 | 9 | 1.6 |
| | 1.5 | VFS11-4015PL | 10 | 10 | 9 | 9 | 3.6 |
| | 2.2 | VFS11-4022PL | 15 | 10 | 9 | 9 | 5.0 |
| | 4.0 | VFS11-4037PL | 20 | 15 | 12 | 9 | 6.8 |
| | 5.5 | VFS11-4055PL | 30 | 20 | 18 | 18 | 11 |
| | 7.5 | VFS11-4075PL | 30 | 30 | 25 | 18 | 15 |
| | 11 | VFS11-4110PL | 50 | 40 | 32 | 25 | 22 |
| | 15 | VFS11-4150PL | 60 | 50 | 38 | 38 | 28 |
| Three-phase 600V class (Note 4) | 0.75 | VFS11-6007P | 5 | 5 | 9 | 9 | 1.0 |
| | 1.5 | VFS11-6015P | 10 | 10 | 9 | 9 | 1.6 |
| | 2.2 | VFS11-6022P | 10 | 10 | 9 | 9 | 3.6 |
| | 4.0 | VFS11-6037P | 15 | 15 | 12 | 12 | 5.0 |
| | 5.5 | VFS11-6055P | 20 | 20 | 18 | 18 | 6.8 |
| | 7.5 | VFS11-6075P | 30 | 30 | 25 | 25 | 11 |
| | 11 | VFS11-6110P | 30 | 30 | 25 | 25 | 15 |
| | 15 | VFS11-6150P | 40 | 40 | 33 | 33 | 22 |

Note 1: Be sure to attach a surge killer to the exciting coil of the relay and the magnetic contactor.

Note 2: When using the auxiliary contacts 2a of the magnetic contactor MC for the control circuit, connect the contacts 2a in parallel to increase reliability.

Note 3: Select an MCCB with a current breaking rating appropriate to the capacity of the power supply, because short-circuit currents vary greatly depending on the capacity of the power supply and the condition of the wiring system. The MCCB, MC, THR and ELCB in this table were selected, on the assumption that a power supply with a normal capacity would be used.

Note 4: 500 / 600V class: For the operation and control circuits, regulate the voltage at 240V or less with a step-down transformer.





# 10.2 Installation of a magnetic contactor

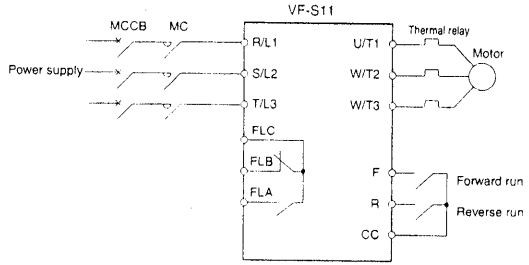
If using the inverter without installing a magnetic contactor (MC) in the primary circuit, use an MCCB (with a power cutoff device) to open the primary circuit when the inverter protective circuit is activated.
If using a braking resistor or braking resistor unit, install a magnetic contactor (MC) or non-fuse circuit breaker with a power cutoff device to the power supply of the inverter, so that the power circuit opens when the failure detection relay (FL) in the inverter or the external overload relay is activated.

## ■ Magnetic contactor in the primary circuit

To detach the inverter from the power supply in any of the following cases, insert a magnetic contactor (primary-side magnetic contactor) between the inverter and the power supply.

(1) If the motor overload relay is tripped
(2) If the protective detector (FL) built into the inverter is activated
(3) In the event of a power failure (for prevention of auto-restart)
(4) If the resistor protective relay is tripped when a braking resistor or braking resistor unit is used

When using the inverter with no magnetic contactor (MC) on the primary side, install a non-fuse circuit breaker with a voltage tripping coil instead of an MC and adjust the circuit breaker so that it will be tripped if the protective relay referred to above is activated. To detect a power failure, use an undervoltage relay or the like




Example of connection of a magnetic contactor in the primary circuit

### Notes on wiring

- When frequently switching between start and stop, do not use the magnetic contactor on the primary side as an on-off switch for the inverter.
  Instead, stop and start the inverter by using terminals F and CC (forward run) or R and CC (reverse run).
- Be sure to attach a surge killer to the exciting coil of the magnetic contactor (MC).

### ■ Magnetic contactor in the secondary circuit

A magnetic contactor may be installed on the secondary side to switch controlled motors or supply commercial power to the load when the inverter is out of operation.

Notes on wiring

- Be sure to interlock the magnetic contactor on the secondary side with the power supply to prevent commercial power from being applied to the inverter output terminals.
- When installing a magnetic contactor (MC) between the inverter and the motor, avoid turning the magnetic contactor on or off during operation. Turning the magnetic contactor on or off during operation causes a current to rush into the inverter which could lead to malfunction.

## 10.3 Installation of an overload relay

1) The VF-S11 inverter has an electronic-thermal overload protective function.
In the following cases, however, an overload relay suitable for the adjustment of the motor electronic thermal protection level (tHr) and appropriate to the motor used should be installed between the inverter and the motor.
   - When using a motor with a current rating different to that of the corresponding Toshiba general-purpose motor
   - When operating a single motor with an output smaller than that of the applicable standard motor or more than one motor simultaneously.
2) When using the VF-S11 inverter to operate a constant-torque motor, such as the Toshiba VF motor, adjust the protection characteristic of the electronic thermal protection unit (OLn) to the VF motor use.
3) It is recommended to use a motor with a thermal relay embedded in the motor coil to give sufficient protection to the motor, especially when it runs in a low-speed range.

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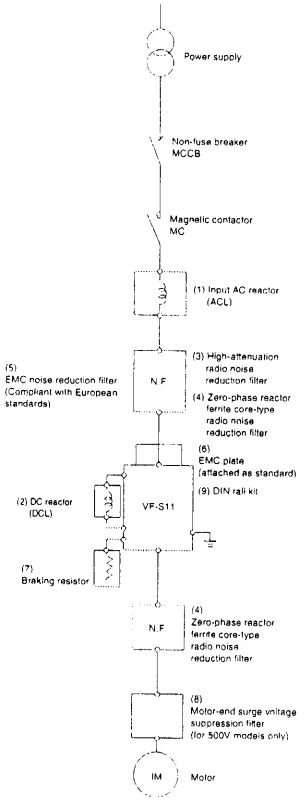
## 10.4 Optional external devices

The following external devices are optionally available for the VF-S11 series of inverters.




(10) Parameter writer
(11) Extension panel
(12) Internal PS485 communication circuit board
(13) Internal DeviceNet communication circuit board
(14) Internal LONWORKS communication circuit board
(15) RS485 communication converter unit
(16) RS232C communication converter cable
(17) Remote panel
(18) Application control unit
(19) Conduit pipe attachment kit

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Optional external devices

| No | Device | Function and purpose |
|---|---|---|
| (1) | Input AC reactor | Used to improve the input power factor, reduce the harmonics, and suppress external surge on the inverter power source side. Install when the power capacity is 200 kVA or more and 10 times or more than the inverter capacity or when a distorted wave generation source such as a thyristor unit or a large-capacity inverter is connected in the same distribution system. |
| (2) | DC reactor | Improves the power factor more than the input reactor. When the facility applying the inverter requires high reliability, it is recommended to use the DC reactor with an input reactor effective for external surge suppression. |
| (3) | Radio noise reduction filter: High-attenuation (NF type) | These types of filters are not necessary because all single-phase 200V or 3-phase 400V models have a built-in EMI noise filter, conforming to Class A, as standard. But install these filters if necessarily of noise reduction move and more.<br>• Effective to prevent interference in audio equipment used near the inverter.<br>• Install on the input side of the inverter.<br>• Provided with wide-range attenuation characteristics from AM radio bands to near 10MHz.<br>• Use when equipment readily affected by noise is installed in the peripheral area. |
| (4) | Radio noise reduction filter: Zero-phase reactor ferrite core-type | • Effective to prevent interference in audio equipment used near the inverter.<br>• Effective in noise reduction on both input and output sides of the inverter.<br>• Provided with attenuation characteristics of several dB in frequencies from AM radio bands to 10MHz.<br>• For noise countermeasures, insert on the secondary side of the inverter. |
| (5) | Radio noise reduction filter: EMC Noise reduction filter (Compliant with European standards) | A high-attenuation compact EMI noise filter that can be Foot-mounted and Side-mounted. With this filter on, the inverter complies with the following stndards.<br><br>Three-phase 240V model:<br>EN55011: Class A, Group 1 (Motor connecting cable length: 5 m or less)<br>And EN55011: Class B, Group 1 (Motor connecting cable length: 1 m or less)<br><br>Single-phase 240V, three-phase 500V models:<br>And EN55011: Class A, Group 1 (Motor connecting cable length: 50 m or less)<br>EN55011: Class B, Group 1 (Motor connecting cable length: 20 m or less) |
| (6) | EMC plate (attached as standard) | A steel plate used to connect shielded earth wires from inverter's power cables or to connect earth wires from external devices. |
| (7) | Braking resistor | Use when rapid deceleration or stop is frequently required or when it is desired to reduce the deceleration time with large load. This resistor consumes regenerative energy during power generation braking.<br>• Braking resistor - With (resistor + protective thermal relay) built in. |
| (8) | Motor - end surge voltage suppression filter (500V class only) | Use an insulation-reinforced motor or install the surge voltage restraint filter to prevent degrading motor insulation caused by surge voltage generation depending on cable length and wiring method, or use of a 500V class motor driven with an inverter. |

| Reactor type | Effect: Improvement of power factor | Effect: Suppression of harmonic: 240V-4.0kW or less | Effect: Suppression of harmonic: Other model | Effect: Suppression of external surge |
|---|---|---|---|---|
| Input AC reactor | O | O | O | O |
| DC reactor | O Large | O | O Large | × |

O Large : Large effective. O : effective. × : ineffective

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| No. | Device | Function and purpose |
|---|---|---|
| (9) | DIN rail kit | Available for 2.2kW or 1.5kW models and lower. (Model: DIN003Z, DIN005Z) |
| (10) | Parameter writer Note 1) | Use this unit for batch read, batch copy, and batch writing of setting parameters. (Model: PWU001Z) |
| (11) | Extension panel Note 1) | Extended operation panel kit provided with LED indication section, RUN/STOP key, UP/DOWN key, Monitor key, and Enter key. (Model: RKP001Z) |
| (12) | Internal RS485 communication circuit board | This unit allows you to connect a upper controller to multiple inverters for data transfer. (Model: RS4003Z) |
| (13) | Internal DeviceNet communication circuit board | This unit allows you to connect a upper controller to multiple inverters for data transfer. (Model : DEV001Z) |
| (14) | Internal LONWORKS communication circuit board | This unit allows you to connect a upper controller to multiple inverters for data transfer. (Model : LIU005Z) |
| (15) | RS485 communication converter unit Note 1) | This unit allows you to connect a upper controller to multiple inverters for data transfer. (Models: RS4001Z, RS4002Z) |
| (16) | RS232C communication converter cable | This unit allows you to connect a personal computer to inverters for data communications. (Model: RS20035) |
| (17) | Remote panel | This panel includes a frequency meter, a frequency regulator and RUN/STOP (forward/reverse run)switches. (Model: CBVR-7B1) |
| (18) | Application control unit | The AP series of control units is available for the inverter to allow it to perform various kinds of applied control. Contact your Toshiba representative for further information. |
| (19) | Conduit pipe attachment kit | Attachment kit used for conformance to NEMA TYPE1. |

Note 1: Dedicated cables are needed to connect inverters to a personal computer.
Cable models: CAB0011 (1m)
CAB0013 (3m)
CAB0015 (5m)

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Table for selection of optional external devices

| Voltage class | Capacity of applicable motor (kW) | Inverter model | Input AC reactor | DC reactor | Radio noise reduction filter: High-attenuation type | Radio noise reduction filter: Core type (Note 1.) | Braking resistor | Motor-end surge voltage suppression filter | EMC plate (Note 2) | EMC noise filter (Compliant with European standards) | DIN rail kit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Single-phase 240V class | 0.2 | VFS11S-2002PL | PFL-2002S | DCLS-2002 | - | RC5078 | PBR-2007 | - | EMP003Z | EMFS11S-2009AZ | DIN003Z |
| | 0.4 | VFS11S-2004PL | PFL-2005S | DCL-2007 | - | RC5078 | PBR-2007 | - | EMP003Z | EMFS11S-2009AZ | DIN003Z |
| | 0.75 | VFS11S-2007PL | PFL-2011S | DCL-2022 | - | RC5078 | PBR-2007 | - | EMP003Z | EMFS11S-2009AZ | DIN003Z |
| | 1.5 | VFS11S-2015PL | PFL-2018S | DCL-2037 | - | RC5078 | PBR-2022 | - | EMP004Z | EMFS11S-2016BZ | DIN005Z |
| | 2.2 | VFS11S-2022PL | PFL-2018S | DCL-2037 | - | RC5078 | PBR-2022 | - | EMP004Z | EMFS11S-2022CZ | - |
| Three-Phase 240V class | 0.2 | VFS11-2002PM | PFL-2001S | DCL-2002 | NF3005A-MJ | RC5078 | PBR-2007 | - | EMP003Z | EMFS11-2007AZ | DIN003Z |
| | 0.4 | VFS11-2004PM | PFL-2005S | DCL-2007 | NF3005A-MJ | RC5078 | PBR-2007 | - | EMP003Z | EMFS11-2007AZ | DIN003Z |
| | 0.55 | VFS11-2005PM | PFL-2005S | DCL-2007 | NF3005A-MJ | RC5078 | PBR-2007 | - | EMP003Z | EMFS11-2007AZ | DIN003Z |
| | 0.75 | VFS11-2007PM | PFL-2005S | DCL-2007 | NF3005A-MJ | RC5078 | PBR-2007 | - | EMP003Z | EMFS11-2007AZ | DIN003Z |
| | 1.5 | VFS11-2015PM | PFL-2011S | DCL-2022 | NF3015A-MJ | RC5078 | PBR-2022 | - | EMP004Z | EMFS11-4015BZ | DIN005Z |
| | 2.2 | VFS11-2022PM | PFL-2011S | DCL-2022 | NF3015A-MJ | RC5078 | PBR-2022 | - | EMP004Z | EMFS11-4015BZ | DIN005Z |
| | 3.7 | VFS11-2037PM | PFL-2018S | DCL-2037 | NF3020A-MJ | RC5078 | PBR-2037 | - | EMP004Z | EMFS11-4025CZ | - |
| | 5.5 | VFS11-2055PM | PFL-2025S | DCL-2055 | NF3030A-MJ | RC9129 | PBR3-2055 | - | EMP005Z | EMFS11-4047DZ | - |
| | 7.5 | VFS11-2075PM | PFL-2050S | DCL-2110 | NF3040A-MJ | RC9129 | PBR3-2075 | - | EMP005Z | EMFS11-4047DZ | - |
| | 11 | VFS11-2110PM | PFL-2050S | DCL-2110 | NF3050A-MJ | RC9129 | PBR3-2110 | - | EMP006Z | EMFS11-2083EZ | - |
| | 15 | VFS11-2150PM | PFL-2100S | DCL-2220 | NF3080A-MJ | RC9129 | PBR3-2150 | - | EMP006Z | EMFS11-2083EZ | - |
| Three-Phase 500V class | 0.4 | VFS11-4004PL | PFL-4012S | DCL-2007 | NF3010C-MJ | RC5078 | PBR-2007 | MSF-4015Z | EMP004Z | EMFS11-4015BZ | DIN005Z |
| | 0.75 | VFS11-4007PL | PFL-4012S | DCL-2007 | NF3010C-MJ | RC5078 | PBR-2007 | MSF-4015Z | EMP004Z | EMFS11-4015BZ | DIN005Z |
| | 1.5 | VFS11-4015PL | PFL-4012S | DCL-2007 | NF3010C-MJ | RC5078 | PBR-2007 | MSF-4015Z | EMP004Z | EMFS11-4015BZ | DIN005Z |
| | 2.2 | VFS11-4022PL | PFL-4012S | DCL-2022 | NF3010C-MJ | RC5078 | PBR-2007 | MSF-4037Z | EMP004Z | EMFS11-4025CZ | - |
| | 3.7 | VFS11-4037PL | PFL-4012S | DCL-2022 | NF3010C-MJ | RC5078 | PBR-4037 | MSF-4037Z | EMP004Z | EMFS11-4025CZ | - |
| | 5.5 | VFS11-4055PL | PFL-4025S | DCL-4110 | NF3015C-MJ | RC9129 | PBR3-4055 | MSF-4075Z | EMP005Z | EMFS11-4047DZ | - |
| | 7.5 | VFS11-4075PL | PFL-4025S | DCL-4110 | NF3020C-MJ | RC9129 | PBR3-4075 | MSF-4075Z | EMP005Z | EMFS11-4047DZ | - |
| | 11 | VFS11-4110PL | PFL-4025S | DCL-4110 | NF3030C-MJ | RC9129 | PBR3-4110 | MSF-4150Z | EMP006Z | EMFS11-4049EZ | - |
| | 15 | VFS11-4150PL | PFL-4050S | DCL-4220 | NF3040C-MJ | RC9129 | PBR3-4150 | MSF-4150Z | EMP006Z | EMFS11-4049EZ | - |
| Three-Phase 600V class | 0.75 | VFS11-6007P | (Note 3) | (Note 3) | FN3359HV -150-28 by Schafener | RC5078 | (Note 3) | - | EMP004Z | (Note 3) | DIN005Z |
| | 1.5 | VFS11-6015P | | | | RC5078 | | - | EMP004Z | | DIN005Z |
| | 2.2 | VFS11-6022P | | | | RC5078 | | - | EMP004Z | | - |
| | 4.0 | VFS11-6037P | | | | RC5078 | | - | EMP004Z | | - |
| | 5.5 | VFS11-6055P | | | | RC9129 | | - | EMP005Z | | - |
| | 7.5 | VFS11-6075P | | | | RC9129 | | - | EMP005Z | | - |
| | 11 | VFS11-6110P | | | | RC9129 | | - | EMP006Z | | - |
| | 15 | VFS11-6150P | | | | RC9129 | | - | EMP006Z | | - |

Note 1: This filter is used wound around the input-side power line. (Number of turns: 4 or more) This filter can be installed on the output side, as well.

Note 2: EMC plate is attached as standard.

Note 3: For 600V models, contact your nearest Toshiba inverter distributor.

10



12.2.5



| Devices | External dimensions and connections |
|---|---|
| Input AC reactor (ACL) | |

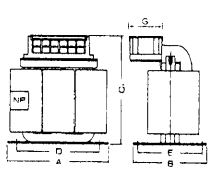



Fig. A

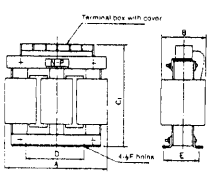
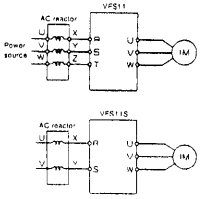



Fig. B




| Model | Rating | Inverter type | Dimensions (mm) A | B | C | D | E | F | G | Diagram | Terminals | Approx. weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PFLS2002S | 1φ-240V-2.0A-50/60Hz | VFS11S-2002PL | 80 | 55 | 115 | 63 | 45 | 5 | 45 | A | Harmonica terminal M3.5 | 0.85 |
| PFL2001S | 3φ-240V-1.7A-50/60Hz | VFS11-2002PM | 105 | 65 | 115 | 90 | 55 | 5 | 40 | | Harmonica terminal M3.5 | 1.0 |
| PFL2005S | 3φ-240V-5.5A-50/60Hz | VFS11-2004 ~ 2007PM VFS11S-2004PL | 105 | 65 | 115 | 90 | 55 | 5 | 40 | | Harmonica terminal M3.5 | 1.2 |
| PFL2011S | 3φ-240V-11A-50/60Hz | VFS11-2015, 2022PM VFS11S-2007PL | 130 | 70 | 140 | 115 | 60 | 5 | 50 | | Harmonica terminal M4 | 2.3 |
| PFL2018S | 3φ-240V-18A-50/60Hz | VFS11-2037PM VFS11S-2015, 2022PL | 130 | 70 | 140 | 115 | 60 | 5 | 50 | | Harmonica terminal M4 | 2.5 |
| PFL2025S | 3φ-240V-25A-50/60Hz | VFS11-2055PM | 125 | 100 | 130 | 50 | 83 | 7 | - | B | Harmonica terminal M4 | 2.6 |
| PFL2050S | 3φ-240V-50A-50/60Hz | VFS11-2075, 2110PM | 155 | 115 | 140 | 50 | 95 | 7 | - | | Harmonica terminal M6 | 3.4 |
| PFL2100S | 3φ-240V-100A-50/60Hz | VFS11-2150PM | 230 | 150 | 210 | 60 | 90 | 8 | - | | Harmonica terminal M8 | 8.2 |
| PFL4012S | 3φ-500V-12.5A-50/60Hz | VFS11-4004 ~ 4037PL | 125 | 95 | 130 | 50 | 79 | 7 | - | B | Harmonica terminal M4 | 2.3 |
| PFL4025S | 3φ-500V-25A-50/60Hz | VFS11-4055 ~ 4110PL | 155 | 110 | 155 | 50 | 94 | 7 | - | | | 4.9 |
| PFL4050S | 3φ-500V-50A-50/60Hz | VFS11-4150PL | 155 | 140 | 165 | 50 | 112 | 7 | - | | Harmonica terminal M6 | 6.6 |

* PFLS2002S has 4 terminals.

10

| Devices | External dimensions and connections |
|---|---|
| DC reactor (DCL) | |

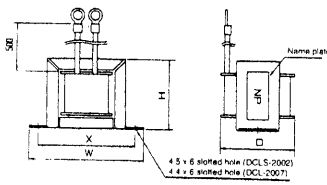



Fig. A

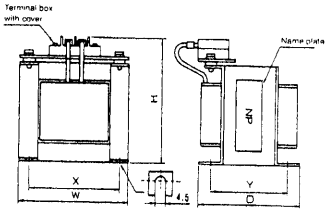



Fig. B

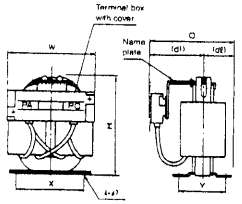
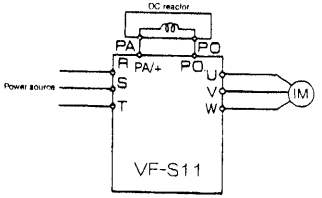



Fig. C




| Model | Rated current (A) | Inverter type | Dimensions (mm) W | H | D | X | Y | d1 | D2 | Diagram | Terminals | Approx weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DCL-2002 | 2 | VFS11-2002PM | 59 | 37 | 35 | 51 | - | - | - | A | V1.25-3.5 | 0.2 |
| DCLS-2002 | 2.5 | VFS11-2002PM VFS11S-2002PL | 79 | 50 | 44 | 68 | - | - | - | | V1.25-3.5 | 0.6 |
| DCL-2007 | 7 | VFS11-2004 ~ 2007PM VFS11S-2004PL | 92 | 65 | 70 | 82 | - | - | - | B | V2-3.5 | 1.2 |
| DCL-2022 | 14 | VFS11-2015, 2022PM VFS11S-2007PL | 86 | 110 | 80 | 71 | 64 | - | - | | M4 | 2.2 |
| DCL-2037 | 22.5 | VFS11-2037PM VFS11S-2015, 2022PL | 86 | 110 | 85 | 71 | 70 | - | - | | M4 | 2.5 |
| DCL-2055 | 38 | VFS11-2055PM | 75 | 130 | 140 | 50 | 85 | 85 | 55 | C | M5 | 1.9 |
| DCL-2110 | 75 | VFS11-2075 ~ 2110PM | 100 | 150 | 150 | 65 | 85 | 95 | 55 | | M8 | 2.4 |
| DCL-2220 | 150 | VFS11-2150PM | 117 | 170 | 190 | 90 | 90 | 130 | 60 | | M8 | 4.3 |
| DCL-2007 | 7 | VFS11-4004 ~ 4015PL (Note) | 92 | 65 | 70 | 82 | - | - | - | A | V2-3.5 | 1.2 |
| DCL-2022 | 14 | VFS11-4022, 4037PL (Note) | 86 | 110 | 80 | 71 | 64 | - | - | | M4 | 2.2 |
| DCL-4110 | 38 | VFS11-4055 ~ 4110PL | 95 | 150 | 165 | 70 | 90 | 105 | 60 | B C | M5 | 3.0 |
| DCL-4220 | 75 | VFS11-4150PL | 105 | 160 | 185 | 80 | 100 | 130 | 65 | | M8 | 3.7 |

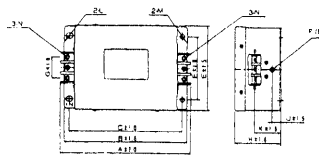
Note: Use 240V class for VFS11-4004PL-4037PL DC reactor.

10





| Devices | External dimensions and connections |
|---|---|
| High-attenuation radio noise reduction filter | |



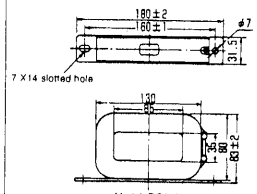

Notes: (1) Noise filter should be connected to the inverter main circuit and the control circuit primary-side.

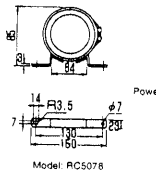
(2) Output cable should be kept away from the input cable.

| Reactor model | Rated current (A) | Inverter type | A | B | C | E | F | G | H | J | K | M | N | P | Approx weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NF3005A-MJ | 5 | VFS11-2002PM ~ VFS11-2007PM | 174.5 | 160 | 145 | 110 | 80 | 32 | 70 | 20 | 45 | ϕ5.5 | M4 | M4 | 1.0 |
| NF3015A-MJ | 15 | VFS11-2015PM, VFS11-2022PM | | | | | | | | | | | | | 1.4 |
| NF3020A-MJ | 20 | VFS11-2037PM | | | | | | | | | | | | | 1.6 |
| NF3030A-MJ | 30 | VFS11-2055PM | | | | | | | | | | | | | |
| NF3040A-MJ | 40 | VFS11-2075PM | 217.5 | 200 | 185 | 120 | 90 | 44 | 90 | 30 | 43 | | M5 | | 2.7 |
| NF3050A-MJ | 50 | VFS11-2110PM | 267.5 | 250 | 235 | 170 | 140 | | | | 60 | | M6 | | 4.6 |
| NF3080A-MJ | 80 | VFS11-2150PM | 294.5 | 280 | 260 | 170 | 150 | 37 | 100 | | 55 | | M6 | | 7.0 |
| NF3010C-MJ | 10 | VFS11-4004 ~ 4037PL | 174.5 | 160 | 145 | 110 | 80 | 32 | 70 | 20 | 45 | ϕ5.5 | M4 | M4 | 1.4 |
| NF3015C-MJ | 15 | VFS11-4055PL | | | | | | | | | | | | | |
| NF3020C-MJ | 20 | VFS11-4075PL | | | | | | | | | | | | | 1.6 |
| NF3030C-MJ | 30 | VFS11-4110PL | 177.5 | 200 | 185 | 120 | 90 | 44 | | | 43 | | M5 | | 2.7 |
| NF3040C-MJ | 40 | VFS11-4150PL | 217.5 | | | | | | | | | | | | |

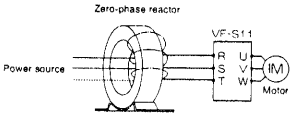
Note: Every inverter with a model number ending in -PL comes standard with a built-in noise filter almost equal in size and performance to this filter.

| Zero-phase ferrite core-type radio noise reduction filter | |
|---|---|




Unit: mm

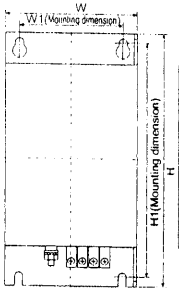


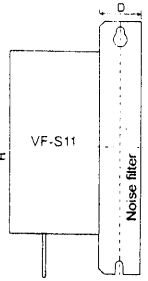

Input or output cable should be coiled over 4-times. RC5078 is recommended for the models 3.7kW or less.

10

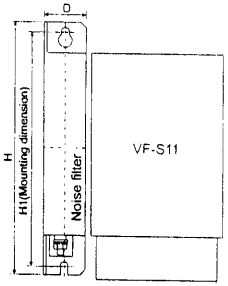
| Devices | External dimensions and connections |
|---|---|
| EMC noise filter (Compliant with European Standards) | |

Foot mount installation



Side mount installation

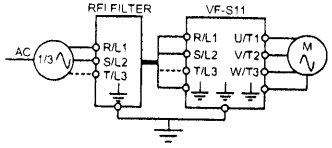


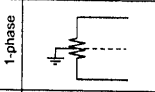
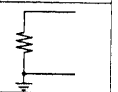
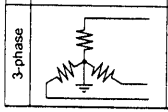
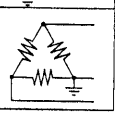

| RFI filter type form | Rated current (A) | Inverter type form | Dimensions (mm) W | H | D | W1 | H1 | E | F | G | Leakage current (mA) Note 1) Power system A | Power system B |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EMFS11S-2009AZ | 9 | VFS11S-2002~2007PL | 72 | 195 | 37 | 52 | 180 | 5 | 8.5 | 10 | 3 | 47 |
| EMFS11-2007AZ | 7 | VFS11-2002~2007PM | 72 | 195 | 37 | 52 | 180 | 5 | 8.5 | 10 | 7 | 45 |
| EMFS11S-2016BZ | 16 | VFS11S-2015PL | 105 | 195 | 35 | 85 | 180 | 5 | 8.5 | 10 | 3 | 47 |
| EMFS11-4015BZ | 15 | VFS11-2015,2022PM<br>VFS11-4004~4015PL | 105 | 195 | 42 | 85 | 180 | 5 | 8.5 | 10 | 8<br>15 | 48<br>96 |
| EMFS11S-2022CZ | 22 | VFS11S-2022PL | 140 | 235 | 35 | 120 | 215 | 5 | 8.5 | 10 | 5 | 103 |
| EMFS11-4025CZ | 25 | VFS11-2037PM<br>VFS11-4022,4037PL | 140 | 235 | 50 | 120 | 215 | 5 | 8.5 | 10 | 20<br>40 | 125<br>248 |
| EMFS11-4047DZ | 47 | VFS11-2055,2075PM<br>VFS11-4055,4075PL | 180 | 305 | 60 | 140 | 285 | 5.5 | 9.5 | 11 | 23<br>47 | 147<br>293 |
| EMFS11-2083EZ | 83 | VFS11-2110,2150PM | 245 | 395 | 80 | 205 | 375 | 5.5 | 9.5 | 11 | 17 | 104 |
| EMFS11-4049EZ | 49 | VFS11-4110,4150PL | 245 | 395 | 60 | 205 | 375 | 5.5 | 9.5 | 11 | 47 | 293 |

Note 1) These values are referential ones of single piece of RFI filter. For 240V class, 60Hz/200V power source. For 500V class, 60Hz/400V power source. For power system A and B, refer to table below.

Select an earth leakage breaker with consideration of leakage current above and leakage current from the inverter unit.

How to wire




| | Power system A | Power system B |
|---|---|---|
| 1-phase |  |  |
| 3-phase |  |  |

Note 2) For 600V models compliant with EU standards, contact your nearest Toshiba inverter distributor.

10





| Devices | External dimensions and connections |
|---|---|
| Braking resistor | |

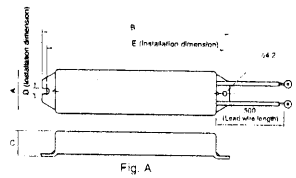



Fig. A

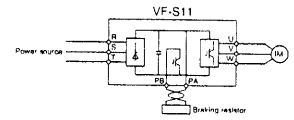



Fig. C

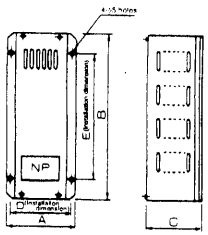
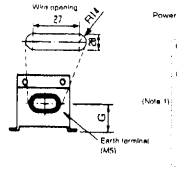



Fig. B



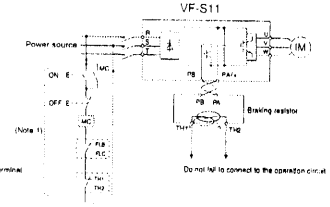




Fig. D

| Model | Rating | Inverter type | Dimensions (mm) A | B | C | D | E | G | External dimensions and connections | Approx. weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| PBR-2007 | 120W-200Ω | VFS11-2002 ~ 2007PM<br>VFS11S-2002 ~ 2007PL | 42 | 182 | 20 | 4.2 | 172 | - | A and C | 0.28 |
| PBR-2022 | 120W-75Ω | VFS11-2015, 2022PM<br>VFS11S-2015, 2022PL | | | | | | | | |
| PBR-2037 | 120W-40Ω | VFS11-2037PM | | | | | | | | |
| PBR3-2055 | 240W-20Ω (40Ω×2P) | VFS11-2055PM | 120 | 320 | 115 | 110 | 230 | 50 | B and D | 4 |
| PBR3-2075 | 440W-15Ω (30Ω×2P) | VFS11-2075PM | | 350 | 190 | | | 150 | | 4.5 |
| PBR3-2110 | 660W-10Ω (30Ω×3P) | VFS11-2110PM | | | | | | | | 5 |
| PBR3-2150 | 880W-7.5Ω (30Ω×4P) | VFS11-2150PM | | | | | | | | 5.5 |
| PBR-2007 | 120W-200Ω | VFS11-4004 ~ 4022PL | 42 | 182 | 20 | 4.2 | 172 | - | A and C | 0.28 |
| PBR-4037 | 120W-160Ω | VFS11-4037PL | | | | | | | | |
| PBR3-4055 | 240W-80Ω (160Ω×2P) | VFS11-4055PL | 120 | 320 | 115 | 110 | 230 | 50 | B and D | 4 |
| PBR3-4075 | 440W-60Ω (120Ω×2P) | VFS11-4075PL | | 350 | 190 | | | 150 | | 4.5 |
| PBR3-4110 | 660W-40Ω (120Ω×3P) | VFS11-4110PL | | | | | | | | 5 |
| PBR3-4150 | 880W-30Ω (120Ω×4P) | VFS11-4150PL | | | | | | | | 5.5 |

Note1: Use the same type of braking resistor of VFS11-2002 ~ 2007PM for those of VFS11-4004 ~ 4022PL.

Note2: The data in Rating above refer to the resultant resistance capacities (watts) and resultant resistance values (Ω).

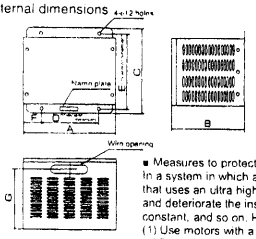
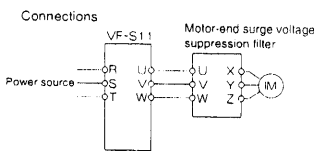
The numeric values inside parentheses refer to the internal compositions of resistors.

The resistances in the Rating column are combined resistances. The numeric values inside parentheses refer to the compositions of resistors (resistance of each resistor x number of resistors).

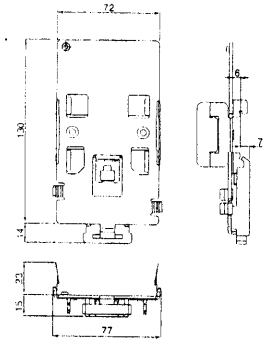
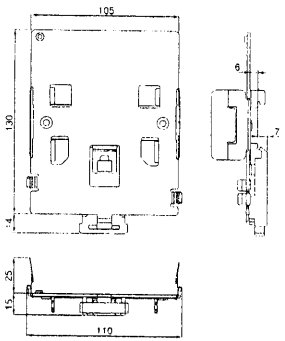
10



12.3.5

| Devices | External dimensions and connections |
|---|---|
| Motor – end surge voltage suppression filter | External dimensions<br>  <br>Connections<br>  <br><br>■ Measures to protect motors against surge voltages<br>In a system in which a 400V-class general-purpose motor is operated with a voltage PMW inverter that uses an ultra high-speed switching device (such as an IGBT), surge voltages may be produced and deteriorate the insulation of motor coils, depending on the cable length, wiring method, cable constant, and so on. Here are some examples of measures against surge voltages.<br>(1) Use motors with a high dielectric strength.<br>(2) To suppress surge voltages, install an AC reactor (an input reactor may be used instead. For the application, contact your Toshiba dealer) or a surge suppression filter on the output side of the inverter. |

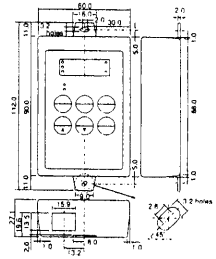
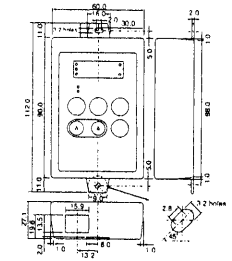
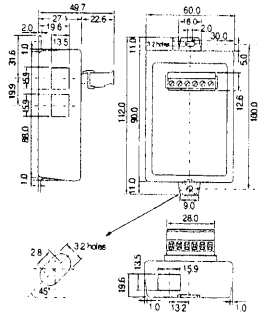
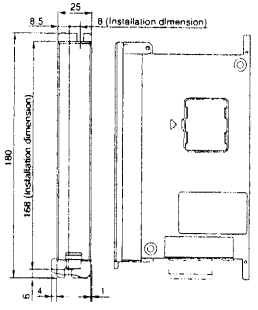
| | | Dimensions (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | | | |
| MSF-4015Z | 0.4, 0.75, 1.5 | 310 | 255 | 300 | 200 | 270 | 55 | 189 | M4 | M4 | 12 |
| MSF-4037Z | 2.2, 4.0 | 310 | 255 | 300 | 200 | 270 | 55 | 209 | M4 | M4 | 20 |
| MSF-4075Z | 5.5, 7.5 | 310 | 315 | 350 | 200 | 320 | 55 | 249 | M5 | M5 | 30 |
| MSF-4150Z | 11, 15 | 330 | 350 | 400 | 200 | 370 | 65 | 289 | M5 | M5 | 40 |

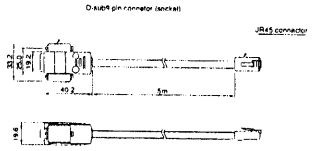
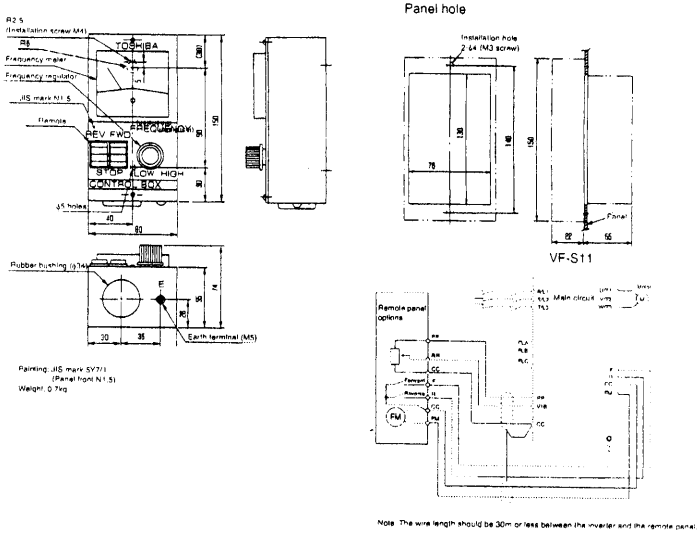
| | |
|---|---|
| DIN rail kit | DIN003Z<br>  <br>DIN005Z<br>  |

| Model | Inverter type | Approx. weight (kg) |
|---|---|---|
| DIN003Z | VFS11S-2002PL~2007PL<br>VFS11-2002PM~2007PM | 0.2 |
| DIN005Z | VFS11S-2015PL, VFS11-2015PM, 2022PM<br>VFS11-4004PL~4015PL, VFS11-6007P, 6015P | 0.3 |





| Devices | External dimensions and connections |
|---|---|
| Parameter writer | Parameter writer type: PWU001Z<br>Cable type (1m): CAB0011<br>(3m): CAB0013<br>(5m): CAB0015<br>  |
| Extension panel | Extension panel type: RKP001Z<br>Cable type (1m): CAB0011<br>(3m): CAB0013<br>(5m): CAB0015<br>  |
| RS485 communication converter unit | • 2-port type: RS4001Z<br>  <br>• 8-port type: RS4002Z<br>  <br>Cable type (1m): CAB0011, (3m): CAB0013, (5m): CAB0015 |

| Devices | External dimensions and connections |
|---|---|
| RS232C communication converter cable | RS232C cable type: RS20035   |
| Remote panel CBVR-7B1 | Panel hole   |

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12.2.5



# 11. Table of parameters and data

## 11.1 User parameters

| Title | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|
| FC | Operation frequency of operation panel | Hz | 0.1/0.01 | LL-UL | 0.0 | | 3.2 |

## 11.2 Basic parameters

- Four navigation functions

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| AUH | - | History function | - | - | Displays parameters in groups of five in the reverse order to that in which their settings were changed. * (Possible to edit) | - | | 4.1.4 |
| AU1 | 0000 | Automatic acceleration/ deceleration | - | - | 0: Disabled (manual)<br>1: Automatic<br>2: Automatic (only at acceleration) | 0 | | 5.1.1 |
| AU2 | 0001 | Torque boost setting macro function | - | - | 0: Disabled<br>1: Automatic torque boost + auto-tuning<br>2: Vector control + auto-tuning<br>3: Energy saving + auto-tuning | 0 | | 5.2 |
| AU4 | 0040 | Parameter setting macro function | - | - | 0: Disabled<br>1: Coast stop<br>2: 3-wire operation<br>3: External input UP/DOWN setting<br>4: 4-20 mA current input operation | 0 | | 5.3 |

- Basic parameters

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| CMOd | 0003 | Command mode selection | - | - | 0: Terminal board<br>1: Operation panel | 1 | | 5.4<br>7.2 |
| FMOd | 0004 | Frequency setting mode selection 1 | - | - | 0: Built-in potentiometer<br>1: VIA<br>2: VIB<br>3: Operation panel<br>4: Serial communication<br>5: UP/DOWN from external contact<br>6: VIA + VIB (Override) | 0 | | 5.4<br>6.5.1<br>7.1 |

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| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| FMSL | 0005 | Meter selection | - | - | 0: Output frequency<br>1: Output current<br>2: Set frequency<br>3: DC voltage<br>4: Output voltage command value<br>5: Input power<br>6: Output power<br>7: Torque<br>8: Torque current<br>9: Motor cumulative load factor<br>10: Inverter cumulative load factor<br>11: PBR (braking reactor) cumulative load factor<br>12: Frequency setting value (after PID)<br>13: VIA Input value<br>14: VIB Input value<br>15: Fixed output 1 (Output current: 100%)<br>16: Fixed output 2 (Output current: 50%)<br>17: Fixed output 3 (Other than the output current: 100%)<br>18: Serial communication data<br>19: For adjustments (FM set value is displayed.) | 0 | | 5.5 |
| FM | 0006 | Meter adjustment | - | - | - | - | | 5.5 |
| typ | 0007 | Default setting | - | - | 0: -<br>1: 50Hz default setting<br>2: 60Hz default setting<br>3: Default setting (Initialization)<br>4: Trip record clear<br>5: Cumulative operation time clear<br>6: Initialization of type information<br>7: Save user setting parameters<br>8: Load user setting parameters<br>9: Cumulative fan operation time record clears | 0 | | 4.2.6<br>4.2.7<br>5.6 |
| Fr | 0008 | Forward/reverse run selection (Operation panel) | - | - | 0: Forward run<br>1: Reverse run<br>2: Forward run (F/R switching possible)<br>3: Reverse run (F/R switching possible) | 0 | | 5.7 |
| ACC | 0009 | Acceleration time 1 | S | 0.1/0.1 | 0.0-3200 | 10.0 | | 5.1.2 |
| dEC | 0010 | Deceleration time 1 | S | 0.1/0.1 | 0.0-3200 | 10.0 | | 5.1.2 |
| FH | 0011 | Maximum frequency | Hz | 0.1/0.01 | 30.0-500.0 | 80.0 | | 5.8 |
| UL | 0012 | Upper limit frequency | Hz | 0.1/0.01 | 0.5- FH | 50.0 (WP)<br>60.0<br>(WN, AN) | | 5.9 |
| LL | 0013 | Lower limit frequency | Hz | 0.1/0.01 | 0.0- UL | 0.0 | | 5.9 |
| uL | 0014 | Base frequency 1 | Hz | 0.1/0.01 | 25-500.0 | 50.0 (WP)<br>60.0<br>(WN, AN) | | 5.10 |
| uLu | 0409 | Base frequency voltage 1 | V | 1/0.1 | 50-330 (240V class)<br>50-660 (500/600V class) | *3 | | 5.10<br>6.13.6 |

*3 : 230 (240V class), 460 (500V class), 575V (600V class)





| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| Pt | 0015 | V/F control mode selection | - | - | 0: V/F constant<br>1: Variable torque<br>2: Automatic torque boost control<br>3: Vector control<br>4: Energy-saving<br>5: Dynamic energy-saving (for fans and pumps)<br>6: PM motor control | 2 | | 5.11 |
| ub | 0016 | Torque boost value 1 | % | 0.1/0.1 | 0.0-30.0 | *1 | | 5.12 |
| tHr | 0600 | Motor electronic-thermal protection level 1 | % (A) | 1/1 | 10-100 | 100 | | 5.13<br>6.19.1 |
| OLn | 0017 | Electronic-thermal protection characteristic selection *2 | - | - | Setting / Overload protection / OL stall<br>0 Standard motor: ○ / ×<br>1 Standard motor: ○ / ○<br>2 Standard motor: × / ×<br>3 Standard motor: × / ○<br>4 VF motor: ○ / ×<br>5 VF motor: ○ / ○<br>6 VF motor: × / ×<br>7 VF motor: × / ○ | 0 | | 5.13 |
| Sr1 | 0018 | Preset-speed operation frequency 1 | Hz | 0.1/0.01 | LL-UL | 0.0 | | 5.14 |
| Sr2 | 0019 | Preset-speed operation frequency 2 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| Sr3 | 0020 | Preset-speed operation frequency 3 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| Sr4 | 0021 | Preset-speed operation frequency 4 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| Sr5 | 0022 | Preset-speed operation frequency 5 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| Sr6 | 0023 | Preset-speed operation frequency 6 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| Sr7 | 0024 | Preset-speed operation frequency 7 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F--- | - | Extended parameters | - | - | - | - | - | 4.1.2 |
| Gr.U | - | Automatic edit function | - | - | - | - | - | 4.1.3 |

*1 : Default values vary depending on the capacity. See the table of the page K-15.

*2 : ○ : valid, × : invalid

# 11.3 Extended parameters

- Input/output parameters 1

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F100 | 0100 | Low-speed signal output frequency | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | 6.1.1 |
| F101 | 0101 | Speed reach setting frequency | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | 6.1.3 |
| F102 | 0102 | Speed reach detection band | Hz | 0.1/0.01 | 0.0-FH | 2.5 | | 6.1.2 |
| F105 | 0105 | Priority selection (Both F-CC and R-CC are ON) | - | - | 0: Reverse<br>1: Slowdown Stop | 1 | | 6.2.1 |
| F108 | 0108 | Always active function selection 1 | - | - | 0-65 (No function) | 0 | | 6.3.1 |
| F109 | 0109 | Analog/contact input function selection (VIA/VIB terminal) | - | - | 0: Analog input for communications<br>VIB : analog input<br>1: VIA : analog input<br>VIB : contact input (Sink)<br>2: VIA : analog input<br>VIB : contact input (Source)<br>3: VIA : contact input (Sink)<br>VIB : contact input (Sink)<br>4: VIA : contact input (Source)<br>VIB : contact input (Source) | 0 | | 6.2.2 |
| F110 | 0110 | Always-active function selection 2 | - | - | 0-65 (ST) | 1 | | 6.3.1 |
| F111 | 0111 | Input terminal selection 1 (F) | - | - | 0-65 (F) | 2 | | 6.3.2 |
| F112 | 0112 | Input terminal selection 2 (R) | - | - | 0-65 (R) | 3 | | |
| F113 | 0113 | Input terminal selection 3 (RES) | - | - | 0-65 (RES) | 10 | | |
| F114 | 0114 | Input terminal selection 4 (S1) | - | - | 0-65 (SS1) | 6 | | |
| F115 | 0115 | Input terminal selection 5 (S2) | - | - | 0-65 (SS2) | 7 | | |
| F116 | 0116 | Input terminal selection 6 (S3) | - | - | 0-65 (SS3) | 8 | | |
| F117 | 0117 | Input terminal selection 7 (VIB) | - | - | 5-17 (SS4) | 9 | | |
| F118 | 0118 | Input terminal selection 8 (VIA) | - | - | 5-17 (AD2) | 5 | | |
| F130 | 0130 | Output terminal selection 1A (RY-RC) | - | - | 0-255 (LOW) | 4 | | 6.3.3 |
| F131 | 0131 | Output terminal selection 2A (OUT-NO) | - | - | 0-255 (RCH) | 6 | | |
| F132 | 0132 | Output terminal selection 3 (FL) | - | - | 0-255 (FL) | 10 | | |
| F137 | 0137 | Output terminal selection 1B (RY-RC) | - | - | 0-255 (always ON) | 255 | | 6.3.4 |
| F138 | 0138 | Output terminal selection 2B (OUT-NO) | - | - | 0-255 (always ON) | 255 | | |





| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F139 | 0139 | Output terminal logic selection (RY-RC, OUT-NO) | - | - | 0: F130 and F137<br>F131 and F138<br>1: F130 or F137<br>F131 and F138<br>2: F130 and F137<br>F131 or F138<br>3: F130 or F137<br>F131 or F138 | 0 | | 6.3.4 |
| F167 | 0167 | Frequency command agreement detection range | Hz | 0.1/0.01 | 0.0-FH | 2.5 | | 6.3.5 |
| F170 | 0170 | Base frequency 2 | Hz | 0.1/0.01 | 25.0-500.0 | 50.0 (WP)<br>60.0<br>(WN, AN) | | 6.4.1 |
| F171 | 0171 | Base frequency voltage 2 | V | 1/0.1 | 50-330 (240V class)<br>50-660 (500/600V class) | *3 | | |
| F172 | 0172 | Torque boost value 2 | % | 0.1/0.1 | 0.0-30.0 | *1 | | |
| F173 | 0173 | Motor electronic-thermal protection level 2 | % (A) | 1/1 | 10-100 | 100 | | 5.13<br>6.4.1 |
| F185 | 0185 | Stall prevention level 2 | % (A) | 1/1 | 10-199,<br>200 (disabled) | 150 | | 6.4.1<br>6.19.2 |

*1 : Default values vary depending on the capacity. See the table of page K-15.

*3 : 230 (240V class), 460 (500V class), 575 (600V class)

- Frequency parameters

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F200 | 0200 | Frequency priority selection | - | - | 0: Fnod (Switchable to F201 by terminal input)<br>1: Fnod (Switchable to F201 at less than 1.0Hz of designated frequency) | 0 | | 6.5.1<br>7.1 |
| F201 | 0201 | VIA input point 1 setting | % | 1/1 | 0-100 | 0 | | 6.5.2 |
| F202 | 0202 | VIA input point 1 frequency | Hz | 0.1/0.01 | 0.0-500.0 | 0.0 | | |
| F203 | 0203 | VIA input point 2 setting | % | 1/1 | 0-100 | 100 | | |
| F204 | 0204 | VIA input point 2 frequency | Hz | 0.1/0.01 | 0.0-500.0 | 50.0 (WP)<br>60.0<br>(WN, AN) | | |
| F207 | 0207 | Frequency setting mode selection 2 | - | - | 0: Built-in potentiometer<br>1: VIA<br>2: VIB<br>3: Operation panel<br>4: Serial communication<br>5: UP/DOWN from external contact<br>6: VIA + VIB (Override) | 1 | | 6.3.5<br>6.5.1<br>7.1 |

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F210 | 0210 | VIB input point 1 setting | % | 1/1 | 0-100 | 0 | | 6.5.2 |
| F211 | 0211 | VIB input point 1 frequency | Hz | 0.1/0.01 | 0.0-500.0 | 0.0 | | |
| F212 | 0212 | VIB input point 2 setting | % | 1/1 | 0-100 | 100 | | |
| F213 | 0213 | VIB input point 2 frequency | Hz | 0.1/0.01 | 0.0-500.0 | 50.0 (WP) 60.0 (WN, AN) | | |
| F240 | 0240 | Starting frequency setting | Hz | 0.1/0.01 | 0.5-10.0 | 0.5 | | 6.6.1 |
| F241 | 0241 | Operation starting frequency | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | 6.6.2 |
| F242 | 0242 | Operation starting frequency hysteresis | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | 6.6.2 |
| F250 | 0250 | DC braking starting frequency | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | 6.7.1 |
| F251 | 0251 | DC braking current | %(A) | 1/1 | 0-100 | 50 | | |
| F252 | 0252 | DC braking time | s | 0.1/0.1 | 0.0-20.0 | 1.0 | | |
| F254 | 0254 | Motor shaft fixing control | - | - | 0: Disabled<br>1: Enabled (after DC braking) | 0 | | 6.7.2 |
| F256 | 0256 | Time limit for lower-limit frequency operation | s | 0.1/0.1 | 0: Disabled<br>0.1-600.0 | 0.0 | | 6.8 |
| F260 | 0260 | Jog run frequency | Hz | 0.1/0.01 | F240 – 20.0 | 5.0 | | 6.9 |
| F261 | 0261 | Jog run stopping pattern | - | - | 0: Slowdown stop<br>1: Coast stop<br>2: DC braking | 0 | | |
| F262 | 0262 | Panel jog run operation mode | - | - | 0: Invalid<br>1: Valid | 0 | | |
| F264 | 0264 | Input from external contacts - UP response time | s | 0.1/0.1 | 0.0-10.0 | 0.1 | | 6.5.2 |
| F265 | 0265 | Input from external contacts - UP frequency step width | Hz | 0.1/0.01 | 0.0-FH | 0.1 | | |
| F266 | 0266 | Input from external contacts - DOWN response time | s | 0.1/0.1 | 0.0-10.0 | 0.1 | | |
| F267 | 0267 | Input from external contacts - DOWN frequency step width | Hz | 0.1/0.01 | 0.0-FH | 0.1 | | |
| F268 | 0268 | Initial value of UP/DOWN frequency | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F269 | 0269 | Saving of changed value of UP/DOWN frequency | - | - | 0: Not changed<br>1: Setting of F268 changed when power is turned off | 1 | | |
| F270 | 0270 | Jump frequency 1 | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | 6.10 |
| F271 | 0271 | Jumping width 1 | Hz | 0.1/0.01 | 0.0-30.0 | 0.0 | | |
| F272 | 0272 | Jump frequency 2 | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | |





| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F273 | 0273 | Jumping width 2 | Hz | 0.1/0.01 | 0.0-30.0 | 0.0 | | 6.10 |
| F274 | 0274 | Jump frequency 3 | Hz | 0.1/0.01 | 0.0-FH | 0.0 | | |
| F275 | 0275 | Jumping width 3 | Hz | 0.1/0.01 | 0.0-30.0 | 0.0 | | |
| F287 | 0287 | Preset-speed operation frequency 8 | Hz | 0.1/0.01 | LL-UL | 0.0 | | 5.14 |
| F288 | 0288 | Preset-speed operation frequency 9 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F289 | 0289 | Preset-speed operation frequency 10 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F290 | 0290 | Preset-speed operation frequency 11 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F291 | 0291 | Preset-speed operation frequency 12 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F292 | 0292 | Preset-speed operation frequency 13 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F293 | 0293 | Preset-speed operation frequency 14 | Hz | 0.1/0.01 | LL-UL | 0.0 | | |
| F294 | 0294 | Preset-speed operation frequency 15 (Fire-speed) | Hz | 0.1/0.01 | LL-UL | 0.0 | | 5.14<br>6.11.2 |

- Operation mode parameters

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F300 | 0300 | PWM carrier frequency | kHz | 0.1/0.1 | 2.0 - 16.0 | 12.0 | | 6.12 |
| F301 | 0301 | Auto-restart control selection | - | - | 0: Disabled<br>1: At auto-restart after momentary stop<br>2: ST terminal on or off<br>3: At auto-restart or when turning ST-CC on or off<br>4: At start-up | 0 | | 6.13.1 |
| F302 | 0302 | Regenerative power ride-through control (Deceleration stop) | - | - | 0: Disabled<br>1: Automatic setting<br>2: Slowdown stop | 0 | | 6.13.2 |
| F303 | 0303 | Retry selection (number of times) | Times | 1/1 | 0: Disabled<br>1-10 | 0 | | 6.13.3 |
| F304 | 0304 | Dynamic braking selection | - | - | 0: Disabled<br>1: Enabled (Resistor overload protection enabled) | 0 | | 6.13.4 |
| F305 | 0305 | Overvoltage limit operation (Slowdown stop mode selection) | - | - | 0: Enabled<br>1: Disabled<br>2: Enabled (Quick deceleration)<br>3: Enabled (Dynamic quick deceleration) | 2 | | 6.13.5 |

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F307 | 0307 | Supply voltage correction (limitation of output voltage) | - | - | 0: Supply voltage uncorrected, output voltage limited<br>1: Supply voltage corrected, output voltage limited<br>2: Supply voltage uncorrected, output voltage unlimited<br>3: Supply voltage corrected, output voltage unlimited | 2 (WP, WN)<br>3 (AN) | | 6.13.6 |
| F308 | 0308 | Dynamic braking resistance | Ω | 0.1/0.1 | 1.0-1000 | *1 | | 6.13.4 |
| F309 | 0309 | Dynamic braking resistor capacity | kW | 0.01/0.01 | 0.01-30.00 | *1 | | 6.13.4 |
| F311 | 0311 | Reverse-run prohibition | - | - | 0: Forward/reverse run permitted<br>1: Reverse run prohibited<br>2: Forward run prohibited | 0 | | 6.13.7 |
| F312 | 0312 | Random mode | - | - | 0: Disabled<br>1: Automatic setting | 0 | | 6.12 |
| F316 | 0316 | Carrier frequency control mode selection | - | - | 0: Carrier frequency not reduced automatically<br>1: Carrier frequency reduced automatically<br>2: Carrier frequency not reduced automatically Support for 500V/600V models<br>3: Carrier frequency reduced automatically Support for 500V/600V models | 1 | | 6.12 |
| F320 | 0320 | Droop gain | % | 1/1 | 0-100 | 0 | | 6.14 |
| F323 | 0323 | Droop insensitive torque band | % | 1/1 | 0-100 | 10 | | 6.14 |
| F342 | 0342 | Braking mode selection | - | - | 0: Disabled<br>1: Enabled (forward run)<br>2: Enabled (reverse run)<br>3: Enabled (operating direction) | 0 | | 6.15 |
| F343 | 0343 | Release frequency | Hz | 0.1/0.01 | F240-20.0 | 3.0 | | |
| F344 | 0344 | Release time | s | 0.01/0.01 | 0.00-2.50 | 0.05 | | |
| F345 | 0345 | Creeping frequency | Hz | 0.1/0.01 | F240-20.0 | 3.0 | | |
| F346 | 0346 | Creeping time | s | 0.01/0.01 | 0.00-2.50 | 0.10 | | |
| F359 | 0359 | PID control waiting time | s | 1/1 | 0-2400 | 0 | | 6.16 |
| F360 | 0360 | PID control | - | - | 0: Disabled, 1: Enabled | 0 | | |
| F362 | 0362 | Proportional gain | - | 0.01/0.01 | 0.01-100.0 | 0.30 | | |
| F363 | 0363 | Integral gain | - | 0.01/0.01 | 0.01-100.0 | 0.20 | | |
| F366 | 0366 | Differential gain | - | 0.01/0.01 | 0.00-2.5 | 0.00 | | |

*1 : Default values vary depending on the capacity. See the table of K-15.





- Torque boost parameters 1

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F400 | 0400 | Auto-tuning | - | - | 0: Auto-tuning disabled<br>1: Initialization of F402 (reset to 0)<br>2: Auto-tuning enabled (after execution: 0) | 0 | | 5.11<br>6.17.1 |
| F401 | 0401 | Slip frequency gain | % | 1/1 | 0-150 | 50 | | |
| F402 | 0402 | Automatic torque boost value | % | 0.1/0.1 | 0.0-30.0 | *1 | | |
| F415 | 0415 | Motor rated current | A | 0.1/0.1 | 0.1-100.0 | *1 | | |
| F416 | 0416 | Motor no-load current | % | 1/1 | 10-90 | *1 | | |
| F417 | 0417 | Motor rated speed | min-1 | 1/1 | 100-32000 | 1410(WP)<br>1710<br>(WN, AN) | | |
| F418 | 0418 | Speed control response coefficient | - | 1/1 | 1-150 | 40 | | |
| F419 | 0419 | Speed control stability coefficient | - | 1/1 | 1-100 | 20 | | |

*1 : Default values vary depending on the capacity. See the table of page K-15.

- Input/output parameters 2

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F470 | 0470 | VIA input bias | - | - | - | - | | 6.5.4 |
| F471 | 0471 | VIA input gain | - | - | - | - | | |
| F472 | 0472 | VIB input bias | - | - | - | - | | |
| F473 | 0473 | VIB input gain | - | - | - | - | | |

- Torque boost parameters 2

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F480 | 0480 | Exciting current coefficient | % | 1/1 | 100-130 | 100 | | 5.11<br>6.17.2 |
| F485 | 0485 | Stall prevention control coefficient 1 | - | 1/1 | 10-250 | 100 | | |
| F492 | 0492 | Stall prevention control coefficient 2 | - | 1/1 | 50-150 | 100 | | |
| F494 | 0494 | Motor adjustment coefficient | - | 1/1 | 0-200 | *1 | | |
| F495 | 0495 | Maximum voltage adjustment coefficient | % | 1/1 | 90-110 | 104 | | |
| F496 | 0496 | Waveform switching adjustment coefficient | kHz | 0.1/0.01 | 0.1-14.0 | 0.2 | | |

*1 : Default values vary depending on the capacity. See the table of page K-15.

- Acceleration/deceleration time parameters

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F500 | 0500 | Acceleration time 2 | s | 0.1/0.1 | 0.0-3200 | 10.0 | | 6.18 |
| F501 | 0501 | Deceleration time 2 | s | 0.1/0.1 | 0.0-3200 | 10.0 | | |
| F502 | 0502 | Acceleration/deceleration 1 pattern | - | - | 0: Linear<br>1: S-pattern 1<br>2: S-pattern 2 | 0 | | |
| F503 | 0503 | Acceleration/deceleration 2 pattern | - | - | | 0 | | |
| F504 | 0504 | Acceleration/deceleration selection (1, 2, 3) | - | - | 1: Acceleration/deceleration 1<br>2: Acceleration/deceleration 2<br>3: Acceleration/deceleration 3 | 1 | | |
| F505 | 0505 | Acceleration/deceleration 1 and 2 switching frequency | Hz | 0.1/0.01 | 0.0-UL | 0.0 | | |
| F506 | 0506 | S-pattern lower-limit adjustment amount | % | 1/1 | 0-50 | 10 | | |
| F507 | 0507 | S-pattern upper-limit adjustment amount | % | 1/1 | 0-50 | 10 | | 6.18 |
| F510 | 0510 | Acceleration time 3 | s | 0.1/0.1 | 0.0-3200 | 10.0 | | |
| F511 | 0511 | Deceleration time 3 | s | 0.1/0.1 | 0.0-3200 | 10.0 | | |
| F512 | 0512 | Acceleration/deceleration 3 pattern | - | - | 0: Linear<br>1: S-pattern 1<br>2: S-pattern 2 | 0 | | |
| F513 | 0513 | Acceleration/deceleration 2 and 3 switching frequency | Hz | 0.1/0.01 | 0.0-UL | 0.0 | | |

- Protection parameters

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F601 | 0601 | Stall prevention level 1 | % (A) | 1/1 | 10-199,<br>200 (disabled) | 150 | | 6.19.2 |
| F602 | 0602 | Inverter trip retention selection | - | - | 0: Canceled with the power off<br>1: Still retained with the power off | 0 | | 6.19.3 |
| F603 | 0603 | Emergency stop selection | - | - | 0: Coast stop<br>1: Slowdown stop<br>2: Emergency DC braking | 0 | | 6.19.4 |
| F604 | 0604 | Emergency DC braking time | s | 0.1/0.1 | 0.0-20.0 | 1.0 | | 6.19.4 |
| F605 | 0605 | Output phase failure detection mode selection | - | - | 0: Disabled<br>1: At start-up (only one time after power is turned on)<br>2: At start-up (each time)<br>3: During operation<br>4: At start-up + during operation<br>5: Detection of cutoff on output side | 0 | | 6.19.5 |
| F607 | 0607 | Motor 150%-overload time limit | s | 1/1 | 10-2400 | 300 | | 6.19.1 |
| F608 | 0608 | Input phase failure detection mode selection | - | - | 0: Disabled, 1: Enabled | 1 | | 6.19.6 |





| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F609 | 0609 | Small current detection current hysteresis | % | 1/1 | 1-20 | 10 | | 6.19.7 |
| F610 | 0610 | Small current trip/alarm selection | - | - | 0: Alarm only<br>1: Tripping | 0 | | |
| F611 | 0611 | Small current detection current | % (A) | 1/1 | 0-100 | 0 | | |
| F612 | 0612 | Small current detection time | s | 1/1 | 0-255 | 0 | | |
| F613 | 0613 | Detection of output short-circuit during start-up | - | - | 0: Each time (standard pulse)<br>1: At start-up (only one time after power is turned on) (standard pulse)<br>2: Each time (short-time pulse)<br>3: At start-up (only one time after power is turned on) (short-time pulse) | 0 | | 6.19.8 |
| F615 | 0615 | Over-torque trip/alarm selection | - | - | 0: Alarm only<br>1: Tripping | 0 | | 6.19.9 |
| F616 | 0616 | Over-torque detection level | % | 1/1 | 0-250 | 150 | | |
| F618 | 0618 | Over-torque detection time | s | 0.1/0.1 | 0.0-10.0 | 0.5 | | |
| F619 | 0619 | Over-torque detection level hysteresis | % | 1/1 | 0-100 | 10 | | 6.19.9 |
| F621 | 0621 | Cumulative operation time alarm setting | 100 Time | 0.1/0.1 (=10 hours) | 0.0-999.9 | 610 | | 6.19.10 |
| F626 | 0626 | Over-voltage stall protection level | % | 1/1 | 100-150 | *1 | | 6.13.5 |
| F627 | 0627 | Undervoltage trip/alarm selection | - | - | 0: Alarm only (detection level below 60%)<br>1: Tripping (detection level below 60%)<br>2: Alarm only (detection level below 50%, DC reactor necessary) | 0 | | 6.19.12 |
| F633 | 0633 | Trip at VIA low level input mode | % | 1/1 | 0: Disabled, 1-100 | 0 | | 6.19.13 |
| F634 | 0634 | Annual average ambient temperature (parts replacement alarms) | - | - | 1: -10 to +10°C<br>2: 11-20°C<br>3: 21-30°C<br>4: 31-40°C<br>5: 41-50°C<br>6: 51-60°C | 3 | | 6.19.14 |

*1 : Default values vary depending on the capacity. See the table of K-15.

- Output parameters

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F669 | 0669 | Logic output/pulse train output selection (OUT-NO) | - | - | 0: Logic output<br>1: Pulse train output | 0 | | 6.20.1 |
| F676 | 0676 | Pulse train output function selection (OUT-NO) | - | - | 0: Output frequency<br>1: Output current<br>2: Set frequency<br>3: DC voltage<br>4: Output voltage command value<br>5: Input power<br>6: Output power<br>7: Torque<br>8: Torque current<br>9: Motor cumulative load factor<br>10: Inverter cumulative load factor<br>11: PBR (braking reactor) cumulative load factor<br>12: Frequency setting value (after PID)<br>13: VIA/II input value<br>14: VIB Input value<br>15: Fixed output 1 (Output current: 100%)<br>16: Fixed output 2 (Output current: 50%)<br>17: Fixed output 3 (Other than the output current: 100%) | 0 | | 6.20.1 |
| F677 | 0677 | Maximum numbers of pulse train | pps | 1/1 | 500-1600 | 800 | | 6.20.1 |
| F691 | 0691 | Inclination characteristic of analog output | - | - | 0: Negative inclination (downward slope)<br>1: Positive inclination (upward slope) | 1 | | 6.20.2 |
| F692 | 0692 | Meter bias | % | 1/1 | 0 – 100 | 0 | | 6.20.2 |

- Operation panel parameters

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F700 | 0700 | Prohibition of change of parameter settings | - | - | 0: Permitted<br>1: Prohibited | 0 | | 6.21.1 |
| F701 | 0701 | Unit selection | - | - | 0: %<br>1: A (ampere)/V (volt) | 0 | | 6.21.2 |
| F702 | 0702 | Free unit selection | Times | 0.01/0.01 | 0.00: Free unit display disabled (display of frequency)<br>0.01-200.0 | 0.00 | | 6.21.3 |
| F705 | 0705 | Inclination characteristic of free unit display | - | - | 0: Negative inclination (downward slope)<br>1: Positive inclination (upward slope) | 1 | | |
| F706 | 0706 | Free unit display bias | Hz | 0.01/0.01 | 0.00-FH | 0.00 | | |
| F707 | 0707 | Free step 1 (pressing a panel key once) | Hz | 0.01/0.01 | 0.00: Disabled<br>0.01-FH | 0.00 | | 6.21.4 |
| F708 | 0708 | Free step 2 (panel display) | - | 1/1 | 0: Disabled<br>1-255 | 0 | | |





| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F710 | 0710 | Standard monitor display selection | - | - | 0: Operation frequency (Hz/free unit)<br>1: Frequency command (Hz/free unit)<br>2: Output current (%/A)<br>3: Inverter rated current (A)<br>4: Inverter load factor (%)<br>5: Output power (%)<br>6: Frequency command after PID control (Hz/free unit)<br>7: Optional item specified from an external control unit | 0 | | 6.21.5 |
| F719 | 0719 | Canceling of operation command when standby terminal (ST) is turned off | - | - | 0: Operation command canceled (cleared)<br>1: Operation command retained | 1 | | 6.21.6 |
| F721 | 0721 | Panel stop pattern | - | - | 0: Slowdown stop<br>1: Coast stop | 0 | | 6.21.7 |
| F730 | 0730 | Prohibition of frequency setting on the operation panel (FC) | - | - | 0: Permitted<br>1: Prohibited | 0 | | 6.21.1 |
| F733 | 0733 | Panel operation prohibition (RUN/STOP keys) | - | - | 0: Permitted<br>1: Prohibited | 0 | | |
| F734 | 0734 | Prohibition of panel emergency stop operation | - | - | 0: Permitted<br>1: Prohibited | 0 | | |
| F735 | 0735 | Prohibition of panel reset operation | - | - | 0: Permitted<br>1: Prohibited | 0 | | |
| F736 | 0736 | Prohibition of change of CMOd / FMOd during operation | - | - | 0: Permitted<br>1: Prohibited | 1 | | |

- Communication parameters

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F800 | 0800 | Communication rate | - | - | 0: 1200bps<br>1: 2400bps<br>2: 4800bps<br>3: 9600bps<br>4: 19200bps | 3 | | 6.22 |
| F801 | 0801 | Parity | - | - | 0: NON (No parity)<br>1: EVEN (Even parity)<br>2: ODD (Odd parity) | 1 | | |
| F802 | 0802 | Inverter number | - | 1/1 | 0-255 | 0 | | |
| F803 | 0803 | Communication error trip time | s | 1/1 | 0: (disabled)<br>1-100 | 0 | | |
| F805 | 0805 | Communication waiting time | s | 0.01/0.01 | 0.00-2.00 | 0.00 | | |
| F806 | 0806 | Setting of master and slave for communication between inverters | - | - | 0: Slave (0 Hz command issued in case the master inverter fails)<br>1: Slave (Operation continued in case the master inverter fails)<br>2: Slave (Emergency stop tripping in case the master inverter fails)<br>3: Master (transmission of frequency commands)<br>4: Master (transmission of output frequency signals) | 0 | | |

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F811 | 0811 | Communication command point 1 setting | % | 1/1 | 0-100 | 0 | | 6.5.2 6.22.1 |
| F812 | 0812 | Communication command point 1 frequency | Hz | 0.1/0.01 | 0.0-500.0 | 0.0 | | |
| F813 | 0813 | Communication command point 2 setting | % | 1/1 | 0-100 | 100 | | |
| F814 | 0814 | Communication command point 2 frequency | Hz | 0.1/0.01 | 0.0-500.0 | 50.0 (WP) 60.0 (WN, AN) | | |
| F829 | 0829 | Selection of communication protocol | - | - | 0: Toshiba inverter protocol 1: Modbus RTU protocol | 0 | | 6.22 |
| F870 | 0870 | Block write data 1 | - | - | 0: No selection 1: Command information 1 2: Command information 2 3: Frequency command 4: Output data on the terminal board 5: Analog output for communications | 0 | | |
| F871 | 0871 | Block write data 2 | - | - | | 0 | | |
| F875 | 0875 | Block read data 1 | - | - | 0: No selection 1: Status information 2: Output frequency 3: Output current 4: Output voltage 5: Alarm information 6: PID feedback value 7: Input terminal board monitor 8: Output terminal board monitor 9: VIA terminal board monitor 10: VIB terminal board monitor | 0 | | |
| F876 | 0876 | Block read data 2 | - | - | | 0 | | |
| F877 | 0877 | Block read data 3 | - | - | | 0 | | |
| F878 | 0878 | Block read data 4 | - | - | | 0 | | |
| F879 | 0879 | Block read data 5 | - | - | | 0 | | |
| F880 | 0880 | Free notes | - | 1/1 | 0-65535 | 0 | | |
| F890 | 0890 | Parameter for option 1 | - | 1/1 | 0-65535 | 0 | | 6.23 |
| F891 | 0891 | Parameter for option 2 | - | 1/1 | 0-65535 | 0 | | |
| F892 | 0892 | Parameter for option 3 | - | 1/1 | 0-65535 | 0 | | 6.23 |
| F893 | 0893 | Parameter for option 4 | - | 1/1 | 0-65535 | 0 | | |
| F894 | 0894 | Parameter for option 5 | - | 1/1 | 0-65535 | 0 | | |

- PM motor parameters

| Title | Communication No. | Function | Unit | Minimum setting unit Panel/Communication | Adjustment range | Default setting | User setting | Reference |
|---|---|---|---|---|---|---|---|---|
| F910 | 0910 | Step-out detection current level | % (A) | 1/1 | 10-150 | 100 | | 6.24 |
| F911 | 0911 | Step-out detection time | s | 1/1 | 0.0: No detection 0.1-25.0 | 0.0 | | |
| F912 | 0912 | High-speed torque adjustment coefficient | - | 0.01/0.01 | 0.00-650.0 | 0.00 | | |





## ■ Default settings by inverter rating

| Inverter type | Torque boost value 1/2 | Dynamic braking resistance | Dynamic braking resistor capacity | Automatic torque boost value | Motor rated current | Motor no-load current | Motor adjustment coefficient | Over-voltage stall protection level |
|---|---|---|---|---|---|---|---|---|
| | ub/F172 (%) | F308 (Ω)(Note) | F309 (kW) | F402 (%) | F415 (A) | F416 (%) | F494 | F626 (%) |
| VFS11S-2002PL | 6.0 | 200.0 | 0.12 | 8.3 | 1.2 | 70 | 90 | 134 |
| VFS11S-2004PL | 6.0 | 200.0 | 0.12 | 6.2 | 2.0 | 65 | 90 | 134 |
| VFS11S-2007PL | 6.0 | 200.0 | 0.12 | 5.8 | 3.4 | 60 | 80 | 134 |
| VFS11S-2015PL | 6.0 | 75.0 | 0.12 | 4.3 | 6.2 | 55 | 70 | 134 |
| VFS11S-2022PL | 5.0 | 75.0 | 0.12 | 4.1 | 8.9 | 52 | 70 | 134 |
| VFS11-2002PM | 6.0 | 200.0 | 0.12 | 8.3 | 1.2 | 70 | 90 | 134 |
| VFS11-2004PM | 6.0 | 200.0 | 0.12 | 6.2 | 2.0 | 65 | 90 | 134 |
| VFS11-2005PM | 6.0 | 200.0 | 0.12 | 6.0 | 2.7 | 62 | 80 | 134 |
| VFS11-2007PM | 6.0 | 200.0 | 0.12 | 5.8 | 3.4 | 60 | 80 | 134 |
| VFS11-2015PM | 6.0 | 75.0 | 0.12 | 4.3 | 6.2 | 55 | 70 | 134 |
| VFS11-2022PM | 5.0 | 75.0 | 0.12 | 4.1 | 8.9 | 52 | 70 | 134 |
| VFS11-2037PM | 5.0 | 40.0 | 0.12 | 3.4 | 14.8 | 48 | 70 | 134 |
| VFS11-2055PM | 4.0 | 20.0 | 0.24 | 3.0 | 21.0 | 46 | 70 | 134 |
| VFS11-2075PM | 3.0 | 15.0 | 0.44 | 2.5 | 28.2 | 43 | 70 | 134 |
| VFS11-2110PM | 2.0 | 10.0 | 0.66 | 2.3 | 40.6 | 41 | 60 | 134 |
| VFS11-2150PM | 2.0 | 7.5 | 0.88 | 2.0 | 54.6 | 38 | 50 | 134 |
| VFS11-4004PL | 6.0 | 200.0 | 0.12 | 6.2 | 1.0 | 65 | 90 | 140 |
| VFS11-4007PL | 6.0 | 200.0 | 0.12 | 5.8 | 1.7 | 60 | 80 | 140 |
| VFS11-4015PL | 6.0 | 200.0 | 0.12 | 4.3 | 3.1 | 55 | 70 | 140 |
| VFS11-4022PL | 5.0 | 200.0 | 0.12 | 4.1 | 4.5 | 52 | 70 | 140 |
| VFS11-4037PL | 5.0 | 160.0 | 0.12 | 3.4 | 7.4 | 48 | 70 | 140 |
| VFS11-4055PL | 4.0 | 80.0 | 0.24 | 2.6 | 10.5 | 46 | 70 | 140 |
| VFS11-4075PL | 3.0 | 60.0 | 0.44 | 2.3 | 14.1 | 43 | 70 | 140 |
| VFS11-4110PL | 2.0 | 40.0 | 0.66 | 2.2 | 20.3 | 41 | 60 | 140 |
| VFS11-4150PL | 2.0 | 30.0 | 0.88 | 1.9 | 27.3 | 38 | 50 | 140 |
| VFS11-6007P | 3.0 | 285.0 | 0.06 | 3.8 | 1.1 | 61 | 80 | 134 |
| VFS11-6015P | 3.0 | 145.0 | 0.12 | 3.8 | 2.1 | 59 | 70 | 134 |
| VFS11-6022P | 3.0 | 95.0 | 0.18 | 3.2 | 3.0 | 54 | 70 | 134 |
| VFS11-6037P | 3.0 | 48.0 | 0.37 | 3.5 | 4.9 | 50 | 70 | 134 |
| VFS11-6055P | 2.0 | 29.0 | 0.61 | 2.0 | 7.3 | 55 | 70 | 134 |
| VFS11-6075P | 2.0 | 29.0 | 0.61 | 1.5 | 9.5 | 51 | 70 | 134 |
| VFS11-6110P | 2.0 | 19.0 | 0.92 | 1.9 | 14.5 | 55 | 60 | 134 |
| VFS11-6150P | 1.0 | 14.0 | 1.23 | 1.7 | 19.3 | 53 | 50 | 134 |

Note: Be sure to set F308 (Dynamic braking resistance) at the resistance of the dynamic braking resistor connected.



12.2.5

## ■ Table of input terminal functions 1

| Function No. | Code | Function | Action |
|---|---|---|---|
| 0 | - | No function is assigned | Disabled |
| 1 | ST | Standby terminal | ON: Ready for operation<br>OFF: Coast stop (gate off) |
| 2 | F | Forward run command | ON: Forward run OFF: Slowdown stop |
| 3 | R | Reverse run command | ON: Reverse run OFF: Slowdown stop |
| 4 | JOG | Jog run mode | ON: Jog run, OFF: Jog run canceled |
| 5 | AD2 | Acceleration/deceleration 2 pattern selection | ON: Acceleration/deceleration 2<br>OFF: Acceleration/deceleration 1 or 3 |
| 6 | SS1 | Preset-speed command 1 | Selection of 15-speed with SS1 to SS4 (4 bits) |
| 7 | SS2 | Preset-speed command 2 | |
| 8 | SS3 | Preset-speed command 3 | |
| 9 | SS4 | Preset-speed command 4 | |
| 10 | RES | Reset command | ON: Acceptance of reset command<br>ON → OFF: Trip reset |
| 11 | EXT | Trip stop command from external input device | ON: E Trip stop |
| 12 | CFMOD | Switching of command mode and frequency setting mode | ON: Forced switching from command mode to terminal input mode, forced switching from frequency setting mode to the mode commanded between FMOd and F207. (If F200 = 0) |
| 13 | DB | DC braking command | ON: DC braking |
| 14 | PID | PID control prohibited | ON: PID control prohibited<br>OFF: PID control permitted |
| 15 | PWENE | Permission of parameter editing | ON: Parameter editing permitted<br>OFF: Parameter editing prohibited (If F700 = 1) |
| 16 | ST+RES | Combination of standby and reset commands | ON: Simultaneous input from ST and RES |
| 17 | ST+CFMOD | Combination of standby and command/frequency setting mode switching | ON: Simultaneous input from ST and CFMOD |
| 18 | F+JOG | Combination of forward run and jog run | ON: Simultaneous input from F and JOG |
| 19 | R+JOG | Combination of reverse run and jog run | ON: Simultaneous input from R and JOG |
| 20 | F+AD2 | Combination of forward run and acceleration/deceleration 2 | ON: Simultaneous input from F and AD2 |
| 21 | R+AD2 | Combination of reverse run and acceleration/deceleration 2 | ON: Simultaneous input from R and AD2 |
| 22 | F+SS1 | Combination of forward run and preset-speed command 1 | ON: Simultaneous input from F and SS1 |
| 23 | R+SS1 | Combination of reverse run and preset-speed command 1 | ON: Simultaneous input from R and SS1 |
| 24 | F+SS2 | Combination of forward run and preset-speed command 2 | ON: Simultaneous input from F and SS2 |
| 25 | R+SS2 | Combination of reverse run and preset-speed command 2 | ON: Simultaneous input from R and SS2 |
| 26 | F+SS3 | Combination of forward run and preset-speed command 3 | ON: Simultaneous input from F and SS3 |
| 27 | R+SS3 | Combination of reverse run and preset-speed command 3 | ON: Simultaneous input from R and SS3 |
| 28 | F+SS4 | Combination of forward run and preset-speed command 4 | ON: Simultaneous input from F and SS4 |
| 29 | R+SS4 | Combination of reverse run and preset-speed command 4 | ON: Simultaneous input from R and SS4 |
| 30 | F+SS1+AD2 | Combination of forward run, preset-speed command 1 and acceleration/deceleration 2 | ON: Simultaneous input from F, SS1 and AD2 |
| 31 | R+SS1+AD2 | Combination of reverse run, preset-speed command 1 and acceleration/deceleration 2 | ON: Simultaneous input from R, SS1 and AD2 |
| 32 | F+SS2+AD2 | Combination of forward run, preset-speed command 2 and acceleration/deceleration 2 | ON: Simultaneous input from F, SS2 and AD2 |
| 33 | R+SS2+AD2 | Combination of reverse run, preset-speed command 2 and acceleration/deceleration 2 | ON: Simultaneous input from R, SS2 and AD2 |





## ■ Table of input terminal functions 2

| Function No. | Code | Function | Action |
|---|---|---|---|
| 34 | F+SS3+AD2 | Combination of forward run, preset-speed command 3 and acceleration/deceleration 2 | ON: Simultaneous input from F, SS3 and AD2 |
| 35 | R+SS3+AD2 | Combination of reverse run, preset-speed command 3 and acceleration/deceleration 2 | ON: Simultaneous input from R, SS3 and AD2 |
| 36 | F+SS4+AD2 | Combination of forward run, preset-speed command 4 and acceleration/deceleration 2 | ON: Simultaneous input from F, SS4 and AD2 |
| 37 | R+SS4+AD2 | Combination of reverse run, preset-speed command 4 and acceleration/deceleration 2 | ON: Simultaneous input from R, SS4 and AD2 |
| 38 | FCHG | Frequency command forced switching | ON: F207 (If F200 = 0)<br>OFF: FMOd |
| 39 | VF2 | No.2 Switching of V/F setting | ON: No.2 V/F setting<br>(Pt = 0, F170, F171, F172, F173)<br>OFF: No.1 V/F setting<br>(Set value of Pt, vL, vLv, vb, tHr) |
| 40 | MOT2 | No.2 motor switching<br>(VF2 + AD2 + OCS2) | ON: No.2 motor<br>(Pt = 0, F170, F171, F172, F173, F185, F500, F501, F503)<br>OFF: No.1 motor (Set value of Pt, vL, vLv, vb, tHr, ACC, dEC, F502, F601) |
| 41 | UP | Frequency UP signal input from external contacts | ON: Increase in frequency |
| 42 | DOWN | Frequency DOWN signal input from external contacts | ON: Reduction in frequency |
| 43 | CLR | Frequency UP/DOWN cancellation signal input from external contacts | OFF→ON: Resetting of UP/DOWN frequency by means of external contacts |
| 44 | CLR+RES | Combination of frequency UP/DOWN cancellation and reset by means of external contacts | ON: Simultaneous input from CLR and RES |
| 45 | EXTN | Inversion of trip stop command from external device | OFF: E Trip stop |
| 46 | OH | Thermal trip stop signal input from external device | ON: OH2 Trip stop |
| 47 | OHN | Inversion of thermal trip stop command from external device | OFF: OH2 Trip stop |
| 48 | SC/LC | Forced switching from remote to local control | Enabled when remote control is exercised<br>ON: Local control (setting of CMOd, FMOd and F207)<br>OFF: Remote control |
| 49 | HD | Operation holding (stop of 3-wire operation) | ON: F (forward run)/R: (reverse run) held, 3-wire operation<br>OFF: Slowdown stop |
| 50 | CMTP | Forced switching of command mode and terminal board command | ON: Terminal board operation<br>OFF: Setting of CMOd |
| 51 | CKWH | Display cancellation of the cumulative power amount (kWh) | ON: Monitor display cancellation of the cumulative power amount (kWh) |
| 52 | FORCE | Forced operation (factory configuration required) | ON: Forced operation mode in which operation is not stopped in the event of the occurrence of a soft fault (preset speed operation frequency 15) To use this function, the inverter needs to be so configured at the factory.<br>OFF: Normal operation |
| 53 | FIRE | Fire-speed control | ON: Fire-speed operation (preset speed operation frequency 15)<br>OFF: Normal operation |

Note. When function 1, 10-12, 15-17, 38, 41-45 or 48 is assigned to an input terminal board, the input terminal board is enabled even if the parameter command mode selection CMOd is set at 1 (panel).

## ■ Table of input terminal functions 3

| Function No. | Code | Function | Action |
|---|---|---|---|
| 54 | STN | Coast stop (gate off) | ON: Coast stop (gate off) |
| 55 | RESN | Inversion of RES | ON: Acceptance of reset command<br>OFF→ ON: Trip reset |
| 56 | F+ST | Combination of forward run and standby | ON: Simultaneous input from F and ST |
| 57 | R+ST | Combination of reverse run and standby | ON: Simultaneous input from R and ST |
| 58 | AD3 | Acceleration/deceleration 3 selection | ON: Acceleration/deceleration 3<br>OFF: Acceleration/deceleration 1 or 2 |
| 59 | F+AD3 | Combination of forward run and acceleration/deceleration 3 | ON: Simultaneous input from F and AD3 |
| 60 | R+AD3 | Combination of reverse run and acceleration/deceleration 3 | ON: Simultaneous input from R and AD3 |
| 61 | OCS2 | Forced switching of stall prevention level 2 | ON: Enabled at the value of F185<br>OFF: Enabled at the value of F601 |
| 62 | HDRY | Holding of RY-RC terminal output | ON: Once turned on, RY-RC are held on.<br>OFF: The status of RY-RC changes in real time according to conditions. |
| 63 | HDOUT | Holding of OUT-NO terminal output | ON: Once turned on, OUT-NO are held on.<br>OFF: The status of OUT-NO changes in real time according to conditions. |
| 64 | PRUN | Cancellation (clearing) of operation command from panel | 0: Operation command canceled (cleared)<br>1: Operation command retained |
| 65 | ICLR | PID control integral value clear | ON: PID control integral value always zero<br>OFF: PID control permitted |

## ■ Table of output terminal functions 1

| Function No. | Code | Function | Action |
|---|---|---|---|
| 0 | LL | Frequency lower limit | ON: The output frequency is above the LL set value.<br>OFF: The output frequency is equal to or less than the LL set value. |
| 1 | LLN | Inversion of frequency lower limit | Inversion of LL setting |
| 2 | UL | Frequency upper limit | ON: Output frequency is equal to or higher than UL value.<br>OFF: Output frequency is lower than UL value. |
| 3 | ULN | Inversion of frequency upper limit | Inversion of UL setting |
| 4 | LOW | Low-speed detection signal | ON: Output frequency is equal to or higher than F100 value.<br>OFF: Output frequency is lower than F100 value. |
| 5 | LOWN | Inversion of low-speed detection signal | Inversion of LOW setting |
| 6 | RCH | Designated frequency attainment signal (completion of acceleration/deceleration) | ON: The output frequency is equal to or less than the specified frequency ± frequency set with F102.<br>OFF: The output frequency is above the specified frequency ± frequency set with F102. |
| 7 | RCHN | Inversion of designated frequency attainment signal (inversion of completion of acceleration/deceleration) | Inversion of RCH setting |
| 8 | RCHF | Set frequency attainment signal | ON: The output frequency is equal to or less than the frequency set with F101 ± F102.<br>OFF: The output frequency is above the frequency set with F101 ± F102. |
| 9 | RCHFN | Inversion of set frequency attainment signal | Inversion of RCHF setting |
| 10 | FL | Failure signal (trip output) | ON: When inverter is tripped<br>OFF: When inverter is not tripped |
| 11 | FLN | Inversion of failure signal (inversion of trip output) | Inversion of FL setting |





## ■ Table of output terminal functions 2

| Function No. | Code | Function | Action |
|---|---|---|---|
| 12 | OT | Over-torque detection | ON: Torque current is equal to or larger than F615 set value and longer than F618 set time.<br>OFF: The torque current is equal to or less than (F615 set value - F619 set value). |
| 13 | OTN | Inversion of over-torque detection | Inversion of OT |
| 14 | RUN | Start/Stop | ON: When operation frequency is output or during (db)<br>OFF: Operation stopped |
| 15 | RUNN | Inversion of RUN/STOP | Inversion of RUN setting |
| 16 | POL | OL pre-alarm | ON: 50% or more of calculated value of overload protection level<br>OFF: Less than 50% of calculated value of overload protection level |
| 17 | POLN | Inversion of OL pre-alarm | Inversion of POL setting |
| 18 | POHR | Braking resistor overload pre-alarm | ON: 50% or more of calculated value of F308 set overload protection level<br>OFF: Less than 50% of calculated value of F308 set overload protection level |
| 19 | POHRN | Inversion of braking resistor overload pre-alarm | Inversion of RCHR setting |
| 20 | POT | Over-torque detection pre-alarm | ON: Torque current is equal to or larger than 70% of F615 set value.<br>OFF: The torque current is below (F615 set value x 70% - F619 set value) |
| 21 | POTN | Inversion of over-torque detection pre-alarm | Inversion of POT setting |
| 22 | PAL | Pre-alarm | One of the following is turned on:<br>ON POL, POHR, POT, MOFF, UC, OT, LL stop, COT, and momentary power failure slowdown stop.<br>or C. P. Or H issues an alarm<br>All the following are turned off:<br>OFF POL, POHR, POT, MOFF, UC, OT, LL stop, COT, and momentary power failure slowdown stop.<br>or C. P. Or H issues no alarm |
| 23 | PALN | Inversion of pre-alarm | Inversion of PAL setting |
| 24 | UC | Small-current detection | ON: The output current is equal to or less than F611 set value for F612 set time.<br>OFF: The output current is equal to or larger than F611 set value + 10%. |
| 25 | UCN | Inversion of small-current detection | Inversion of UC setting |
| 26 | HFL | Significant failure | ON: OCA. OCL. Ot. E. EEP1. Etn. EPH0. Err2. S. OH2. UP1. EF2. UC. EtYP. Or EPH1)<br>OFF: Failure other than the above |
| 27 | HFLN | Inversion of significant failure | Inversion of HFL setting |
| 28 | LFL | Insignificant failure | ON: (OC1-3. OP1-3. OH. OL1-2. OLr)<br>OFF: Failure other than the above |
| 29 | LFLN | Inversion of insignificant failure | Inversion of LFL setting |
| 30 | RDY1 | Ready for operation (including ST/RUN) | ON: Ready for operation (ST and RUN are also ON)<br>OFF: Others |
| 31 | RDY1N | Inversion of ready for operation (including ST/RUN) | Inversion of RDY1 setting |
| 32 | RDY2 | Ready for operation (excluding ST/RUN) | ON: Ready for operation (ST and RUN are not ON)<br>OFF: Others |
| 33 | RDY2N | Inversion of ready for operation (excluding ST/RUN) | Inversion of RDY2 |
| 34 | FCVIB | Frequency VIB selection | ON: VIB selected as frequency command<br>OFF: Terminal other than VIB selected as frequency command |

## ■ Table of output terminal functions 3

| Function No. | Code | Function | Action |
|---|---|---|---|
| 35 | FCVIBN | Inversion of frequency VIB selection | Inversion of FCVIB |
| 36 | FLR | Fault signal (put out also at the time of a retry) | ON: When inverter trips or retries<br>OFF: When inverter does not trip or retry |
| 37 | FLRN | Inversion of failure signal (put out also at the time of a retry) | Inversion of FLR |
| 38 | OUT0 | Specified data output 1 | ON: Specified data from remote control FA50: BIT0= 1<br>OFF: Specified data from remote control FA50: BIT0= 0 |
| 39 | OUT0N | Inversion of specified data output 1 | Inversion of OUT0 setting |
| 40 | OUT1 | Specified data output 2 | ON: Specified data from remote control FA50: BIT1= 1<br>OFF: Specified data from remote control FA50: BIT1= 0 |
| 41 | OUT1N | Inversion of specified data output 2 | Inversion of OUT1 setting |
| 42 | COT | Cumulative operation time alarm | ON: Cumulative operation time is equal to or longer than F621<br>OFF: Cumulative operation time is shorter than F621 |
| 43 | COTN | Inversion of cumulative operation time alarm | Inversion of COT |
| 44 | LTA | Parts replacement alarm | ON: Calculation for parts replacement time is equal to or longer than the preset time<br>ON: Calculation for parts replancement time is shorter than the preset time |
| 45 | LTAN | Inversion of replacement alarm | Inversion of LTA |
| 46 | BR | Braking sequence output | ON: Braking retention signal<br>OFF: Braking release signal |
| 47 | BRN | Inversion of braking sequence output | Inversion of BR |
| 48 | LI1 | F terminal input signal | ON: The signal input to F terminal is ON<br>OFF: The signal input to F terminal is OFF |
| 49 | LI1N | Inversion of F terminal input signal | Inversion of LI1 |
| 50 | LI2 | R terminal input signal | ON: The signal input to R terminal is ON<br>OFF: The signal input to R terminal is OFF |
| 51 | LI2N | Inversion of R terminal input signal | Inversion of LI2 |
| 52 | PIDF | Signal in accordance of frequency command | ON: Frequency commanded by Fn0d or F207 and that by VIA show the same value.<br>OFF: Frequency commanded by Fn0d or F207 and that by VIA show different values. |
| 53 | PIDFN | Inversion of signal in accordance of frequency command | Inversion of PIDF setting |
| 54 | MOFF | Undervoltage detection | ON: Undervoltage detected<br>OFF: Other than undervoltage |
| 55 | MOFFN | Inversion of undervoltage detection | Inversion of MOFF |
| 56-253 | Disabled | Invalid settings, always OFF (ignored) | Invalid settings, always OFF (ignored) |
| 254 | AOFF | Always OFF | Always OFF |
| 255 | AON | Always ON | Always ON |





## ■ Order of precedence of combined functions

XX: Impossible combination, X: Invalid, + : Valid under some conditions, O: Valid, @: Priority

| Function No. / Function | | 1 | 2 | 3 | 4 | 5/58 | 6/9 | 10 | 11 | 50 | 13 | 14 | 15 | 46 | 48 | 41/42 | 43 | 49 | 38 | 39 | 40 | 52 | 53 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Standby | | @ | @ | @ | @ | @ | O | O | O | @ | O | O | O | O | O | O | @ | O | O | O | O | X |
| 2 | Forward run command | + | | X | + | O | O | O | X | O | X | O | O | X | O | O | O | O | O | O | O | O | X |
| 3 | Reverse run command | + | @ | | + | O | O | O | X | O | X | O | O | X | O | O | O | O | O | O | O | O | X |
| 4 | Jug run command | + | + | + | | @ | ÷ | O | X | O | X | @ | O | X | O | O | O | XX | O | O | O | O | X |
| 5/58 | Acceleration/deceleration 2 or 3 selection | + | O | O | X | | O | O | X | O | X | O | O | X | O | O | O | O | O | O | X | O | O |
| 6~9 | Preset-speed run commands 1 to 4 | + | O | O | X | O | | O | X | O | X | O | O | X | O | O | O | O | O | O | O | O | X |
| 10 | Reset command | O | O | O | O | O | O | | X | O | O | O | O | X | O | O | O | O | O | O | O | O | O |
| 11 | Trip stop command from external input device | + | @ | @ | @ | @ | @ | @ | | O | @ | @ | O | X | O | @ | O | @ | O | O | O | @ | @ |
| 50 | Forced switching of command mode and | O | O | O | O | O | O | O | O | | O | O | O | O | O | O | O | O | O | O | O | O | O |
| 13 | DC braking command | + | @ | @ | @ | @ | @ | O | X | O | | @ | O | X | O | @ | O | @ | O | O | O | O | X |
| 14 | PID control prohibited | O | O | O | X | O | O | O | X | O | X | | O | X | O | O | O | O | O | O | O | O | X |
| 15 | Permission of parameter editing | O | O | O | O | O | O | O | O | O | O | O | | O | O | O | O | O | O | O | O | O | O |
| 46 | Thermal trip stop command from external | O | @ | @ | @ | @ | @ | @ | @ | O | @ | @ | O | | O | @ | O | @ | O | O | O | X | O |
| 48 | Remote/local control forced switching | O | O | O | O | O | O | O | O | O | O | O | O | O | | O | O | O | O | O | O | O | O |
| 41/42 | Frequency UP/DOWN signal input from | O | O | O | O | O | O | O | X | O | X | O | O | X | O | | O | O | O | O | O | O | X |
| 43 | Clearing of UP/DOWN frequency with external | O | O | O | O | O | O | O | O | O | O | O | O | O | O | O | | O | O | O | O | O | X |
| 49 | Operation holding (cancellation of 3-wire | + | O | O | XX | O | O | O | X | O | X | O | O | X | O | O | O | | O | O | O | O | X |
| 38 | Frequency commands forced switching | O | O | O | O | O | O | O | O | O | O | O | O | O | O | O | O | O | | O | O | O | X |
| 39 | No.2 Switching of V/F setting | O | O | O | O | O | O | O | O | O | O | O | O | O | O | O | O | O | O | | X | O | O |
| 40 | No.2 motor switching | O | O | O | O | @ | O | O | O | O | O | O | O | O | O | O | O | O | O | @ | | O | O |
| 52 | Forced operation | O | O | O | O | O | O | O | X | O | O | O | O | @ | O | O | O | O | O | O | O | | O |
| 53 | Fire-speed control | @ | @ | @ | @ | O | @ | O | X | O | @ | @ | O | O | O | @ | @ | @ | @ | O | O | O | |

* For the functions of combined terminals (combined functions), refer to the table of their respective functions.

# 12. Specifications

## 12.1 Models and their standard specifications

### ■ Standard specifications

| Item | | Specification | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Input voltage | | 3-phase 240V | | | | | | | | | |
| Applicable motor (kW) | | 0.2 | 0.4 | 0.55 | 0.75 | 1.5 | 2.2 | 4.0 | 5.5 | 7.5 | 11 | 15 |
| Rating | Type | VFS11 | | | | | | | | | | |
| | Form | 2002PM | 2004PM | 2005PM | 2007PM | 2015PM | 2022PM | 2037PM | 2055PM | 2075PM | 2110PM | 2150PM |
| | Capacity (kVA) Note 1) | 0.6 | 1.3 | 1.4 | 1.8 | 3.0 | 4.2 | 6.7 | 10 | 13 | 21 | 25 |
| | Rated output/current (A) Note 2) | 1.5 (1.5) | 3.3 (3.3) | 3.7 (3.3) | 4.8 (4.4) | 8.0 (7.9) | 11.0 (10.0) | 17.5 (16.4) | 27.5 (25.0) | 33 (33) | 54 (49) | 66 (60) |
| | Output voltage Note 3) | 3-phase 200V to 240V | | | | | | | | | | |
| | Overload current rating | 150%-60 seconds, 200%-0.5 second | | | | | | | | | | |
| Power supply | Voltage-frequency | 3-phase 200V to 240V - 50/60Hz | | | | | | | | | | |
| | Allowable fluctuation | Voltage + 10%, -15% Note 4), frequency ±5% | | | | | | | | | | |
| Protective method | | IP20 Enclosed type (JEM1030) | | | | | | | | | | |
| Cooling method | | Self-cooling | | | | Forced air-cooled | | | | | | |
| Color | | Munsel 5Y-8/0.5 | | | | | | | | | | |
| Built-in filter | | Basic filter | | | | | | | | | | |

| Item | | Specification | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Input voltage | | 1-phase 240V | | | | | 3-phase 500V | | | | | | | | |
| Applicable motor (kW) | | 0.2 | 0.4 | 0.75 | 1.5 | 2.2 | 0.4 | 0.75 | 1.5 | 2.2 | 4.0 | 5.5 | 7.5 | 11 | 15 |
| Rating | Type | VFS11S | | | | | VFS11 | | | | | | | | |
| | Form | 2002PL | 2004PL | 2007PL | 2015PL | 2022PL | 4004PL | 4007PL | 4015PL | 4022PL | 4037PL | 4055PL | 4075PL | 4110PL | 4150PL |
| | Capacity (kVA) Note 1) | 0.6 | 1.3 | 1.8 | 3.0 | 4.2 | 1.1 | 1.8 | 3.1 | 4.2 | 7.2 | 11 | 13 | 21 | 25 |
| | Rated output current (A) Note 2) | 1.5 (1.5) | 3.3 (3.3) | 4.8 (4.4) | 8.0 (7.9) | 11.0 (10.0) | 1.5 (1.5) | 2.3 (2.1) | 4.1 (3.7) | 5.5 (5.0) | 9.5 (8.6) | 14.3 (13.0) | 17.0 (17.0) | 27.7 (25.0) | 33 (30) |
| | Rated output voltage Note 3) | 3-phase 200V to 240V | | | | | 3-phase 380V to 500V | | | | | | | | |
| | Overload current rating | 150%-60 seconds, 200%-0.5 second | | | | | 150%-60 seconds, 200% -0.5 second | | | | | | | | |
| Power supply | Voltage-current | 1-phase 200V to 240V – 50/60Hz | | | | | 3-phase 380V to 500V - 50/60Hz | | | | | | | | |
| | Allowable fluctuation | Voltage + 10%, -15% Note 4), frequency±5% | | | | | Voltage + 10%, -15% Note 4), frequency ±5% | | | | | | | | |
| Protective method | | IP20 Enclosed type (JEM1030) | | | | | IP20 Enclosed type (JEM1030) | | | | | | | | |
| Cooling method | | Self-cooling | | | Forced air-cooled | | Forced air-cooled | | | | | | | | |
| Color | | Munsel 5Y-8/0.5 | | | | | Munsel 5Y-8/0.5 | | | | | | | | |
| Built-in filter | | EMI filter | | | | | EMI filter | | | | | | | | |

| Item | | Specification | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Input voltage | | 3-phase 600V | | | | | | | |
| Applicable motor (kW) | | 0.75 | 1.5 | 2.2 | 4.0 | 5.5 | 7.5 | 11 | 15 |
| Rating | Type | VFS11- | | | | | | | |
| | Form | 6007P | 6015P | 6022P | 6037P | 6055P | 6075P | 6110P | 6150P |
| | Capacity (kVA) Note 1) | 1.7 | 2.7 | 3.9 | 6.1 | 9 | 11 | 17 | 22 |
| | Rated output/current (A) Note 2) | 1.7 (1.5) | 2.7 (2.4) | 3.9 (3.5) | 6.1 (5.5) | 9.0 (8.1) | 11.0 (9.9) | 17.0 (15.3) | 22.0 (19.8) |
| | Output voltage Note 3) | 3-phase 525V to 600V | | | | | | | |
| | Overload current rating | 150%-60 seconds, 200%-0.5 second | | | | | | | |
| Power supply | Voltage-frequency | 3-phase 525V to 600V - 50/60Hz | | | | | | | |
| | Allowable fluctuation | Voltage + 10%, -15% Note 4), frequency ±5% | | | | | | | |
| Protective method | | IP20 Enclosed type (JEM1030) | | | | | | | |
| Cooling method | | Forced air-cooled | | | | | | | |
| Color | | Munsel 5Y-8/0.5 | | | | | | | |
| Built-in filter | | No filter | | | | | | | |





Note 1. Capacity is calculated at 220V for the 240V models, at 440V for the 500V models and at 575V for the 600V models.
Note 2. Indicates rated output current setting when the PWM carrier frequency (parameter F300) is 4kHz or less. When exceeding 4kHz, the rated output current setting is indicated in the parentheses. It needs to be further reduced for PWM carrier frequencies above 12 kHz.
The rated output current is reduced even further for 500V models with a supply voltage of 480V or more.
The default setting of the PWM carrier frequency is 12kHz.
Note 3. Maximum output voltage is the same as the input voltage.
Note 4. ±10% when the inverter is used continuously (load of 100%).
Note 5. If you are using 600V model, be sure to connect an input reactor (ACL).

### ■ Common specification

| Item | | Specification |
|---|---|---|
| Principal control functions | Control system | Sinusoidal PWM control |
| | Rated output voltage | Adjustable within the range of 50 to 600V by correcting the supply voltage (not adjustable above the input voltage) |
| | Output frequency range | 0.5 to 500.0Hz, default setting: 0.5 to 80Hz, maximum frequency: 30 to 500Hz |
| | Minimum setting steps of frequency | 0.1Hz: analog input (when the max. frequency is 100Hz), 0.01Hz: Operation panel setting and communication setting |
| | Frequency accuracy | Digital setting: within ±0.01% of the max. frequency (-10 to +60°C)<br>Analog setting: within ±0.5% of the max. frequency (25°C ±10°C) |
| | Voltage/frequency characteristics | V/f constant, variable torque, automatic torque boost, vector control, automatic energy-saving, dynamic automatic energy-saving control, PM motor control. Auto-tuning. Base frequency (25 - 500Hz) adjusting to 1 or 2, torque boost (0 - 30%) adjusting to 1 or 2, adjusting frequency at start (0.5 - 10Hz) |
| | Frequency setting signal | Potentiometer on the front panel, external frequency potentiometer (connectable to a potentiometer with a rated impedance of 1 - 10kΩ), 0 - 10Vdc (input impedance: VIA/VIB=30kΩ, 4 - 20mAdc (Input impedance: 250Ω). |
| | Terminal board base frequency | The characteristic can be set arbitrarily by two-point setting. Possible to set individually for three functions: analog input (VIA and VIB) and communication command. |
| | Frequency jump | Three frequencies can be set. Setting of the jump frequency and the range. |
| | Upper- and lower-limit frequencies | Upper-limit frequency: 0 to max. frequency, lower-limit frequency: 0 to upper-limit frequency |
| | PWM carrier frequency | Adjustable within a range of 2.0 to 16.0Hz (default: 12kHz). |
| | PID control | Setting of proportional gain, integral gain, differential gain and control wait time. Checking whether the amount of processing amount and the amount of feedback agree. |
| Operation specifications | Acceleration/deceleration time | Selectable from among acceleration/deceleration times 1, 2 and 3 (0.0 to 3200 sec.). Automatic acceleration/deceleration function. S-pattern acceleration/deceleration 1 and 2 and S-pattern adjustable. Control of forced rapid deceleration and dynamic rapid deceleration |
| | DC braking | Braking start-up frequency: 0 to maximum frequency, braking rate: 0 to 100%, braking time: 0 to 20 seconds, emergency DC braking, motor shaft fixing control |
| | Dynamic braking | Control and drive circuit is built in the inverter with the braking resistor outside (optional). |
| | Input terminal function (programmable) | Possible to select from among 66 functions, such as forward/reverse run signal input, jog run signal input, operation base signal input and reset signal input, to assign to 8 input terminals. Logic selectable between sink and source. |
| | Output terminal functions (programmable) | Possible to select from among 58 functions, such as upper/lower limit frequency signal output, low speed detection signal output, specified speed reach signal output and failure signal output, to assign to FL relay output, open collector output and RY output terminals. |
| | Forward/reverse run | The RUN and STOP keys on the operation panel are used to start and stop operation, respectively. The switching between forward run and reverse run can be done from one of the three control units: operation panel, terminal board and external control unit. |
| | Jog run | Jog mode, if selected, allows jog operation from the operation panel or the terminal board. |
| | Preset speed operation | Base frequency + 15-speed operation possible by changing the combination of 4 contacts on the terminal board. |
| | Retry operation | Capable of restarting automatically after a check of the main circuit elements in case the protective function is activated. 10 times (Max.) (selectable with a parameter) |
| | Various prohibition settings | Possible to write-protect parameters and to prohibit the change of panel frequency settings and the use of operation panel for operation, emergency stop or resetting. |
| | Regenerative power ride-through control | Possible to keep the motor running using its regenerative energy in case of a momentary power failure (default: OFF). |
| | Auto-restart operation | In the event of a momentary power failure, the inverter reads the rotational speed of the coasting motor and outputs a frequency appropriate to the rotational speed in order to restart the motor smoothly. This function can also be used when switching to commercial power. |
| | Drooping function | When two or more inverters are used to operate a single load, this function prevents load from concentrating on one inverter due to unbalance. |
| | Override function | The sum of two analog signals (VIA/VIB) can be used as a frequency command value. |
| | Failure detection signal | 1c-contact output (250Vac-0.5A-cosφ=0.4) |

<Continued overleaf>



12.2.5

<Continued>

| | Item | Specification |
|---|---|---|
| Protective function | Protective function | Stall prevention, current limitation, over-current, output short circuit, over-voltage, over-voltage limitation, undervoltage, ground fault, power supply phase failure, output phase failure, overload protection by electronic thermal function, armature over-current at start-up, load side over-current at start-up, over-torque, undercurrent, overheating, cumulative operation time, life alarm, emergency stop, braking resistor over-current/overload, various pre-alarms |
| | Electronic thermal characteristic | Switching between standard motor and constant-torque VF motor, switching between motors 1 and 2, setting of overload trip time, adjustment of stall prevention levels 1 and 2, selection of overload stall |
| | Reset function | Function of resetting by closing contact 1a or by turning off power or the operation panel. This function is also used to save and clear trip records. |
| Display function | Alarms | Stall prevention, overvoltage, overload, under-voltage, setting error, retry in process, upper/lower limits |
| | Causes of failures | Over-current, overvoltage, overheating, short-circuit in load, ground fault, overload on inverter, over-current through arm at start-up, over-current through load at start-up, CPU fault, EEPROM fault, RAM fault, ROM fault, communication error. (Selectable: Overload of braking resistor, emergency stop, under-voltage, low voltage, over-torque, motor overload, output open-phase) |
| | Monitoring function | Operation frequency, operation frequency command, forward/reverse run, output current, voltage in DC section, output voltage, torque, torque current, load factor of inverter, integral load factor of PBR, input power, output power, information on input terminals, information on output terminals, version of CPU1, version of CPU2, version of memory, PID feedback amount, frequency command (after PID), integral input power, integral output power, rated current, causes of past trips 1 through 4, parts replacement alarm, cumulative operation time |
| | Past trip monitoring function | Stores data on the past four trips: number of trips that occurred in succession, operation frequency, direction of rotation, load current, input voltage, output voltage, information on input terminals, information on output terminals, and cumulative operation time when each trip occurred. |
| | Output for frequency meter | Analog output: (1mAdc full-scale DC ammeter or 7.5Vdc full-scale DC ammeter / Rectifier-type AC voltmeter, 225% current Max. 1mAdc, 7.5Vdc full-scale), 4 to 20mA/0 to 20mA output |
| | 4-digit 7-segments LED | Frequency: inverter output frequency.<br>Alarm: stall alarm "C", overvoltage alarm "P", overload alarm "L", overheat alarm "H".<br>Status: inverter status (frequency, cause of activation of protective function, input/output voltage, output current, etc.) and parameter settings.<br>Free-unit display: arbitrary unit (e.g. rotating speed) corresponding to output frequency. |
| | Indicator | Lamps indicating the inverter status by lighting, such as RUN lamp, MON lamp, PRG lamp, % lamp, Hz lamp, frequency setting potentiometer lamp, UP/DOWN key lamp and RUN key lamp. The charge lamp indicates that the main circuit capacitors are electrically charged. |
| Environments | Use environments | Indoor, altitude: 1000m (Max.), not exposed to direct sunlight, corrosive gas, explosive gas or vibration (less than 5.9m/s$^2$) (10 to 55Hz) |
| | Ambient temperature | -10 to +60°C Note)1,2. |
| | Storage temperature | -20 to +65°C |
| | Relative humidity | 20 to 93% (free from condensation and vapor). |

Note 1. Above 40°C : Remove the protective seal from the top of VF-S11.
If the ambient temperature is above 50°C: Remove the seal from the top of the inverter and use the inverter with the rated output current reduced.

Note 2. If inverters are installed side by side (with no sufficient space left between them): Remove the seal from the top of each inverter.
When installing the inverter where the ambient temperature will rise above 40°C, remove the seal from the top of the inverter and use the inverter with the rated output current reduced.

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## 12.2 Outside dimensions and mass

### ■ Outside dimensions and mass

| Voltage class | Applicable motor (kW) | Inverter type | Dimensions (mm) W | H | D | W1 | H1 | H2 | D2 | Drawing | Approx. weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-phase 240V | 0.2 | VFS11S-2002PL | 72 | 130 | 130 | 60 | 121.5 | 15 | 8 | A | 1.0 |
| | 0.4 | VFS11S-2004PL | | | | | | | | | 1.0 |
| | 0.75 | VFS11S-2007PL | | | 140 | | | | | | 1.2 |
| | 1.5 | VFS11S-2015PL | 105 | 130 | 150 | 93 | | 13 | | B | 1.4 |
| | 2.2 | VFS11S-2022PL | 140 | 170 | 150 | 126 | 157 | 14 | | C | 2.2 |
| 3-phase 240V | 0.2 | VFS11-2002PM | 72 | 130 | 120 | 60 | 121.5 | 15 | 8 | A | 0.9 |
| | 0.4 | VFS11-2004PM | | | | | | | | | 0.9 |
| | 0.55 | VFS11-2005PM | | | | | | | | | 1.1 |
| | 0.75 | VFS11-2007PM | | | 130 | | | | | | 1.1 |
| | 1.5 | VFS11-2015PM | 105 | 130 | | 93 | | 13 | | B | 1.2 |
| | 2.2 | VFS11-2022PM | | | 150 | | | | | | 1.3 |
| | 4.0 | VFS11-2037PM | 140 | 170 | 150 | 126 | 157 | 14 | | C | 2.2 |
| | 5.5 | VFS11-2055PM | 180 | 220 | 170 | 160 | 210 | 12 | | D | 4.8 |
| | 7.5 | VFS11-2075PM | | | | | | | | | 4.9 |
| | 11 | VFS11-2110PM | 245 | 310 | 190 | 225 | 295 | 19.5 | | E | 9.3 |
| | 15 | VFS11-2150PM | | | | | | | | | 9.6 |
| 3-phase 500V | 0.4 | VFS11-4004PL | 105 | 130 | 150 | 93 | 121.5 | 13 | 8 | B | 1.4 |
| | 0.75 | VFS11-4007PL | | | | | | | | | 1.5 |
| | 1.5 | VFS11-4015PL | | | | | | | | | 1.5 |
| | 2.2 | VFS11-4022PL | 140 | 170 | 150 | 126 | 157 | 14 | | C | 2.3 |
| | 4.0 | VFS11-4037PL | | | | | | | | | 2.5 |
| | 5.5 | VFS11-4055PL | 180 | 220 | 170 | 160 | 210 | 12 | | D | 5.0 |
| | 7.5 | VFS11-4075PL | | | | | | | | | 5.1 |
| | 11 | VFS11-4110PL | 245 | 310 | 190 | 225 | 295 | 19.5 | | E | 9.6 |
| | 15 | VFS11-4150PL | | | | | | | | | 9.6 |
| 3-phase 600V | 0.75 | VFS11-6007P | 105 | 130 | 150 | 93 | 121.5 | 13 | 8 | B | 1.3 |
| | 1.5 | VFS11-6015P | | | | | | | | | 1.3 |
| | 2.2 | VFS11-6022P | 140 | 170 | 150 | 126 | 157 | 14 | | C | 2.1 |
| | 4.0 | VFS11-6037P | | | | | | | | | 2.2 |
| | 5.5 | VFS11-6055P | 180 | 220 | 170 | 160 | 210 | 12 | | D | 4.7 |
| | 7.5 | VFS11-6075P | | | | | | | | | 4.7 |
| | 11 | VFS11-6110P | 245 | 310 | 190 | 225 | 295 | 19.5 | | E | 8.8 |
| | 15 | VFS11-6150P | | | | | | | | | 8.8 |

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## ■ Outline drawing

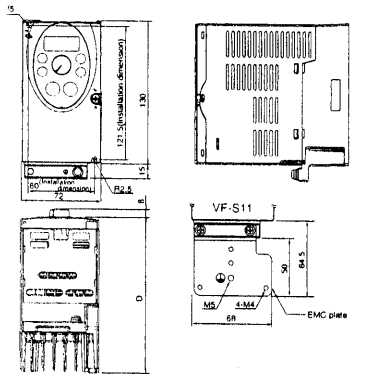



Fig.A

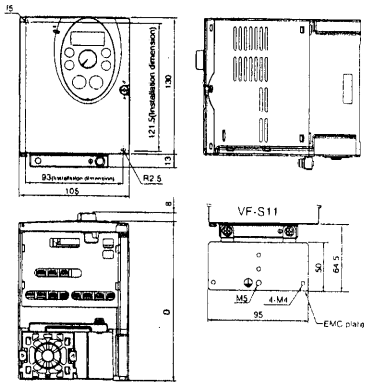



Fig.B

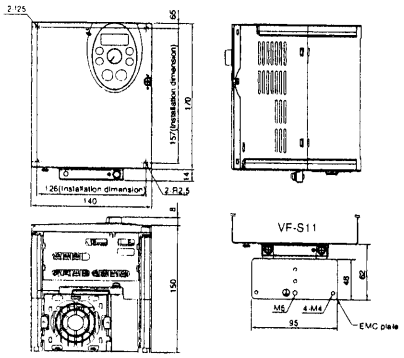



Fig.C

Note 1. To make it easier to grasp the dimensions of each inverter, dimensions common to all inverters in these figures are shown with numeric values but not with symbols.
Here are the meanings of the symbols used.

W: Width
H: Height
D: Depth
W1: Mounting dimension (horizontal)
H1: Mounting dimension (vertical)
H2: Height of EMC plate mounting area
D2: Depth of frequency setting knob

Note 2. Here are the avaiable EMC plate
Fig.A : EMP003Z (Approx. weight : 0.1kg)
Fig.B, Fig.C : EMP004Z (Approx. weight : 0.1kg)
Fig.D : EMP005Z (Approx. weight : 0.3kg)
Fig.E : EMP006Z (Approx. weight : 0.3kg)

Note 3. The models shown in Fig. A and Fig. B are fixed at two points: in the upper left and lower right corners.

Note 4. The model shown in Fig. A is not equipped with a cooling fan.





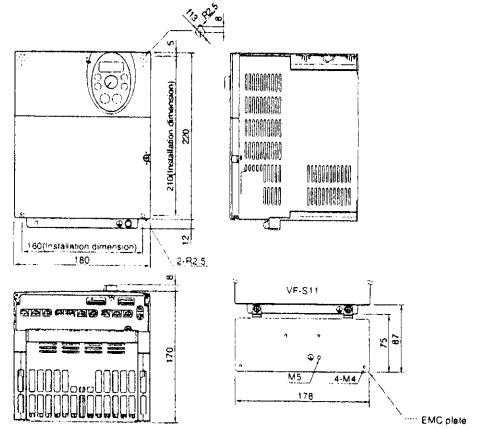



Fig.D

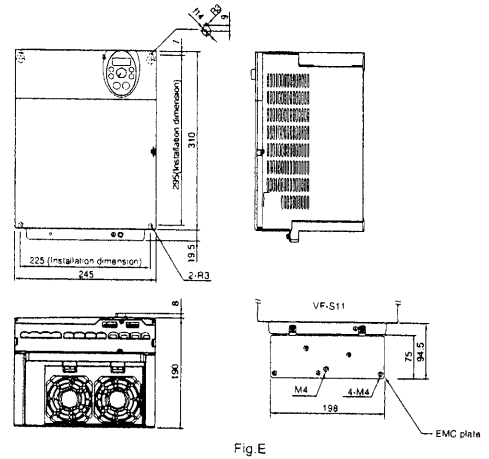



Fig.E

# 13. Before making a service call - Trip information and remedies

## 13.1 Trip causes/warnings and remedies

When a problem arises, diagnose it in accordance with the following table.
If it is found that replacement of parts is required or the problem cannot be solved by any remedy described in the table, contact your Toshiba dealer.

[Trip information]

| Error code | Failure code | Problem | Possible causes | Remedies |
|---|---|---|---|---|
| OC 1<br>OC 1P | 0001<br>0025 | Overcurrent during acceleration<br>Overcurrent flowing in element during acceleration | • The acceleration time ACC is too short.<br>• The V/F setting is improper.<br>• A restart signal is imput to the rotating motor after a momentary stop, etc.<br>• A special motor (e.g. motor with a small impedance) is used. | • Increase the acceleration time ACC.<br>• Check the V/F parameter.<br>• Use F301 (auto-restart) and F302 (ride-through control).<br>• Adjust the carrier frequency F300.<br>• Set the carrier frequency control mode selection parameter F316 to 1 or 3 (carrier frequency decreased automatically). |
| OC2<br>OC2P | 0002<br>0026 | Overcurrent during deceleration<br>Overcurrent flowing in element during decelearion | • The deceleration time dEC is too short. | • Increase the deceleration time dEC.<br>• Set the carrier frequency control mode selection parameter F316 to 1 or 3 (carrier frequency decreased automatically). |
| OC3<br>OC3P | 0003<br>0027 | Overcurrent during constant speed operation<br>Overcurrent flowing in element during operation | • The load fluctuates abruptly.<br>• The load is in an abnormal condition. | • Reduce the load fluctuation.<br>• Check the load (operated machine).<br>• Set the carrier frequency control mode selection parameter F316 to 1 or 3 (carrier frequency decreased automatically). |
| OC 1P<br>OC2P<br>OC3P | 0025<br>0026<br>0027 | Ground fault trip<br>Arm overcurrent at start-up<br>(for 11 and 15 kW models only) | • A current leaked from an output cable or the motor to ground.<br>• A main circuit elements is defective. | • Check cables, connectors, and so on for ground faults.<br>• Make a service call. |
| OCL | 0004 | Overcurrent (An overcurrent on the load side at start-up) | • The insulation of the output main circuit or motor is defective.<br>• The motor has too small impedance.<br>• A 11 or 15 kW model was started, although a current is leaked from an output cable or the motor to ground. | • Check the cables and wires for defective insulation.<br>• When using a 11 or 15 kW model, check cables, connectors, and so on for ground faults. |
| OCA | 0005 | Arm overcurrent at start-up | • A main circuit elements is defective. | • Make a service call. |
| * EPH1 | 0008 | Input phase failure | • A phase failure occured in the input line of the main circuit.<br>• The capacitor in the main circuit lacks capacitance. | • Check the main circuit input line for phase failure.<br>• Enable F608 (input phase failure detection).<br>• Check the capacitor in the main circuit for exhaustion. |
| * EPHO | 0009 | Output phase failure | • A phase failure occurred in the output line of the main circuit. | • Check the main circuit output line, motor, etc. for phase failure.<br>• Enable F605 (Output phase failure detection). |

* You can select a trip ON/OFF by parameters.

(Continued overleaf)





(Continued)

| Error code | Failure code | Problem | Possible causes | Remedies |
|---|---|---|---|---|
| OP1 | 000A | Overvoltage during acceleration | • The imput voltage fluctuates abnormally.<br>(1) The power supply has a capacity of 200kVA or more.<br>(2) A power factor improvement capacitor is opened or closed.<br>(3) A system using a thyrister is connected to the same power distribution line.<br>• A restart signal is input to the rotating motor after a momentary stop, etc. | • Insert a suitable input reactor.<br>• Use F301 (auto-restart) and F302 (ride-through control). |
| OP2 | 000B | Overvoltage during deceleration | • The deceleration time dEC is too short. (Regenerative energy is too large.)<br>• F304 (dynamic braking resistor) is off.<br>• F305 (overvoltage limit operation) is off.<br>• The input voltage fluctuates abnormally.<br>(1) The power supply has a capacity of 200kVA or more.<br>(2) A power factor improvement capacitor is opened and closed.<br>(3) A system using a thyrister is connected to the same power distribution line. | • Increase the deceleration time dEC.<br>• Install a dynamic braking resistor.<br>• Enable F304 (dynamic braking resistor).<br>• Enable F305 (overvoltage limit operation).<br>• Insert a suitable input reactor. |
| OP3 | 000C | Overvoltage during constant-speed operation | • The input voltage fluctuates abnormally.<br>(1) The power supply has a capacity of 200kVA or more.<br>(2) A power factor improvement capacitor is opened or closed.<br>(3) A system using a thyrister is connected to the same power distribution line.<br>• The motor is in a regenerative state because the load causes the motor to run at a frequency higher than the inverter output frequency. | • Insert a suitable input reactor.<br>• Install a dynamic braking resistor. |
| OL 1 | 000D | Inverter overload | • The acceleration time ACC is too short.<br>• The DC braking amout is too large.<br>• The V/F setting is improper.<br>• A restart signal is input to the rotating motor after a momentary stop, etc.<br>• The load is too large. | • Increase the acceleration time ACC.<br>• Reduce the DC braking amount F251 and the DC braking time F252.<br>• Check the V/F parameter setting.<br>• Use F301 (auto-restart) and F302 (ride-through control).<br>• Use an inverter with a larger rating. |
| OL2 | 000E | Motor overload | • The V/F setting is improper.<br>• The motor is locked up.<br>• Low-speed operation is performed continuously.<br>• An excessive load is applied to the motor during operation. | • Check the V/F parameter setting.<br>• Check the load (operated machine).<br>• Adjust OLN to the overload that the motor can withstand during operation in a low speed range. |
| OLr | 000F | Dynamic braking resistor overload trip | • The deceleration time is too short.<br>• Dynamic braking is too large. | • Increase the deceleration time dEC.<br>• Increase the capacity of dynamic braking resistor (wattage) and adjust PBR capacity parameter F308. |
| * Ot | 0020 | Over-torque trip | • Over-torque reaches to a detection level during operation. | • Enable F615 (over-torque trip selection).<br>• Check system error. |
| OH | 0010 | Overheat | • The cooling fan does not rotate.<br>• The ambient temperature is too high.<br>• The vent is blocked up.<br>• A heat generating device is installed close to the inverter.<br>• The thermistor in the unit is broken. | • Restart the operation by resetting the inverter after it has cooled down enough.<br>• The fan requires replacement if it does not rotate during operation.<br>• Secure sufficient space around the inverter.<br>• Do not place any heat generating device near the inverter.<br>• Make a service call. |

* You can select a trip ON/OFF by parameters.

(Continued overleaf)

(Continued)

| Error code | Failure code | Problem | Possible causes | Remedies |
|---|---|---|---|---|
| OH2 | 002E | External thermal trip | • An external thermal trip is input. | • Check the external thermal input. |
| E | 0011 | Emergency stop | • During automatic operation or remote operation, a stop command is entered from the operation panel or a remote input device. | • Reset the inverter. |
| EEP1 | 0012 | EEPROM fault 1 | • A data writing error occurs. | • Turn off the inverter, then turn it again. If it does not recover from the error, make a service call. |
| EEP2 | 0013 | EEPROM fault 2 | • Power supply is cut off during tYP operation and data writing is aborted. | • Turn the power off temporarily and turn it back on, and then try tYP operation again. |
| EEP3 | 0014 | EEPROM fault 3 | • A data reading error occurred. | • Turn off the inverter, then turn it again. If it does not recover from the error, make a service call. |
| Err2 | 0015 | Main unit RAM fault | • The control RAM is defective. | • Make a service call. |
| Err3 | 0016 | Main unit ROM fault | • The control ROM is defective. | • Make a service call. |
| Err4 | 0017 | CPU fault 1 | • The control CPU is defective. | • Make a service call. |
| Err5 | 0018 | Remote control error | • An error arises during remote operation. | • Check the remote control device, cables, etc. |
| Err7 | 001A | Current detector fault | • The current detector is defective. | • Make a service call. |
| Err8 | 001B | Optional circuit board format error | • An optional circuit board in a different format is installed. | • Check again to be sure that the circuit board is connected correctly, and then reset the power supply.<br>• Replace the circuit board with a correctly formatted one. |
| * UC | 001D | Low-current operation Trip | • The output current decreased to a low-current detection level during operation. | • Enable F610 (low-current detection).<br>• Check the suitable detection level for the system (F611, F612).<br>• Make a service call if the setting is correct. |
| * UP1 | 001E | Undervoltage trip (main circuit) | • The input voltage (in the main circuit) is too low. | • Check the input voltage.<br>• Enable F627 (undervoltage trip selection).<br>• To cope with a momentary stop due to undervoltage, enable F302 (ride-through control) and F301 (auto-restart). |
| EF2 | 0022 | Ground fault trip | • A ground fault occurs in the output cable or the motor. | • Check the cable and the motor for ground faults. |
| Etn1 | 0064 | Auto-tuning error | • Check the motor parameter F401 to F494.<br>• The motor with the capacity of 2 classes or less than the inverter is used.<br>• The output cable is too thin.<br>• The motor is rotating.<br>• The inverter is used for loads other than those of three-phase induction motors. | |
| EtYP | 0029 | Inverter type error | • Circuit board is changed. (Or main circuit/drive circuit board) | • Make a service call. |
| * E-18 | 0032 | Brea in analog signal cable | • The signal input via VIA is below the analog sinal detectio level set with F633. | • Check the cables for breaks. And check the setting of input signal or setting value of F633. |
| E-19 | 0033 | CPU communications error | • A communications error occurs between control CPUs. | • Make a service call. |
| E-20 | 0034 | Excessive torque boosted | • The torque boost parameter F402 is set too high.<br>• The motor has too small impedance. | • Decrease the setting of the torque boost parameter F402. |
| E-21 | 0035 | CPU fault 2 | • The control CPU is defective. | • Make a service call. |
| SOUt | 002F | Step-out (For PM motor only) | • The motor shaft is locked.<br>• One output phase is open.<br>• An impact load is applied. | • Unlock the motor shaft.<br>• Check the interconnect cables between the Inverter and the motor. |

* You can select a trip ON/OFF by parameters.





[Alarm information] Each message in the table is displayed to give a warning but does not cause the inverter to trip

| Error code | Problem | Possible causes | Remedies |
|---|---|---|---|
| OFF | ST terminal OFF | • The ST-CC circuit is opened. | • Close the ST-CC circuit. |
| nOFF | Undervoltage in main circuit | • The supply voltage between R, S and T is under voltage. | • Measure the main circuit supply voltage. If the voltage is at a normal level, the inverter requires repairing. |
| rtry | Retry in process | • The inverter is in the process of retry.<br>• A momentary stop occurred. | • The inverter is normal if it restarts after several tens of senconds. The inverter restarts automatically. Be careful of the machine because it may suddenly restart. |
| Err1 | Frequency point setting error alarm | • The frequency setting signals at points 1 and 2 are set too close to each other. | • Set the frequency setting signals at points 1 and 2 apart from each other. |
| CLr | Clear command acceptable | • This message is displayed when pressing the STOP key while an error code is displayed. | • Press the STOP key again to clear the trip. |
| EOFF | Emergency stop command acceptable | • The operation panel is used to stop the operation in automatic control or remote control mode. | • Press the STOP key for an emergency stop. To cancel the emergency stop, press any other key. |
| H !!<br>LO | Setting error alarm / An error code and data are displayed alternately twice each. | • An error is found in a setting when data is reading or writing. | • Check whether the setting is made correctly. |
| HEAd/<br>End | Display of first/last data items | • The first and last data item in the RUN data group is displayed. | • Press MODE key to exit the data group. |
| db | DC braking | • DC braking in process | • The message goes off in several tens of seconds if no problem occurs. Note) |
| dbon | Shaft fixing control | • Motor shaft fixing control is in process. | • Normal if the message disappears when a stop command is entered (or the operation command is canceled). |
| E1<br>E2<br>E3 | Flowing out of excess number of digits | • The number of digits such as frequencies is more than 4. (The upper digits have a priority.) | • Lower the fequency free unit magnification F702. |
| StOP | Momentary power failure slowdown stop prohibition function activated. | • The slowdown stop prohibition function set with F302 (momentary power failure ride-through operation) is activated. | • To restart operation, reset the inverter or input an operation signal again. |
| LStP | Auto-stop because of continuous operation at the lower-limit frequency | • The automatic stop function selected with F256 was activated. | • To deactivate the automatic stop function, increase the frequency command above the lower-limit frequency (LL) + 0.2 Hz or turn off the operation command. |
| In It | Parameters in the process of initialization | • Parameters are being initialized to default values. | • Normal if the message disappears after a while (several seconds to several tens of seconds). |
| E-17 | Operation panel key fault | • The RUN or STOP key is held down for more than 20 seconds.<br>• The RUN or STOP key is faulty. | • Check the operation panel. |
| Atn1 | Auto-tuning | • Auto-tuning in process | • Normal if it the message disappears after a few seconds. |

Note) When the ON/OFF function is selected for DC braking (DB), using the input terminal selection parameter, you can judge the inverter to be normal if "db" disappears when opening the circuit between the terminal and CC.

[Prealarm display]

| | | |
|---|---|---|
| C | Overcurrent alarm | Same as OC (overcurrent) |
| P | Overvoltage alarm | Same as OP (overvoltage) |
| L | Overload alarm | Same as OL1 and OL2 (overload) |
| H | Overheat alarm | Same as OH (overheat) |

If two or more problems arise simultaneously, one of the following alarms appears and blinks.
[P. PL . [PL
The blinking alarms [ . P. L . H are displayed in this order from left to right.

## 13.2 Restoring the inverter from a trip

Do not reset the inverter when tripped because of a failure or error before eliminating the cause. Resetting the tripped inverter before eliminating the problem causes it to trip again.

The inverter can be restored from a trip by any of the following operations:

(1) By turning off the power (Keep the inverter off until the LED turns off.)
Note) Refer to 6.15.3 (inverter trip retention selection F602) for details.
(2) By means of an external signal (Short circuit between RES and CC on terminal board → Open)
(3) By operation panel operation
(4) By inputting a trip clear signal from a remote input device
(Refer to the remote input device operating manual for details.)

To reset the inverter by operation panel operation, follow these steps.

1. Press the STOP key and make sure that [Lr is displayed.
2. Pressing the STOP key again will reset the inverter if the cause of the trip has already been eliminated.

☆ When any overload function [OL 1: inverter overload, OL 2: motor overload, OLr: braking resistor overload] is active, the inverter cannot be reset by inputting a reset signal from an external device or by operation panel operation before the virtual cooling time has passed.

Virtual cooling time ... OL 1 : about 30 seconds after the occurrence of a trip
OL 2 : about 120 seconds after a occurrence of a trip
OLr : about 20 seconds after a occurrence of a trip

☆ In case of a trip due to overheating (OH), the inverter checks the temperature within. Wait until the temperature in the inverter falls sufficiently before resetting the inverter.

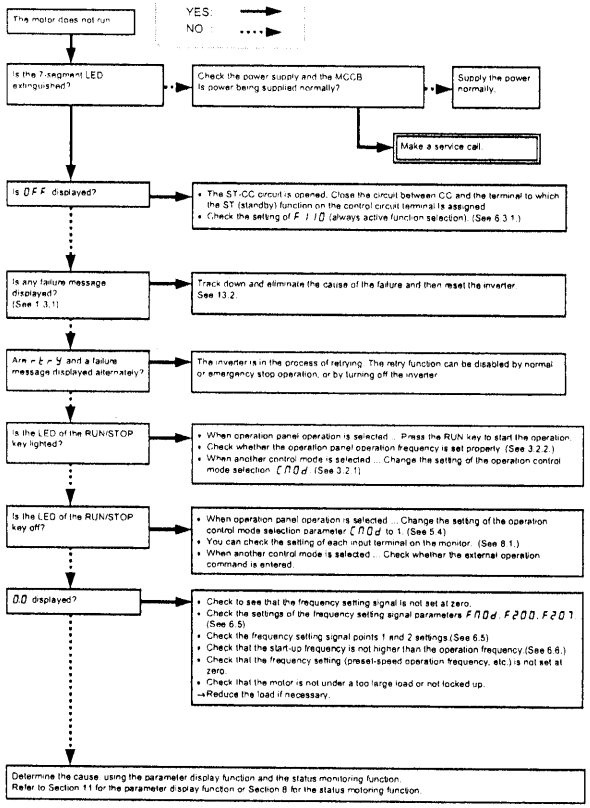
[Caution]
Turning the inverter off then turning it on again resets the inverter immediately. You can use this mode of resetting if there is a need to reset the inverter immediately. Note, however, that this operation may damage the system or the motor if it is repeated frequently.





## 13.3 If the motor does not run while no trip message is displayed ...

If the motor does not run while no trip message is displayed, follow these steps to track down the cause.



## 13.4 How to determine the causes of other problems

The following table provides a listing of other problems, their possible causes and remedies.

| Problems | Causes and remedies |
|---|---|
| The motor runs in the wrong direction. | • Invert the phases of the output terminals U, V and W.<br>• Invert the forward/reverse run-signal terminals of the external input device. (See 6.3 "Assignment of functions to control terminals".)<br>• Change the setting of the parameter Fr in the case of panel operation. |
| The motor runs but its speed does not change normally. | • The load is too heavy. Reduce the load.<br>• The soft stall function is activated. Disable the soft stall function. (See 5.14.)<br>• The maximum frequency FH and the upper limit frequency UL are set too low. Increase the maximum frequency FH and the upper limit frequency UL.<br>• The frequency setting signal is too low. Check the signal set value, circuit, cables, etc.<br>• Check the setting characteristics (point 1 and point 2 settings) of the frequency setting signal parameters. (See 6.5.)<br>• If the motor runs at a low speed, check to see that the stall prevention function is activated because the torque boost amount is too large. Adjust the torque boost amount (Ub) and the acceleration time (ACC). (See 5.12 and 5.1.) |
| The motor does not ac-celerate or decelerate smoothly. | • The acceleration time (ACC) or the deceleration time (dEC) is set too short. Increase the acceleration time (ACC) or the deceleration time (dEC). |
| A too large current flows into the motor. | • The load is too heavy. Reduce the load.<br>• If the motor runs at a low speed, check whether the torque boost amount is too large. (See 5.12.) |
| The motor runs at a higher or lower speed than the specified one. | • The motor has an improper voltage rating. Use a motor with a proper voltage rating.<br>• The motor terminal voltage is too low. Check the setting of the base frequency voltage parameter (ULu). (See 6.13.6.) Replace the cable with a cable larger in diameter.<br>• The reduction gear ratio, etc., are not set properly. Adjust the reduction gear ratio, etc.<br>• The output frequency is not set correctly. Check the output frequency range.<br>• Adjust the base frequency. (See 5.10.) |
| The motor speed fluctu-ates during operation. | • The load is too heavy or too light. Reduce the load fluctuation.<br>• The inverter or motor used does not have a rating large enough to drive the load. Use an inverter or motor with a rating large enough.<br>• Check whether the frequency setting signal changes.<br>• If the V/F control selection parameter Pt is set at 3, check the vector control setting, operation conditions, etc. (See 5.11.) |
| Parameter settings cannot be changed. | Change the setting of the parameter F700 (prohibition of change of parameter setting) to 0 (permitted) if it is set at 1 (prohibited).<br>* For reasons of safety, some parameters cannot be reprogrammed while the inverter is running. (see 4.1.5) |

How to cope with parameter setting-related problems

| | |
|---|---|
| If you forget parameters which have been reset | • You can search for all reset parameters and change their settings.<br>* Refer to 4.1.3 for details. |
| If you want to return all reset parameters to their respective default settings | • You can return all parameters which have been reset to their default settings.<br>* Refer to 4.1.6 for details. |





# 14. Inspection and maintenance

| Danger | |
|---|---|
| Mandatory | • The equipment must be inspected every day. If the equipment is not inspected and maintained, errors and malfunctions may not be discovered which could lead to accidents.<br>• Before inspection, perform the following steps.<br>(1) Shut off all input power to the inverter.<br>(2) Wait at least ten minutes and check to make sure that the charge lamp is no longer lit.<br>(3) Use a tester that can measure DC voltages (800V DC or more), and check that the voltage to the DC main circuits (across PA-PC) does not exceed 45V.<br>Performing an inspection without carrying out these steps first could lead to electric shock. |

Be sure to inspect the inverter regularly and periodically to prevent it from breaking down because of the environment of use, such as temperature, humidity, dust and vibration, or deterioration of its components with aging.

## 14.1 Regular inspection

Since electronic parts are susceptible to heat, install the inverter in a cool, well-ventilated and dust-free place. This is essential for increasing the service life.

The purpose of regular inspections is to maintain the correct environment of use and to find any sign of failure or malfunction by comparing current operation data with past operation records.

| Subject of inspection | Inspection procedure | | | Critena for judgement |
|---|---|---|---|---|
| | Inspection item | Inspection cycle | Inspection method | |
| 1. Indoor environment | 1) Dust, temperature and gas | Occasionally | 1) Visual check, check by means of a thermometer, smell check | 1) Improve the environment if it is found to be unfavorable. |
| | 2) Drop of water or other liquid | Occasionally | 2) Visual check | 2) Check for any trace of water condensation. |
| | 3) Room temperature | Occasionally | 3) Check by means of a thermometer | 3) Max. temperature: 60°C |
| 2. Units and components | 1) Vibration and noise | Occasionally | Tactile check of the cabinet | Is something unusual is found, open the door and check the transformer, reactors, contactors, relays, cooling fan, etc., inside. If necessary, stop the operation. |
| 3. Operation data (output side) | 1) Load current | Occasionally | Moving-iron type AC ammeter | To be within the rated current, voltage and temperature. No significant difference from data collected in a normal state. |
| | 2) Voltage (*) | Occasionally | Rectifier type AC voltmeter | |
| | 3) Temperature | Occasionally | Thermometer | |

*) The voltage measured may slightly vary from voltmeter to voltmeter. When measuring the voltage, always take readings from the same circuit tester or voltmeter.

## ■ Check points

1. Something unusual in the installation environment
2. Something unusual in the cooling system
3. Unusual vibration or noise
4. Overheating or discoloration
5. Unusual odor
6. Unusual motor vibration, noise or overheating
7. Adhesion or accumulation of foreign substances (conductive substances)

# 14.2 Periodical inspection

Make a periodical inspection at intervals of 3 or 6 months depending on the operating conditions.

| Danger | |
|---|---|
| Mandatory | •Before inspection, perform the following steps.<br>(1) Shut off all input power to the inverter.<br>(2) Wait at least ten minutes and check to make sure that the charge lamp is no longer lit.<br>(3) Use a tester that can measure DC voltages (800V DC or more), and check that the voltage to the DC main circuits (across PA-PC) does not exceed 45V.<br>Performing an inspection without carrying out these steps first could lead to electric shock. |
| Prohibited | • Never replace any part.<br>This could be a cause of electric shock, fire and bodily injury. To replace parts, call the local sales agency. |

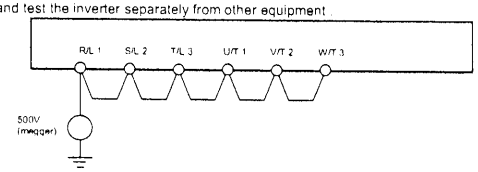
## ■ Check items

1. Check to see if all screwed terminals are tightened firmly. If any screw is found loose, tighten it again with a screwdriver.
2. Check to see if all caulked terminals are fixed properly. Check them visually to see that there is no trace of overheating around any of them.
3. Check all cables and wires for damage. Check them visually.
4. Remove dirt and dust. With a vacuum cleaner, remove dirt and dust. When cleaning, clean the vents and the printed circuit boards. Always keep them clean to prevent an accident due to dirt or dust.
5. If no power is supplied to the inverter for a long time, the performance of its large-capacity electrolytic capacitor declines.
   When leaving the inverter unused for a long time, supply it with electricity once every two years, for 5 hours or more each, to recover the performance of the large-capacity electrolytic capacitor. And also check the function of the inverter. It is advisable not to supply the commercial power directly to the inverter but to gradually increase the power supply voltage with a transformer, etc.
6. If the need arises, conduct an insulation test on the main circuit terminal board only, using a 500V insulation tester. Never conduct an insulation test on control terminals other than terminals on the printed circuit board or on control terminals. When testing the motor for insulation performance, separate it from the inverter in advance by disconnecting the cables from the inverter output terminals U, V and W. When conducting an insulation test on peripheral circuits other than the motor circuit, disconnect all cables from the inverter so that no voltage is applied to the inverter during the test.





(Note) Before an insulation test, always disconnect all cables from the main circuit terminal board and test the inverter separately from other equipment.




7. Never test the inverter for pressure. A pressure test may cause damage to its components.
8. Voltage and temperature check

   Recommended voltmeter : Input side ... Moving-iron type voltmeter (⧑)

   Output side ... Rectifier type voltmeter (⧑)

   It will be very helpful for detecting a defect if you always measure and record the ambient temperature before, during and after the operation.

## ■ Replacement of expendable parts

The inverter is composed of a large number of electronic parts including semiconductor devices. The following parts deteriorate with the passage of time because of their composition or physical properties. The use of aged or deteriorated parts leads to degradation in the performance or a breakdown of the inverter. To avoid such trouble, the inverter should be checked periodically.

Note) Generally, the life of a part depends on the ambient temperature and the conditions of use. The life spans listed below are applicable to parts when used under normal environmental conditions.

1) Cooling fan
   The fan, which cools down heat-generating parts, has a service life of about 30,000 hours (about 2 or 3 years of continuous operation). The fan also needs to be replaced if it makes a noise or vibrates abnormally.
2) Smoothing capacitor
   The smoothing aluminum electrolytic capacitor in the main circuit DC section degrades in performance because of ripple currents, etc. It becomes necessary to replace the capacitor after it is used for about 5 years under normal conditions. Since the smoothing capacitor is mounted on a printed circuit board, it needs to be replaced together with the circuit board.
   <Criteria for appearance check>
   - Absence of liquid leak
   - Safety valve in the depressed position
   - Measurement of electrostatic capacitance and insulation resistance

Note: The operation time is helpful for roughly determining the time of replacement. For the replacement of parts, contact your nearest Toshiba inverter distributor. For safety's sake, never replace any part on your own. (Parts replacement alarms can be known by monitor and alarm output, if it is set. Refer to section 6.19.14)

## ■ Standard replacement cycles of principal parts

As guides, the table below lists part replacement cycles that were estimated based on the assumption that the inverter would be used in a normal use environment under normal conditions (ambient temperature, ventilation conditions, and energizing time). The replacement cycle of each part does not mean its service life but the number of years over which its failure rate does not increase significantly.

| Part name | Standard replacement cycle | Replacement mode and others |
|---|---|---|
| Cooling fan | 2 to 3 years | Replacement with a new one |
| Main circuit smoothing aluminum electrolytic capacitor | 5 years | Replacement with a new one |
| Relay and contactor | - | Whether to replace or not depends on the check results |
| Aluminum electrolytic capacitor mounted on a printed circuit board | 5 years | Replace with a new circuit board |

Note) The life of a part greatly varies depending on the environment of use.

## 14.3 Making a call for servicing

For the Toshiba service network, refer to the back cover of this instruction manual. If defective conditions are encountered, please contact the Toshiba service section in charge via your Toshiba dealer.
When making a call for servicing, please inform us of the contents of the rating label on the right panel of the inverter, the presence or absence of optional devices, etc., in addition to the details of the failure.

## 14.4 Keeping the inverter in storage

Take the following precautions when keeping the inverter in storage temporarily or for a long period of time.

1. Store the inverter in a well-ventilated place away from heat, damp, dust and metal powder.
2. If the printed circuit board in your inverter has an anti-static cover (black cover), do not leave it detached from the circuit board during storage. The cover must be detached before turning on the inverter.
3. If no power is supplied to the inverter for a long time, the performance of its large-capacity electrolytic capacitor declines.
   When leaving the inverter unused for a long time, supply it with electricity once every two years, for 5 hours or more each, to recover the performance of the large-capacity electrolytic capacitor. And also check the function of the inverter. It is advisable not to supply the commercial power directly to the inverter but to gradually increase the power supply voltage with a transformer, etc.







# 15. Warranty

Any part of the inverter that proves defective will be repaired and adjusted free of charge under the following conditions:

1. This warranty applies only to the inverter main unit.
2. Any part of the inverter which fails or is damaged under normal use within twelve months from the date of delivery shall be repaired free of charge.
3. For the following kinds of failure or damage, the repair cost shall be borne by the customer even within the warranty period.
   - Failure or damage caused by improper or incorrect use or handling, or unauthorized repair or modification of the inverter
   - Failure or damage caused by the inverter falling or an accident during transportation after the purchase
   - Failure or damage caused by fire, salty water or wind, corrosive gas, earthquake, storm or flood, lightning, abnormal voltage supply, or other natural disasters
   - Failure or damage caused by the use of the inverter for any purpose or application other than the intended one
4. All expenses incurred by Toshiba for on-site services shall be charged to the customer, unless a service contract is signed beforehand between the customer and Toshiba, in which case the service contract has priority over this warranty.

# 16. Disposal of the inverter

| ⚠ Warning | |
|---|---|
| Mandatory | • If you throw away the inverter, have it done by a specialist in industry waste disposal(*). If you throw away the inverter by yourself, this can result in explosion of capacitor or produce noxious gases, resulting in injury.<br>(*) Persons who specialize in the processing of waste and known as "industrial waste product collectors and transporters" or "industrial waste disposal persons. "If the collection, transport and disposal of industrial waste is done by someone who is not licensed for that job, it is a punishable violation of the law. (Laws in regard to cleaning and processing of waste materials) |

For safety's sake, do not dispose of the disused inverter yourself but ask an industrial waste disposal agent.
Disposing of the inverter improperly could cause its capacitor to explode and emit toxic gas, causing injury to persons.



**TOSHIBA**
**TOSHIBA CORPORATION**
**INDUSTRIAL AND POWER SYSTEMS & SERVICES COMPANY**

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● For further information, please contact your nearest Toshiba Liaison Representative or International Operations - Producer Goods.
● The data given in this manual are subject to change without notice.
2004-12

## BOILER AND FEW CONTROL PANEL

### LOCAL PUMPS CONTROL

1 2 3

HS1

LEAD P1 - LAG P2 - STOP P3
LEAD P2 - LAG P3 - STOP P1
LEAD P3 - LAG P1 - STOP P2

LOCAL - OFF - AUTO

HS2

LOCAL : MANUAL CONTROL VIA PUMP SELECTOR SW

AUTO : CONTROL VIA PROCESS PLC
- STOP ON LOW FEW WATER.
- ALTERNATE PUMP OPERATION

B1 DISABLE

BOILER & CIRCULATOR

B2 DISABLE

NORMAL - ECONOMY

HS3

~~NORMAL : NO INTERVENTION FROM PLC~~

~~ECONOMY: HWS DEPEND ON OUTSIDE AIR TEMPERATURE~~
~~-5C OR LESS : 80C~~
~~10C OR MORE : 60C~~
~~P3 AND P4 RUN WHEN OUTDOR TEMPERATURE DROP BELOW 18C~~

FUNCTION DISABLED DUE TO SALSNES FILTER HEATER REQUIREMENT

PART LIST
=========

1 ENCLOSURES EUROBEX 30"x20"x8" 5412 ESBU302008

1 LAMICOID

2 SELECTOR SWITCH 3 POSITION 800T-J2B

1 SELECTOR SWITCH 2 POSITION 800T-H2T

PART LIST
=========

3 TERMINAL RAIL 14" 1492-DR6

1 WIRING DUCT DUCT 2" TOTAL=112" T2X3HDG
1 WIRING DUCT COVER 2" TOTAL=112"

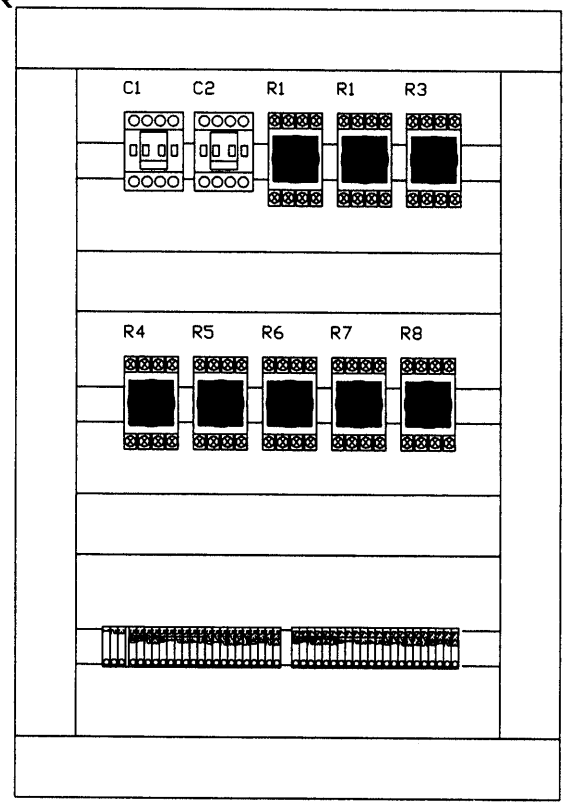
TERMINAL BLOCKS (TOTAL 45)
- n GRAY
- 1 WHITE
- 1 GREEN

2 STOP BLOCK 1492-EA35
1 END COVER
2 TERMINAL SEPARATOR

2 SELECTOR SWITCH 3 POSITION

1 SELECTOR SWITCH 2 POSITION

JEVCAR




| REV. | DESCRIPTION | DATE | BY |
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| A | PRE-APPROVAL | 06/20/05 | CF |
| B | | | |
| C | | | |

| REV. | DESCRIPTION | DATE | BY |
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| D | | | |
| E | | | |
| F | | | |

INSTRUMENTATION

PLC SHEMATIC DIAGRAM

SPEC - BUILD.
JEVCAR TECHNOLOGIES
CSA / ULC

CITY OF IQALUIT

WASTEWATER TREATMENT PLANT
PHASE 1

FILTERED EFLUENT AND BOILER CONTROL PANEL

| | | | |
|---|---|---|---|
| DRAWN BY: CHECKED BY: | SCALE: NTS | DATE JUNE 20TH, 2005 | SHEET NO 4/8 |
| CADD SYSTEM AutoCAD | DWG NO. CADD SYSTEM | REV. 0 | CONTRACT 0 |

REP: REPERTOIRE:

18.3.1

## SEQUENCE OF OPERATION UNDER PROCESS PLC OPERATION (Few Pump)

1- pump/boiller control panel controls FEW pump operation on a run time base.

2- on pressur drop, lead pump start, on decond stage drop, second pump start

3- every 15 h of opperation of the lead pump, lowest time pump become lead pump.

3- in case of low pressur for more then 5 min. alarm on panel view.

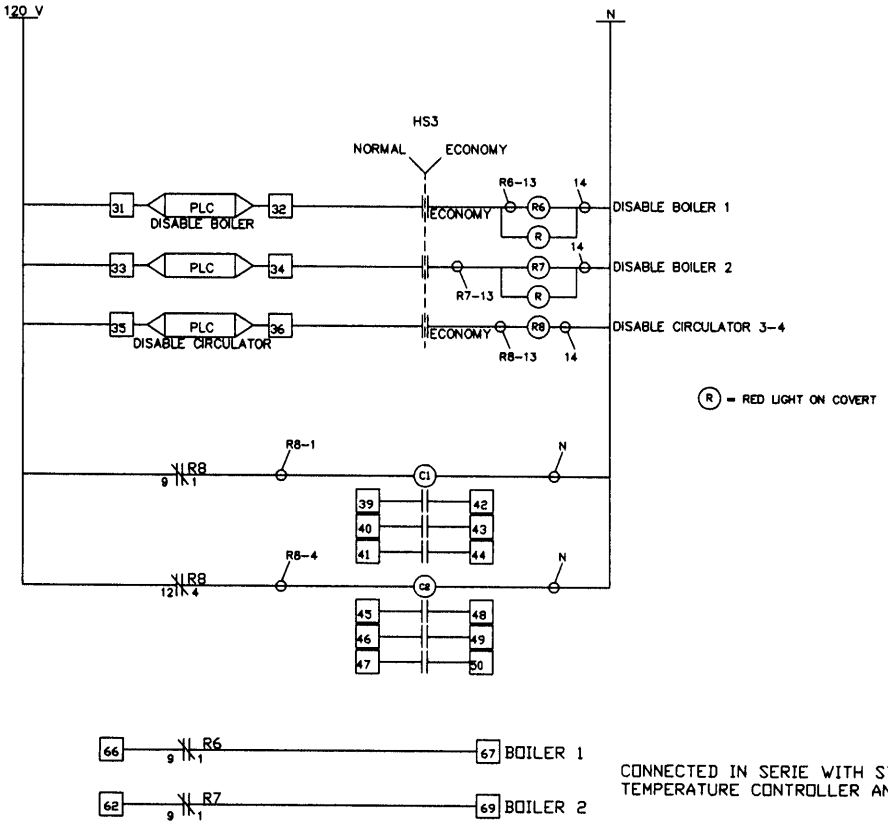
4- on high FEW level(90%), outside blue lamp active.

5- on low FEW water(30%), outside red lamp active.

6- on low low FEW water(20%), alarm on all MMI.

7- on very low FEW water(10%), alarm on all MMI, Few pump stop.

8 all status, level and alarm avialable on a specific page on all panel view.




CONNECTED IN SERIE WITH STANDARD BOILER TEMPERATURE CONTROLLER AND HIGH LIMIT

## SYMBOL SCHEDULE

- CONTROL PANEL TERMINALS
- SEE LOOP DRAWING REFERENCE FOR FIELD WIRING LAYOUT
- FIELD WIRING
- PANEL WIRING

## DESCRIPTION

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | PRE-APPROVAL | 06/20/05 | CF |
| B | | | |
| C | | | |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | | | |
| E | | | |
| F | | | |

**INSTRUMENTATION**

PLC SHEMATIC DIAGRAM

SPEC - MUSLIM.

JEYCAR TECHNOLOGIES

CSA / ULC

**CITY OF IQALUIT**

WASTEWATER TREATMENT PLANT
PHASE 1

# FILTERED EFLUENT AND BOILER CONTROL PANEL

| | | | |
|---|---|---|---|
| DRAWN BY: / CHECKED BY: | SCALE: NTS | DATE: JUNE 20TH, 2006 | SHEET NO: 4/8 |
| CADD SYSTEM: AutoCAD | DWG NO.: CADD SYSTEM | REV.: 0 | CONTRACT: 0 |

REP: REPERTOIRE:

1993

1 - LEAD P1 - LAG P2 - STOP P3
2 - LEAD P2 - LAG P3 - STOP P1
3 - LEAD P3 - LAG P1 - STOP P2

PS1 - PRESSURE SWITCH 1 FIRST STAGE
PS2 - PRESSURE SWITCH 2 SECOND STAGE

## SEQUENCE OF OPERATION (boiler)

1- Boilers are 50% capacity each and oprate in a lead / lag configuration

2- Boiler / pump control panel controls boilers and pump operation

3- Existing pump P-03 and new pump P-04 shall be activated when the outdoor air temperature drops below 16C(via PLC)

4- Integral boiler controls are provided by the boiler manufacturer and connected to the boiler / pump control panel

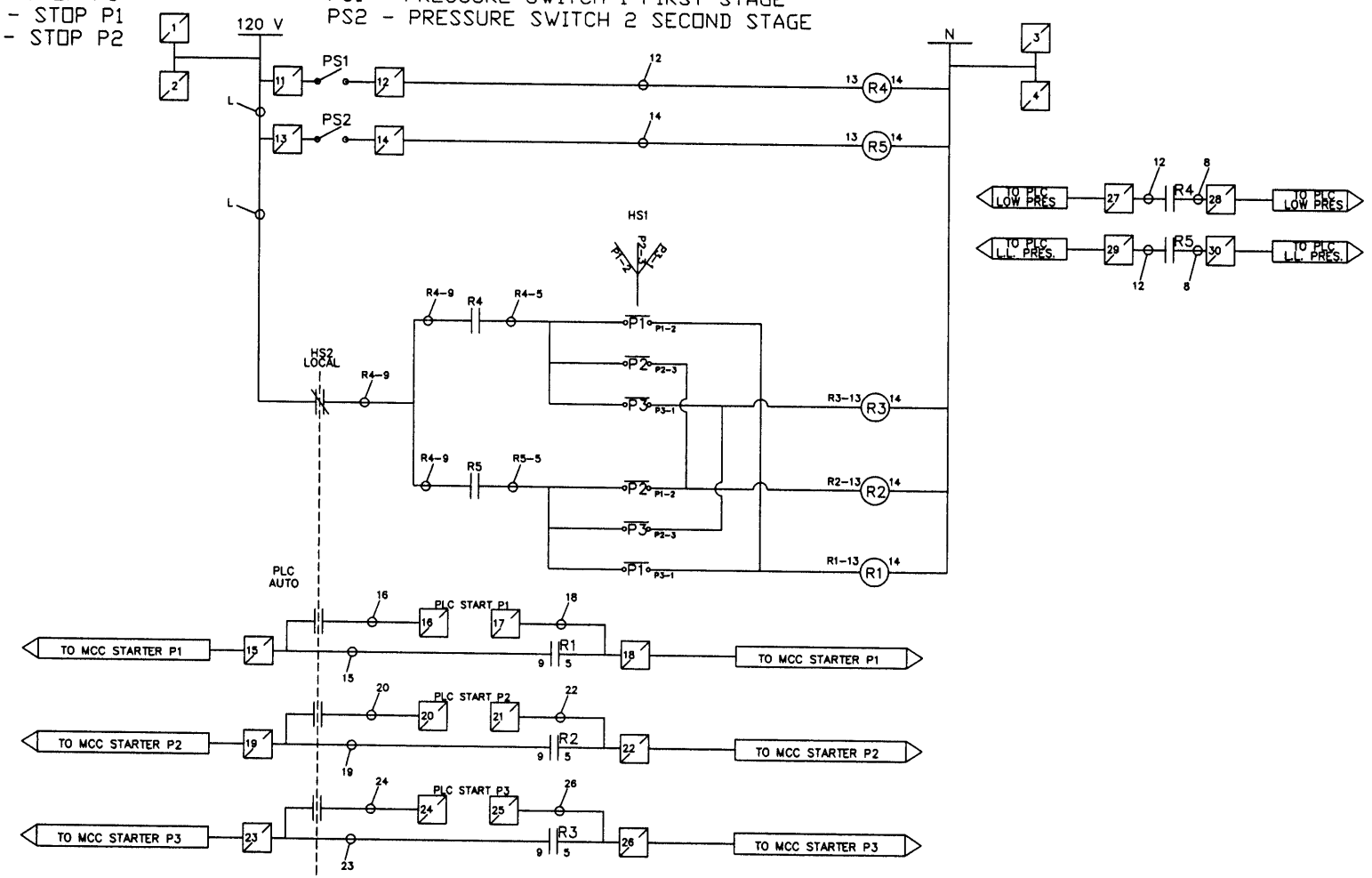
5- control panel enable/disable switch to permit return to mechanical operation.

6- Supply temperature to building heating loop is reset as follows:

| O/A temps. | HWS |
|---|---|
| -5C or less | 88C |
| 10C | 60C |

7. when hws set to 60c p.l.c to cycle boiller a lower temperature.

8 all status, temperature and alarm avialable on a specific page on all panel view.

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| A | REVISION-A | DATE | NOM |
| B | REVISION-B | DATE | NOM |
| C | REVISION-C | DATE | NOM |

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| D | REVISION-D | DATE | NOM |
| E | REVISION-E | DATE | NOM |
| F | REVISION-F | DATE | NOM |

INSTRUMENTATION

PLC SHEMATIC DIAGRAM
I/O CARD 0000

JEVCAR TECHNOLOGIES

CITY OF IQALUIT

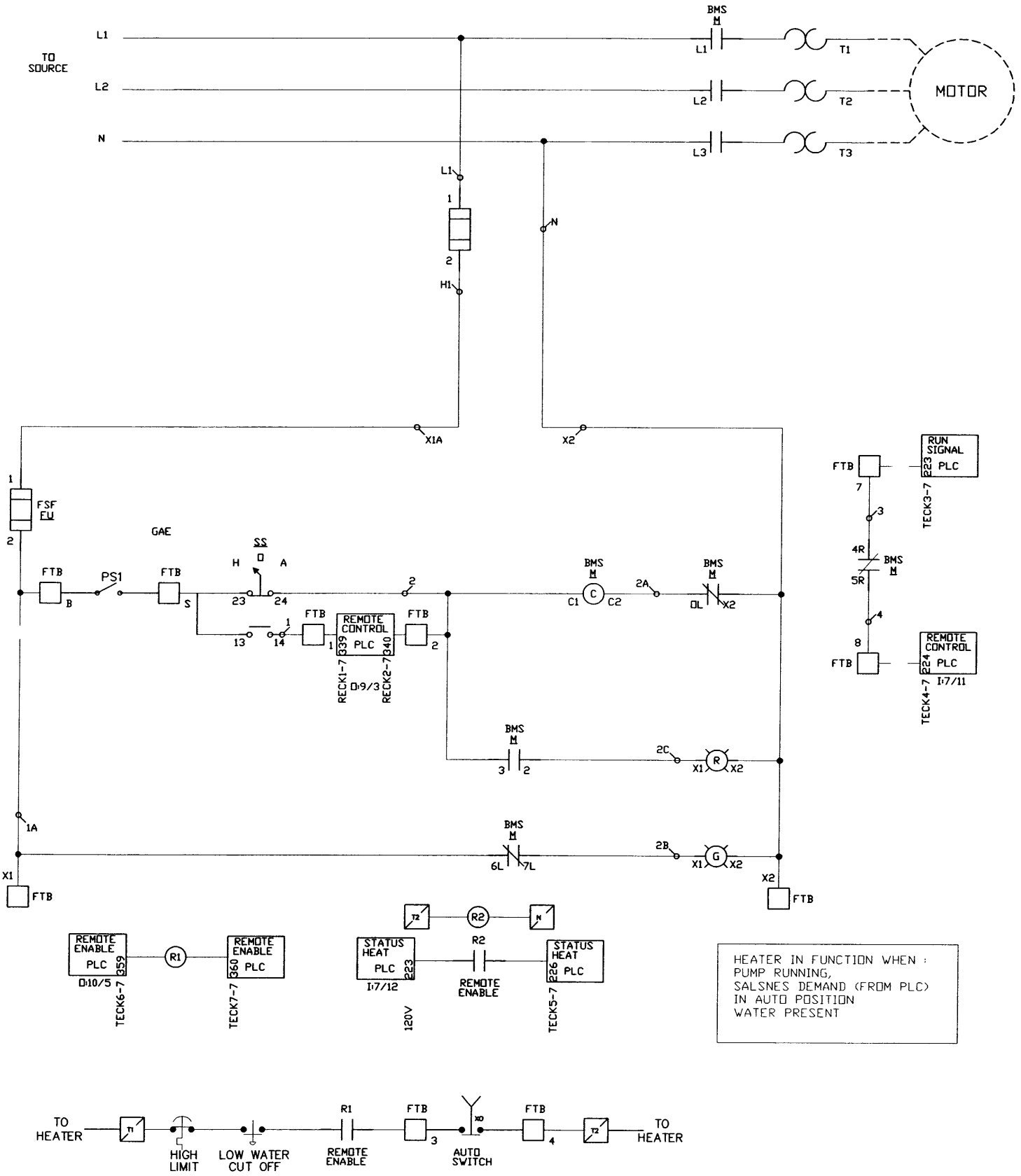
WASTEWATER TREATMENT PLANT
PHASE 1

# FILTERED EFLUENT AND BOILER CONTROL PANEL

| DRAWN BY: / CHECKED BY: | SCALE: NTS | DATE: JUNE 15TH, 2005 | SHEET NO: 0 |
|---|---|---|---|
| CADD SYSTEM: AutoCAD | DWG NO.: CADD SYSTEM | REV.: 0 | CONTRACT: 0 |

REP: REPERTOIRE:

# VERY HOT FEW WATER BOOSTER PUMP P20

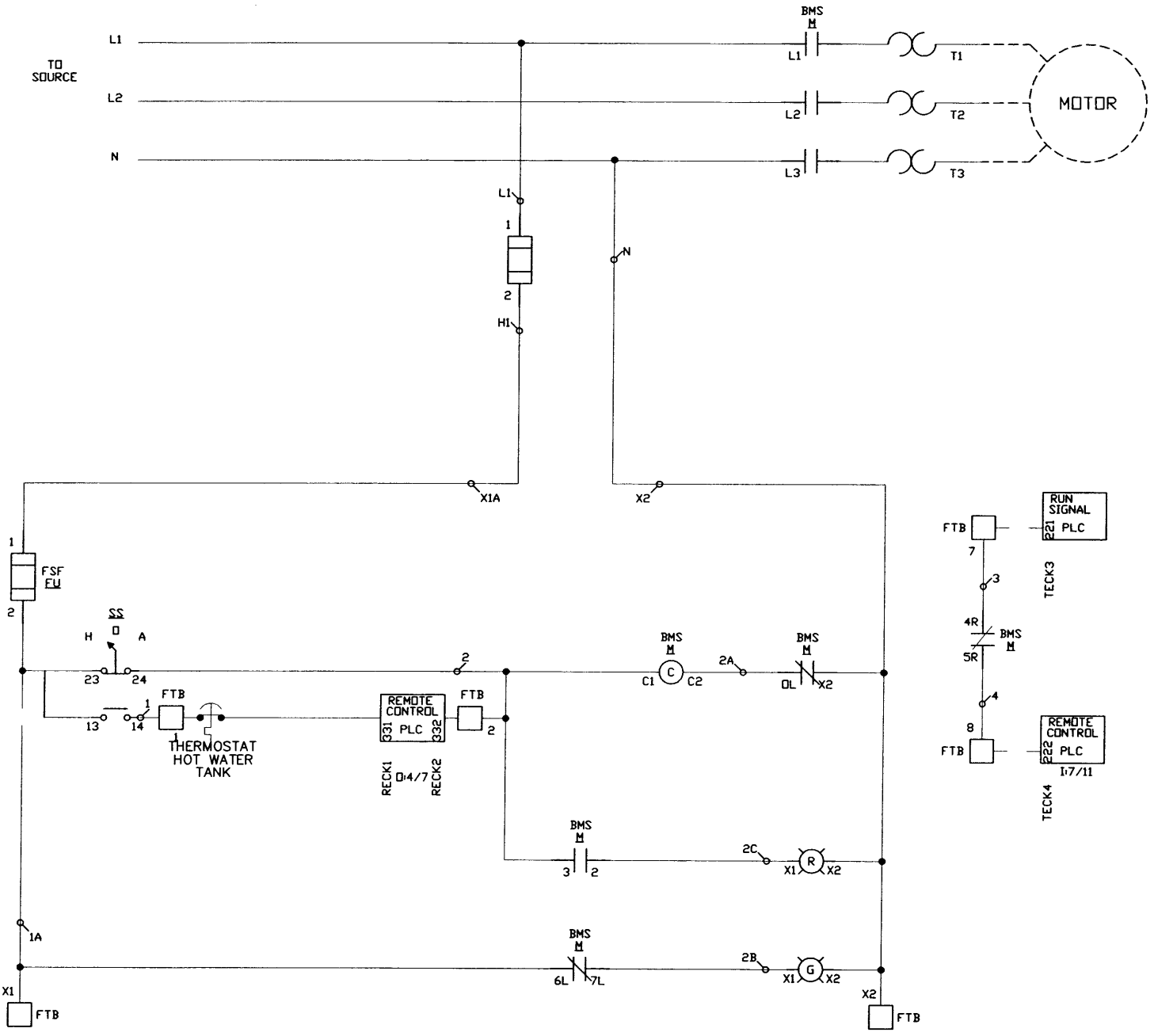



. UNITS INCLUDED

HL .RINK WIRE MARKERS

| | | | | |
|---|---|---|---|---|
| JOB NAME : | IQUALUIT SEWAGE WATER STATION | VERY HOT FEW WATER BOOSTER PUMP P20 | EQUIPMENT DESIGNATION : | FEW P20 |
| JOB LOCATION : | MIRABEL, QC. | | EQUIPMENT TYPE : | MODIFIED MOTOR CONTROL CENTER |
| DRAWN BY : | CAD | | DRAWING TYPE : | ELEMENTARY DIAGRAM |
| ENGR : | CARL,F | | DRAWING # : | |
| DATE : | APRIL 15, 2006 | | REVISION : | AS BUILT MARCH 2006 |
| DRAWING STATUS : | RECORD | | PAGE : | - - - |

# FEW HOT WATER RECIRC PUMP P21




ECIRC PUMP IN FUNCTION WHEN:

IN AUTO POSITION
(DEPEND ON TEMPERATURE

IN HAND, ALWAYS

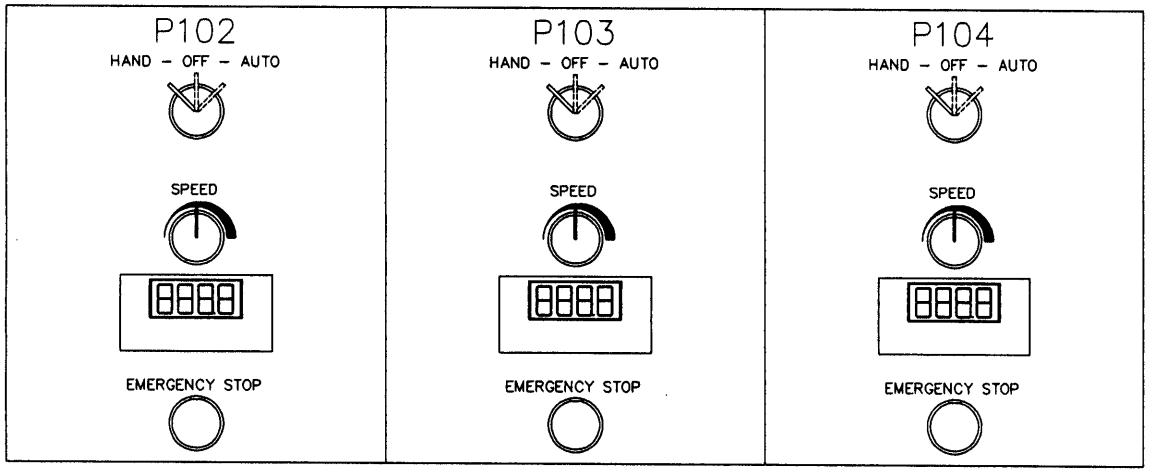
L UNITS INCLUDED
HL RINK WIRE MARKERS

| | |
|---|---|
| JOB NAME : | IQUALUIT SEWAGE WATER STATION |
| JOB LOCATION : | MIRABEL, QC. |
| DRAWN BY : | CAD |
| ENGR : | CARL,F |
| DATE : | APRIL 15, 2006 |
| DRAWING STATUS : | RECORD |

FEW HOT WATER
RECIRC PUMP P21

| | |
|---|---|
| EQUIPMENT DESIGNATION : | FEW P21 |
| EQUIPMENT TYPE : | MODIFIED MOTOR CONTROL CENTER |
| DRAWING TYPE : | ELEMENTARY DIAGRAM |
| DRAWING # : | |
| REVISION : | AS BUILT MARCH 2006 |
| PAGE : | - - - |

# RAW WASTE WATER PUMP CONTROL PANEL




PART LIST
=========

1 EUROBEX ENCLOSURE 5412 ESBU 30" X 12" X 8"

3 PANEL LAMICOID "P10x"

3 SELECTOR SWITCH 800T-J2B
3 PLATE "HAND-OFF-AUTO" 800T-X501

3 POTENTIOMETER 800H-UR35
3 SPEED PLATE W/GRADUATED MARKINGS 800T-X608
3 DIGITAL INDICATOR UM331 (YOKOGAWA)

3 TWO POSITION PUSH-PULL 800T-FX6A1
3 PUSH TO STOP PLATE 800T-618Y

| REV. | DESCRIPTION | DATE | BY |
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| A | REVISION-A | DATE | NOM |
| B | REVISION-B | DATE | NOM |
| C | REVISION-C | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
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| D | REVISION-D | DATE | NOM |
| E | REVISION-E | DATE | NOM |
| F | REVISION-F | DATE | NOM |

INSTRUMENTATION

PLC SHEMATIC DIAGRAM
I/O CARD 0000

SPEC - KUDLIK.
DEVCAR TECHNOLOGIES
CSA / ULC

CITY OF IQALUIT

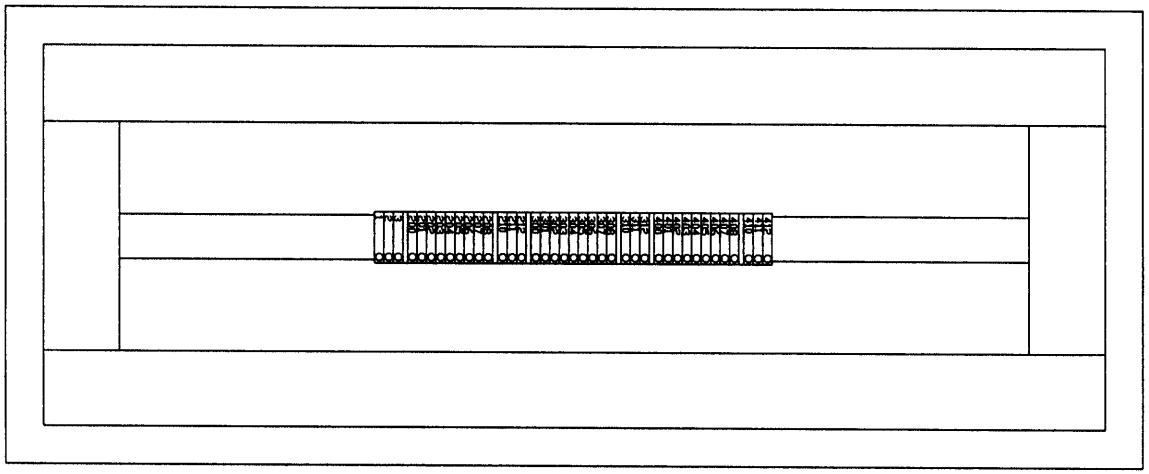
WASTEWATER TREATMENT PLANT
PHASE 1

RAW WASTE WATER PUMP CONTROL PANEL (OUTSIDE)

| DRAWN BY: | SCALE: | DATE | SHEET NO |
|---|---|---|---|
| CHECKED BY: | NTS | JUNE 13TH, 2006 | 0 |
| CADD SYSTEM: AutoCAD | DWG NO. CADD SYSTEM | REV. 0 | CONTRACT 0 |

REP: REPERTOIRE:

13.4.1



PART LIST
=========

2 WIRING DUCT PANDUIT 2"x28" T2X3HDG
2 WIRING DUCT COVER 2"x28"

2 WIRING DUCT PANDUIT 2"x6" T2X3HDG
2 WIRING DUCT COVER 2"x6"

1 RAIL 28" 1492-DR6

TERMINAL BLOCKS (TOTAL 39)
- 24 RED 1492-W4-R
- 6 BLACK 1492-W4-BL
- 4 GREEN 1492-W4-G
- 3 YELLOW 1492-W4-Y
- 1 GRAY 1492-W4
- 1 WHITE 1492-W4-W

2 STOP BLOCK 1492-EA35
1 END COVER
6 TERMINAL SEPARATORS

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | REVISION-A | DATE | NOM |
| B | REVISION-B | DATE | NOM |
| C | REVISION-C | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
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| D | REVISION-D | DATE | NOM |
| E | REVISION-E | DATE | NOM |
| F | REVISION-F | DATE | NOM |

INSTRUMENTATION

PLC SHEMATIC DIAGRAM
I/O CARD 0000

CITY OF IQALUIT

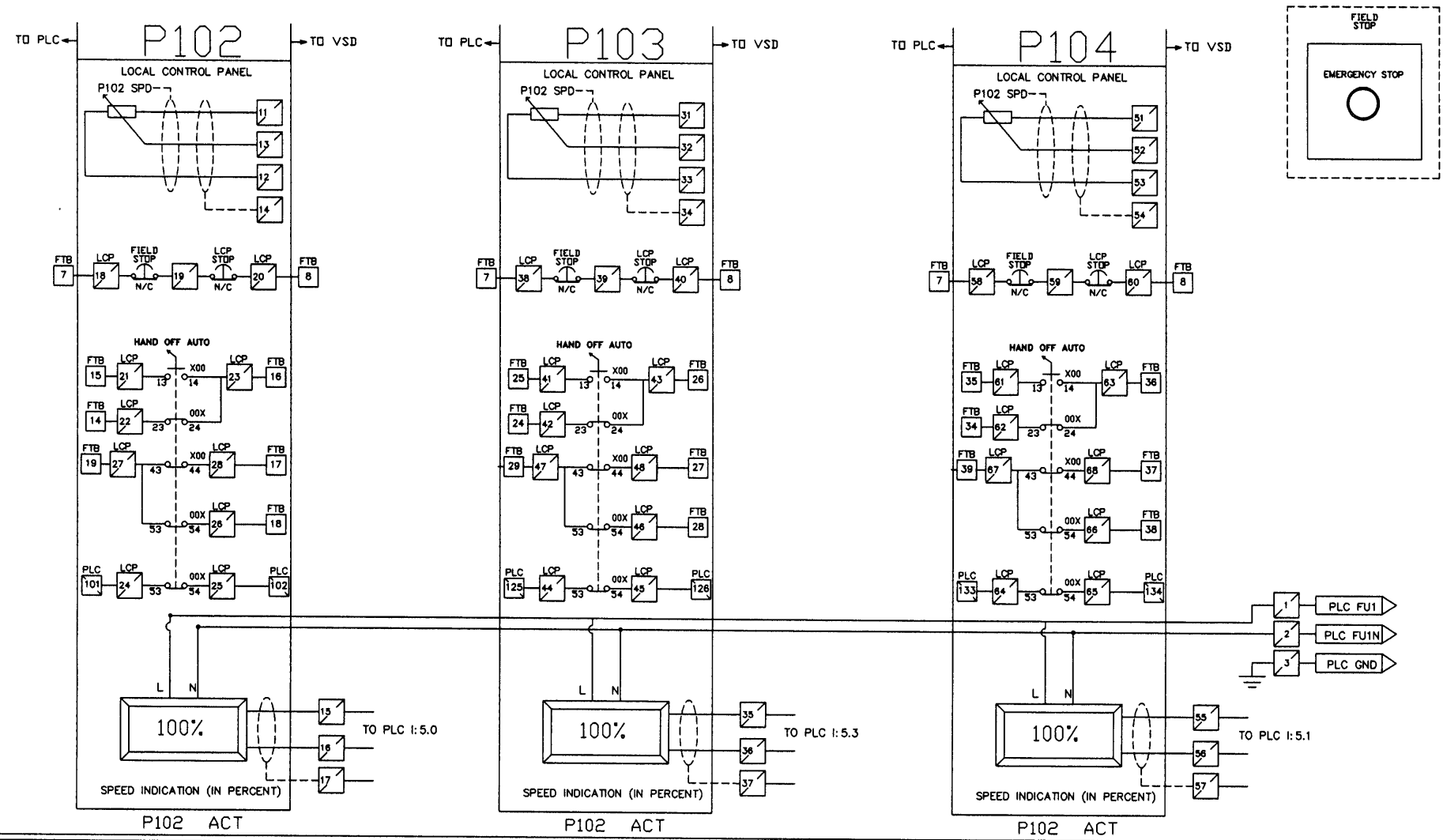
WASTEWATER TREATMENT PLANT
PHASE 1

RAW WASTE WATER PUMP CONTROL PANEL (INSIDE)

| | | | |
|---|---|---|---|
| DRAWN BY: / CHECKED BY: | SCALE: NTS | DATE JUNE 15TH, 2006 | SHEET NO 0 |
| CADD SYSTEM AutoCAD | DWG NO. CADD SYSTEM | REV. 0 | CONTRACT 0 |

REP: REPERTOIRE:

13.4.8




| REV. | DESCRIPTION | DATE | BY |
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| B | REVISION-B | DATE | NOM |
| C | REVISION-C | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | REVISION-D | DATE | NOM |
| E | REVISION-E | DATE | NOM |
| F | REVISION-F | DATE | NOM |

INSTRUMENTATION

PLC SHEMATIC DIAGRAM
I/O CARD 0000

JEYCAR TECHNOLOGIES
CSA / ULC

CITY OF IQALUIT

WASTEWATER TREATMENT PLANT
PHASE 1

# RAW WASTE WATER PUMP CONTROL PANEL

| | | | |
|---|---|---|---|
| DRAWN BY: CHECKED BY: | SCALE: NTS | DATE JUNE 15TH, 2006 | SHEET NO 0 |
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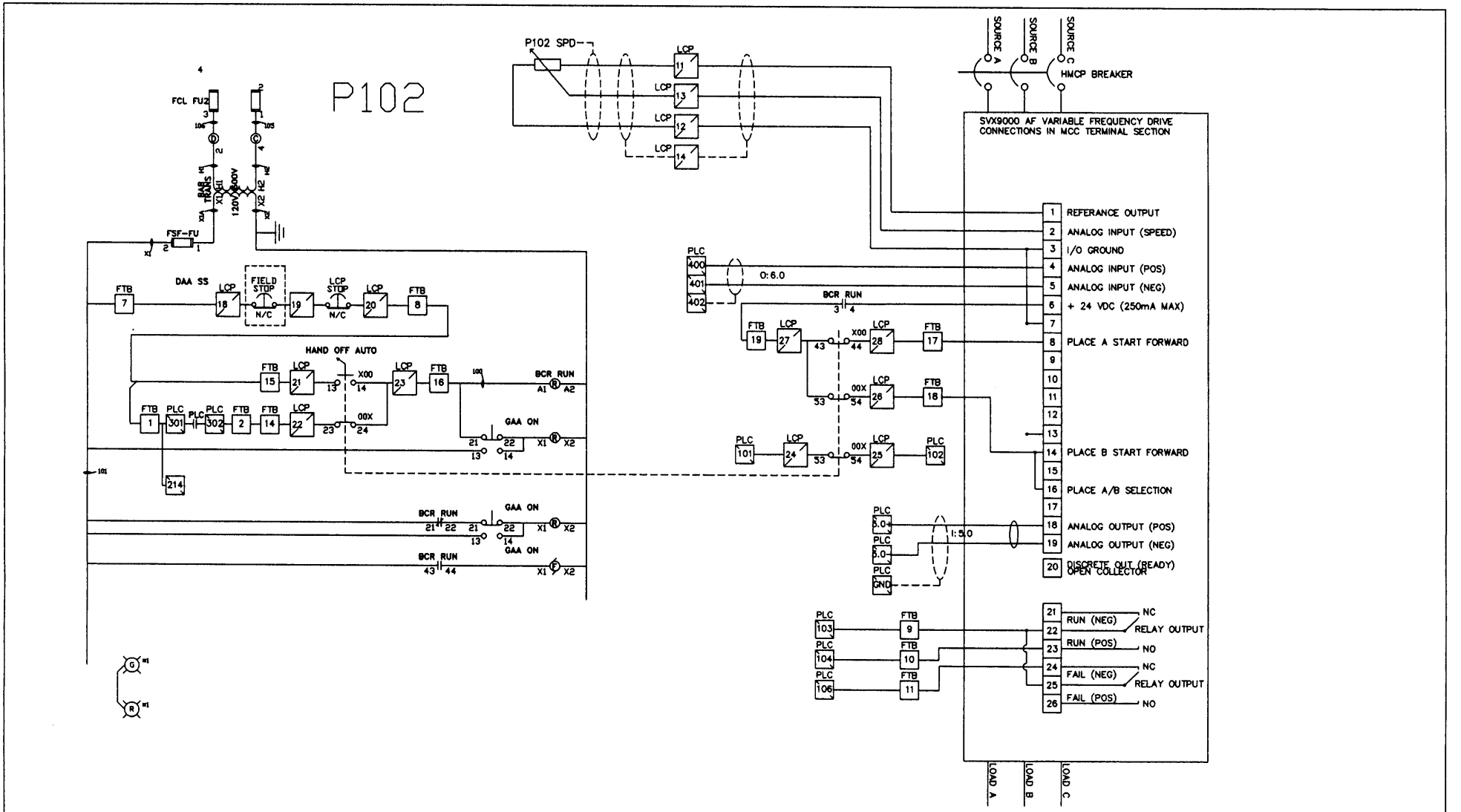
13.4.3

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| REV. | DESCRIPTION | DATE | BY |
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| D | REVISION-D | DATE | NOM |
| E | REVISION-E | DATE | NOM |
| F | REVISION-F | DATE | NOM |

**INSTRUMENTATION**

PLC SHEMATIC DIAGRAM
I/O CARD 0000

JEVCAR TECHNOLOGIES

**CITY OF IQALUIT**

WASTEWATER TREATMENT PLANT
PHASE 1

# RAW WASTE WATER PUMP CONTROL PANEL (P102)

| | | | |
|---|---|---|---|
| DRAWN BY: | SCALE: NTS | DATE: JUNE 13TH, 2008 | SHEET NO: 0 |
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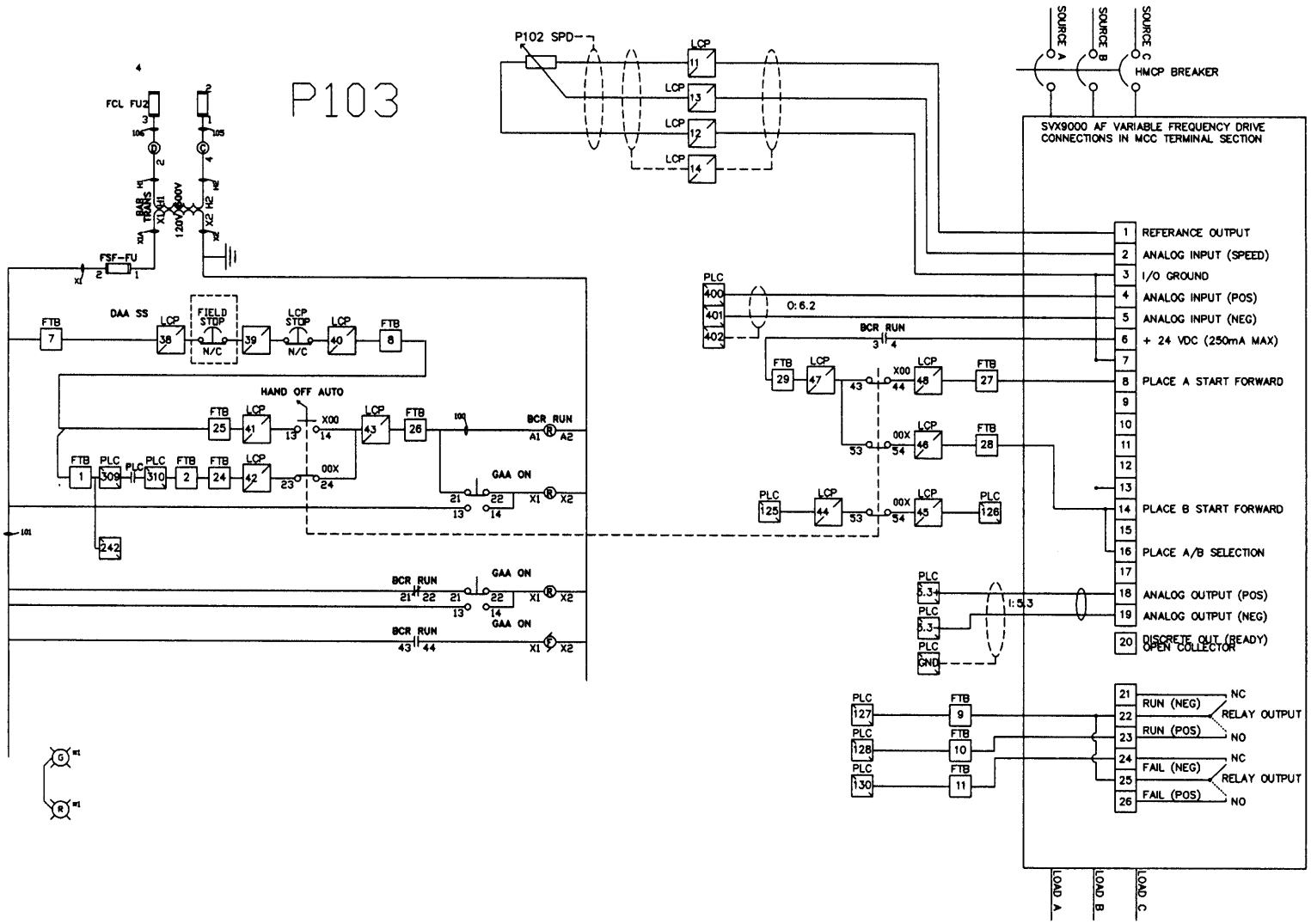


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| C | REVISION-C | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| D | REVISION-D | DATE | NOM |
| E | REVISION-E | DATE | NOM |
| F | REVISION-F | DATE | NOM |

**INSTRUMENTATION**

PLC SHEMATIC DIAGRAM
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WASTEWATER TREATMENT PLANT
PHASE 1

# RAW WASTE WATER PUMP CONTROL PANEL (P103)

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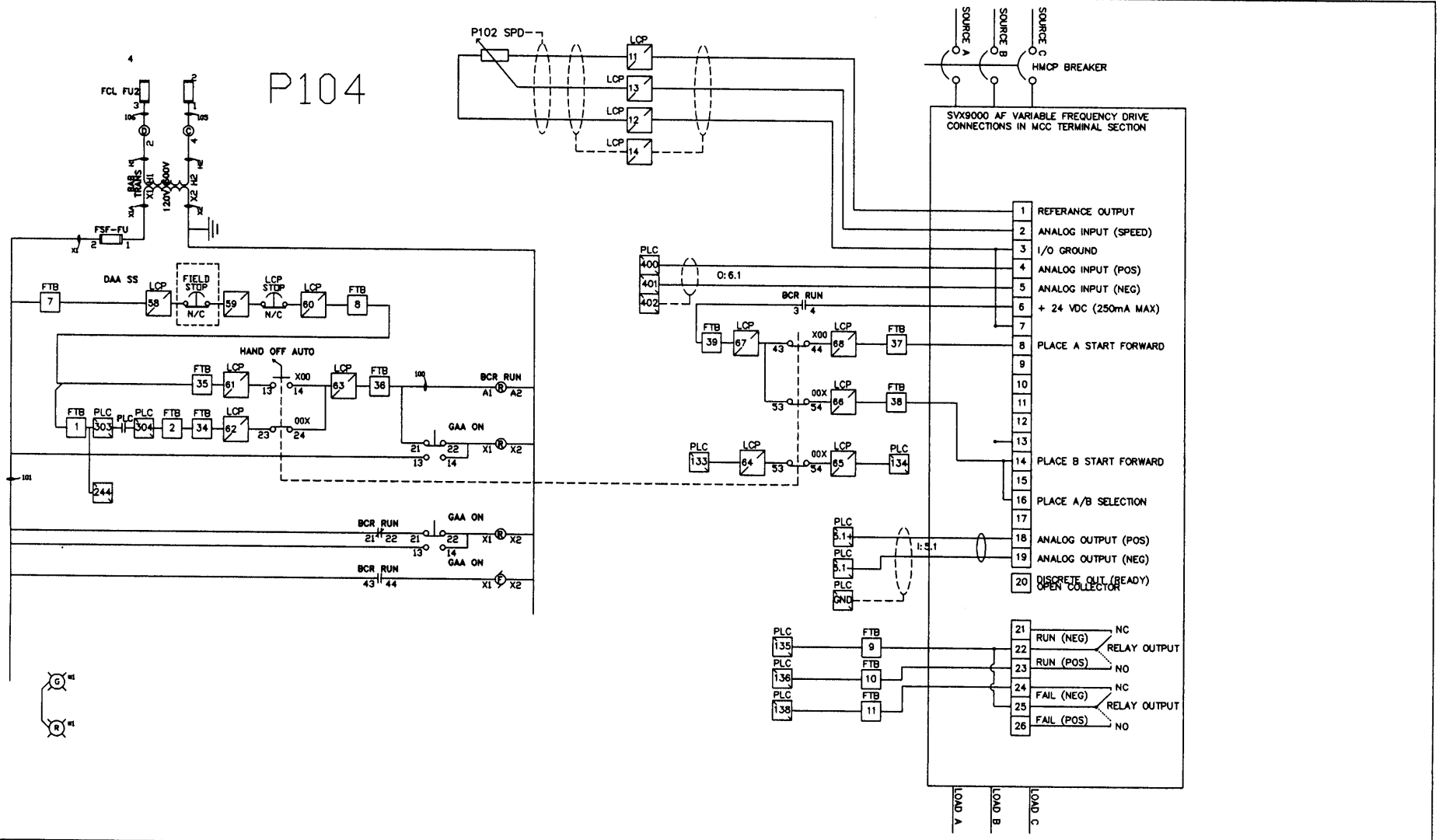


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| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
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| E | REVISION-E | DATE | NOM |
| F | REVISION-F | DATE | NOM |

**INSTRUMENTATION**

PLC SHEMATIC DIAGRAM
I/O CARD 0000

DEVCAR TECHNOLOGIES

**CITY OF IQALUIT**

WASTEWATER TREATMENT PLANT
PHASE 1

# RAW WASTE WATER PUMP CONTROL PANEL (P104)

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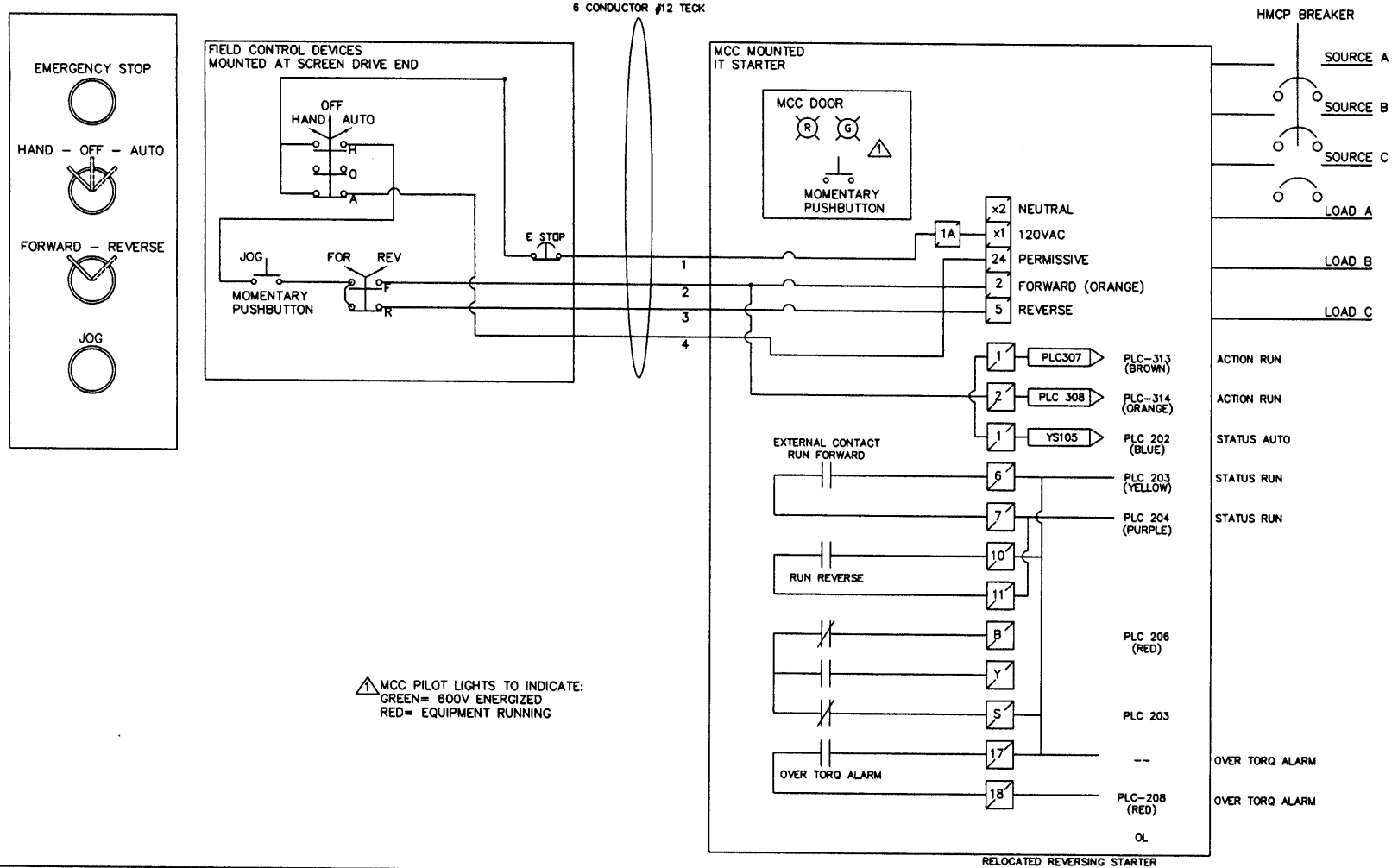


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| REV. | DESCRIPTION | DATE | BY |
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| F | REVISION-F | DATE | NOM |

INSTRUMENTATION

SSCR 105
mcc connection

CITY OF IQALUIT

WASTEWATER TREATMENT PLANT
PHASE 1

MOTOR CONTROL CENTER
SSCR 105 INTERCONNECT

| | | | |
|---|---|---|---|
| DRAWN BY: | SCALE: NTS | DATE JUNE 13TH, 2006 | SHEET NO 0 |
| CHECKED BY: | | | |
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REP: REPERTOIRE:

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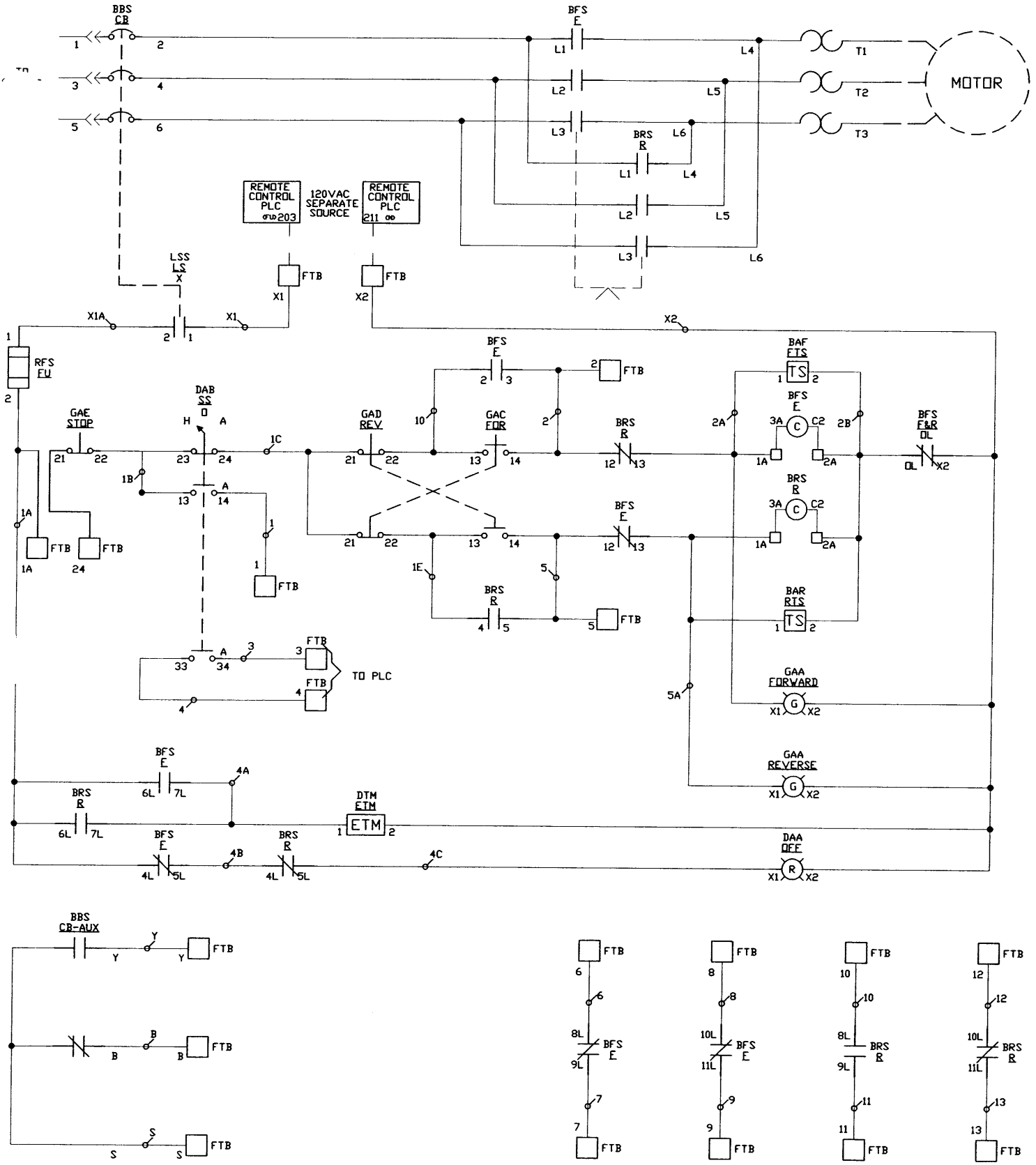
# SSCR 105



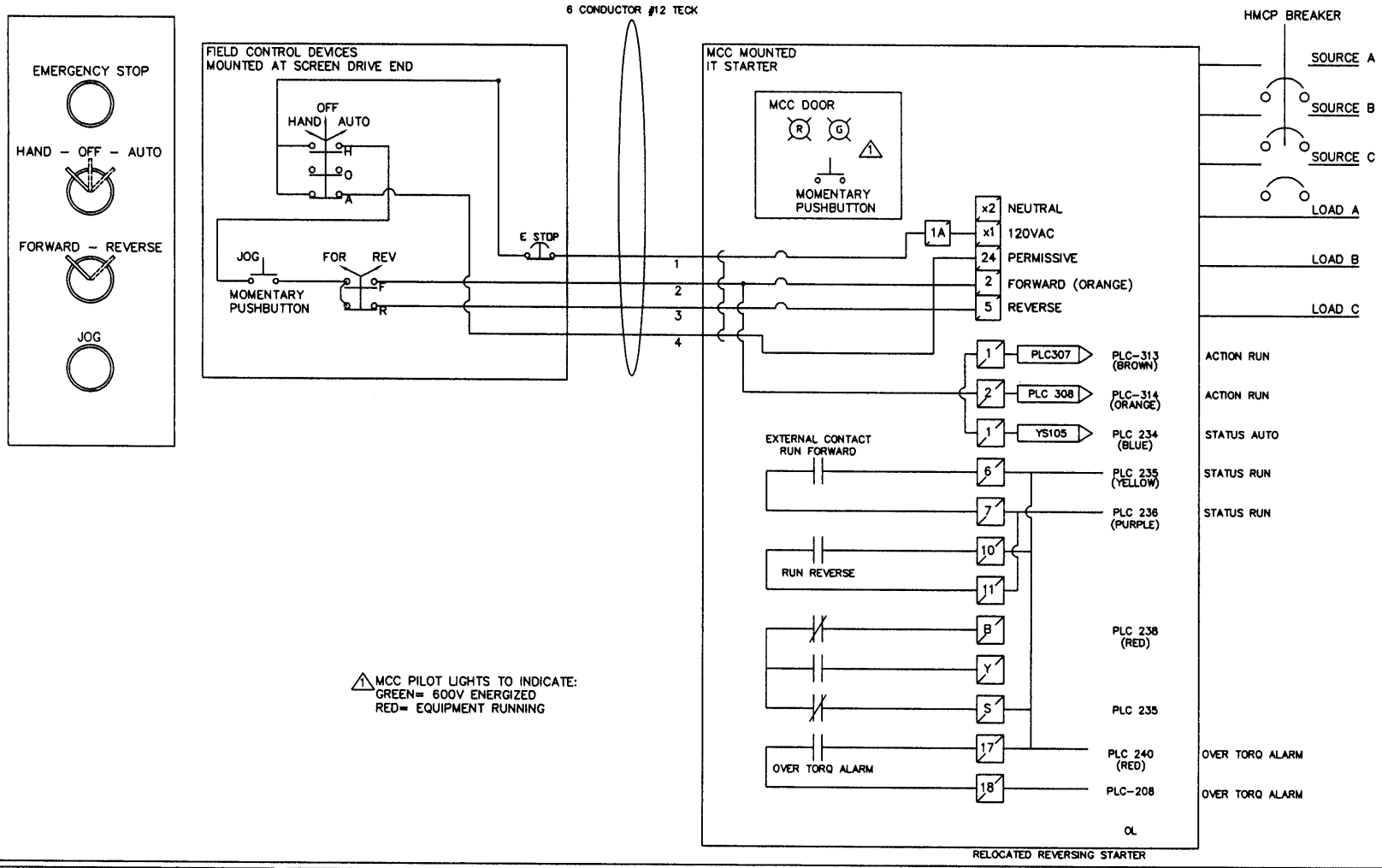

| X1 | X2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | B | S | Y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| | |
|---|---|
| JOB NAME : | HILL MURRAY & ASSOCIATES |
| JOB LOCATION : | SIDNEY, BC |
| DRAWN BY : | CAD |
| ENGR : | S.U. |
| DATE : | MAY 28, 1999 |
| DRAWING STATUS : | RECORD |

MOTOR CONTROL CENTER
SSCR 105

| | |
|---|---|
| EQUIPMENT DESIGNATION : | MCC ADDER |
| EQUIPMENT TYPE : | MODEL 6 MOTOR CONTROL CENTER |
| DRAWING TYPE : | ELEMENTARY DIAGRAM |
| DRAWING # : | E12461865-001-02 |
| REVISION : | AS BUILT MARCH 2006 |
| PAGE : | - - - |

# SSCR 106




⚠1 MCC PILOT LIGHTS TO INDICATE:
GREEN= 600V ENERGIZED
RED= EQUIPMENT RUNNING

| REV. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| A | REVISION-A | DATE | NOM |
| B | REVISION-B | DATE | NOM |
| C | REVISION-C | DATE | NOM |

| REV. | DESCRIPTION | DATE | BY |
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| D | REVISION-D | DATE | NOM |
| E | REVISION-E | DATE | NOM |
| F | REVISION-F | DATE | NOM |

INSTRUMENTATION

SSCR 106
mcc connection

DEVCAR TECHNOLOGIES CSA / ULC

CITY OF IQALUIT

WASTEWATER TREATMENT PLANT
PHASE 1

MOTOR CONTROL CENTER
SSCR 106 INTERCONNECT

| DRAWN BY: | SCALE: | DATE | SHEET NO |
|---|---|---|---|
| CHECKED BY: | NTS | JUNE 13TH, 2005 | 0 |
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REP: REPERTOIRE:

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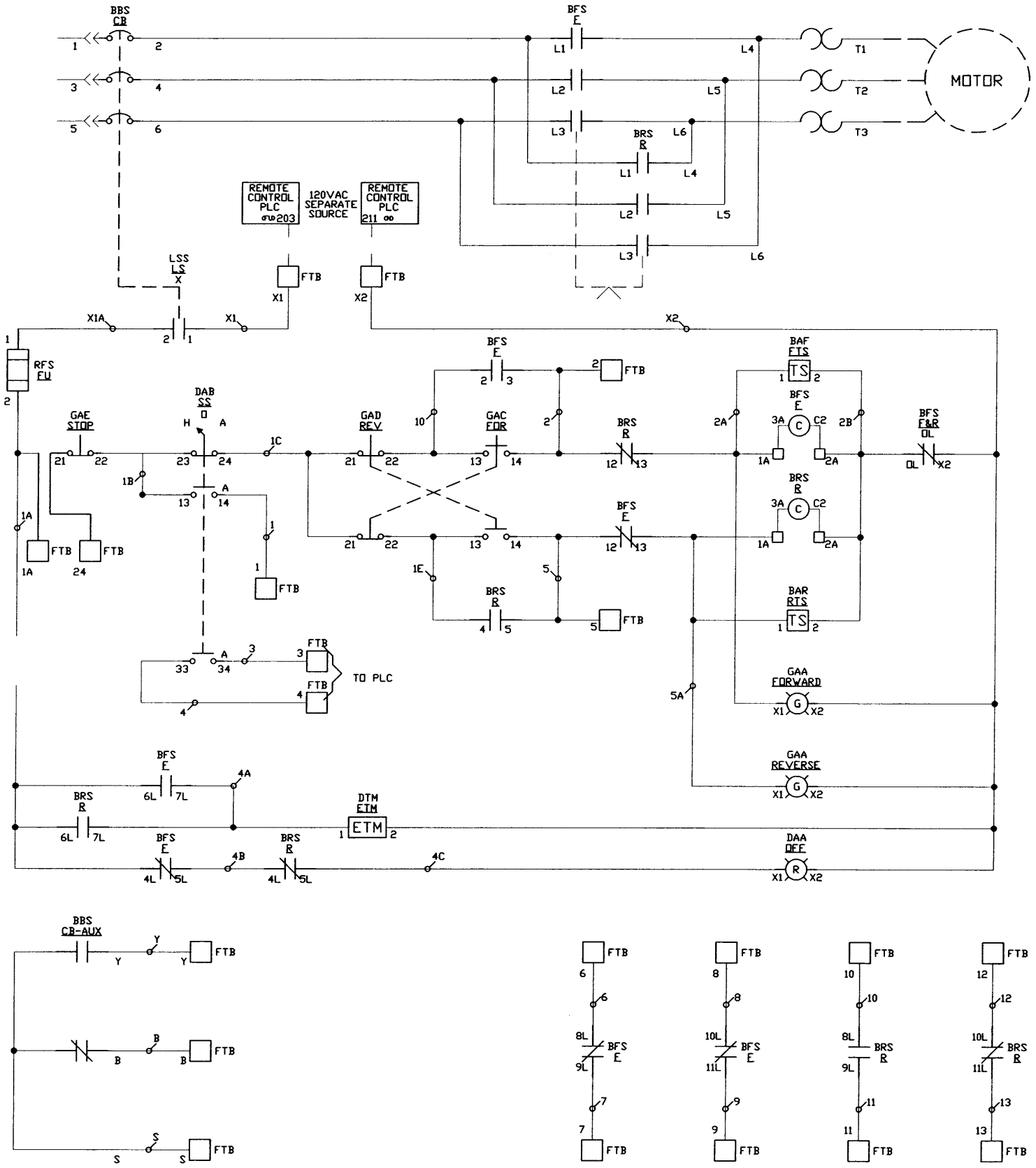
# SSCR 106

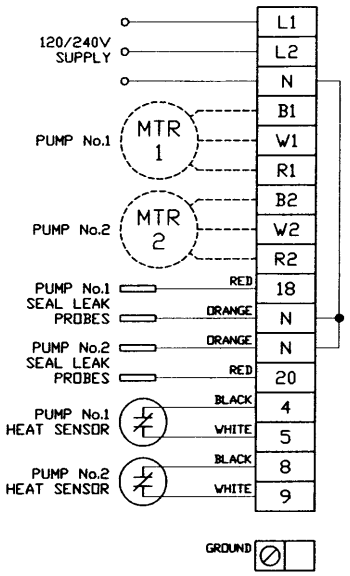



| X1 | X2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | B | S | Y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| JOB NAME : | HILL MURRAY & ASSOCIATES | MOTOR CONTROL CENTER SSCR 106 | EQUIPMENT DESIGNATION : | MCC ADDER |
| JOB LOCATION : | SIDNEY, BC | | EQUIPMENT TYPE : | MODEL 6 MOTOR CONTROL CENTER |
| DRAWN BY : | CAD | | DRAWING TYPE : | ELEMENTARY DIAGRAM |
| ENGR : | S.U. | | DRAWING # : | E12461865-001-02 |
| DATE : | MAY 28, 1999 | | REVISION : | AS BUILT MARCH 2006 |
| DRAWING STATUS : | RECORD | | PAGE : | - - - |

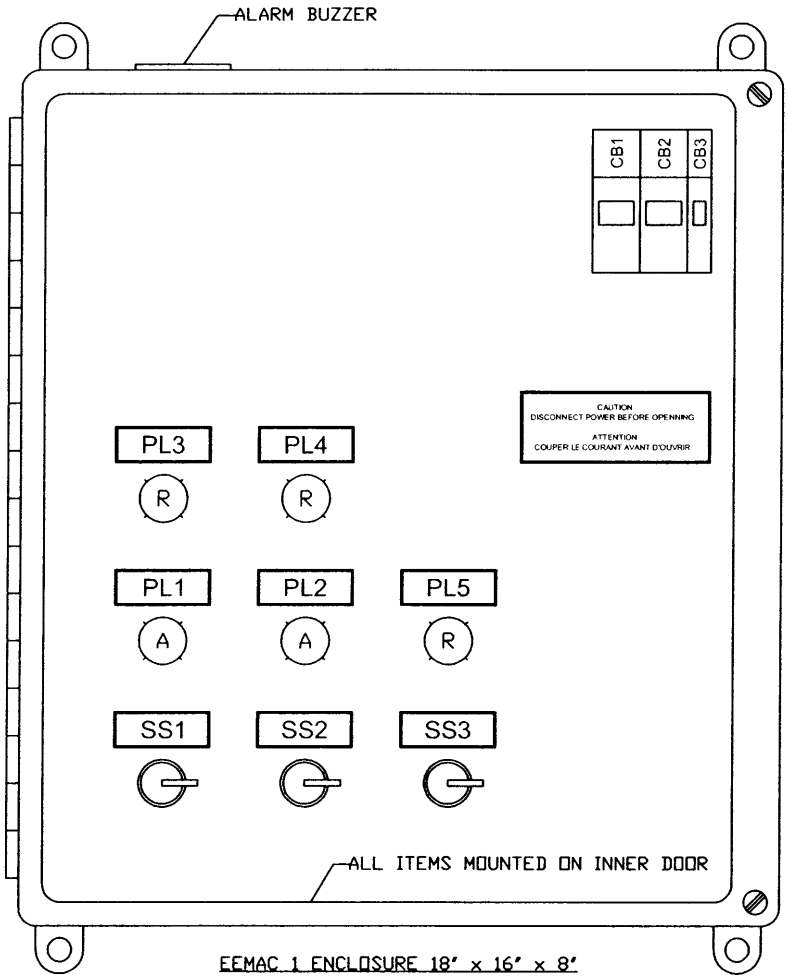
# DUPLEX PUMP CONTROL SYSTEM

TERMINALS-TB1



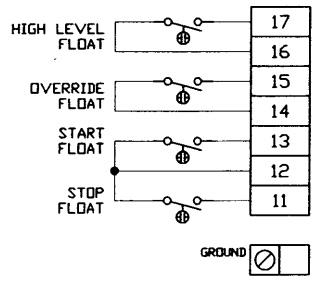

NOTES : A) INTRINSICALLY SAFE FLOAT WIRING MUST BE RUN IN SEPARATE CONDUIT TO TERMINALS IN CONTROL PANEL.

B) IF FLOATS ARE NOT WIRED DIRECTLY TO TERMINALS IN CONTROL PANEL, CAUTION MUST BE TAKEN TO PREVENT CONDENSATION FROM FORMING ACROSS FLOAT CONTACT CIRCUIT. THIS MAY CAUSE FALSE OPERATION OF INTRINSICALLY SAFE RELAY.



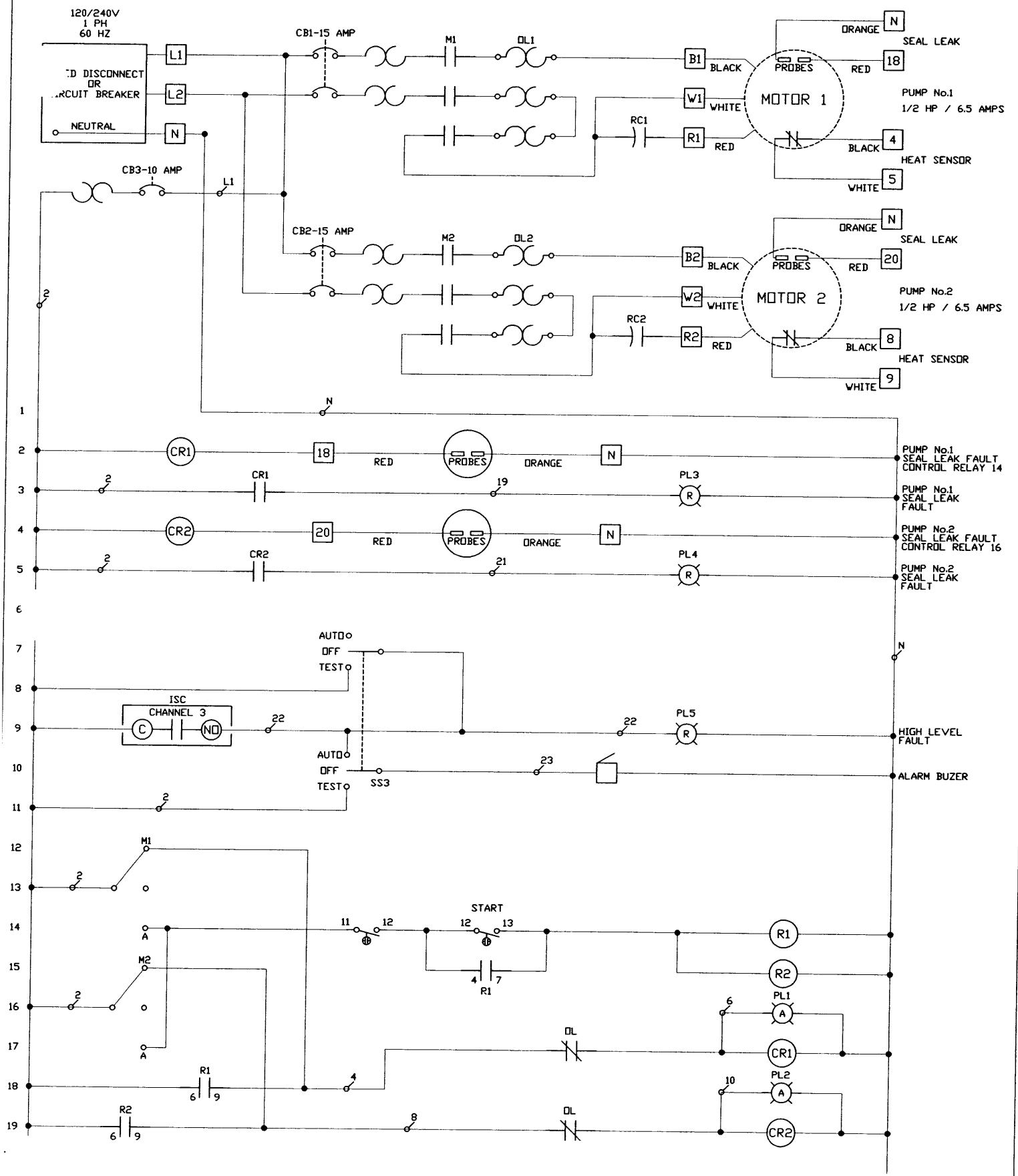

EEMAC 1 ENCLOSURE 18" x 16" x 8"

TERMINALS-TB2




| | | | |
|---|---|---|---|
| JOB NAME : | F.E. MYERS COMPANY | DUPLEX PUMP CONTROL SYSTEM LAYOUT | EQUIPMENT DESIGNATION : DUPLEX PUMP CONTROL SYSTEM |
| JOB LOCATION : | ONTARIO | | EQUIPMENT TYPE : MODEL No. : CPSX5-21D |
| DRAWN BY : | A. BELTON | | DRAWING TYPE : ELEMENTARY DIAGRAM |
| ENGR : | R. IRWIN | | CAD REF. : MY21821-2 DRAWING # : M2114-22365 |
| DATE : | MARCH 10. 2005 | | REVISION : AS BUILT MARCH 2006 |
| DRAWING STATUS : | RECORD | | PAGE : - - - |

# DUPLEX PUMP CONTROL SYSTEM




| | |
|---|---|
| JOB NAME : | F.E. MYERS COMPANY |
| JOB LOCATION : | ONTARIO |
| DRAWN BY : | A. BELTON |
| ENGR : | R. IRWIN |
| DATE : | MARCH 10, 2005 |
| DRAWING STATUS : | RECORD |

## DUPLEX PUMP CONTROL SYSTEM LAYOUT

| | |
|---|---|
| EQUIPMENT DESIGNATION : | DUPLEX PUMP CONTROL SYSTEM |
| EQUIPMENT TYPE : | MODEL No. : CPSX5-21D |
| DRAWING TYPE : | ELEMENTARY DIAGRAM |
| CAD REF. : MY21821-2 | DRAWING # : M2114-22365 |
| REVISION : | AS BUILT MARCH 2006 |
| PAGE : | - - - |

## Chapter 13
## GAS POINT , GAS MONITORING EQUIPMENT

## MANUFACTURER/DISTRIBUTOR:

WEIR Canada
8600 ST-PATRICK STREET
LaSalle ,QUEBEC.CA
H8N-1V1
PH:514-366-5900 FAX:8167

**13.1 GAS POINT GENERAL INFORMATION "7 PAGES42 "**

**13.2 GAS POINT , INSTALLATION AND OPERATING INSTRUCTION.**

**13.3 GAS POINT TRANSMITTER OPERATING INSTRUCTION.**

**END OF CHAPTER 13**

| | | |
|---|---|---|
| A | 2 | **H2S Gas Detector** |
| | | GP-HD BW GAS POINT EXPLOSION |
| | | PROOF / AIT-110 |
| B | 2 | **Combustible Gas Detector** |
| | | GP-IR-WD COMBUSTIBLE INFRA RED |
| | | GAS POINT EXPLOSION PROOF |
| | | **AIT-112/ AIT-114** |
| C | 1 | IR-RW03 ASSEMBLY REPLACEMENT |
| | | **COMBUSTIBLE INFRA RED AIT-113** |
| | | |
| | | **SPARE PARTS ART.2.1.2..1.2.** |
| D | 1 | SS-RH02 ASSEMBLY REPLACEMENT |
| | | **HYDROGEN SULFIDE 17300-2.1.2.2** |
| | | |
| E | 2 | calibration gaz regulator |
| | | |
| | | **TEST GAS CYLINDER** |
| F | 1 | G0042-H25 25 PPM H2S |
| F | 1 | CG2-j2 58 litres methan calibration |
| | | |
| H | 4 | KIT FOR REMOTE SENSING HEAD |
| | | HOUSING PLUS CABLES |
| | | |
| | | |
| G | 1 | **GAZ DETECTOR CONTROLLER cr-4000** |

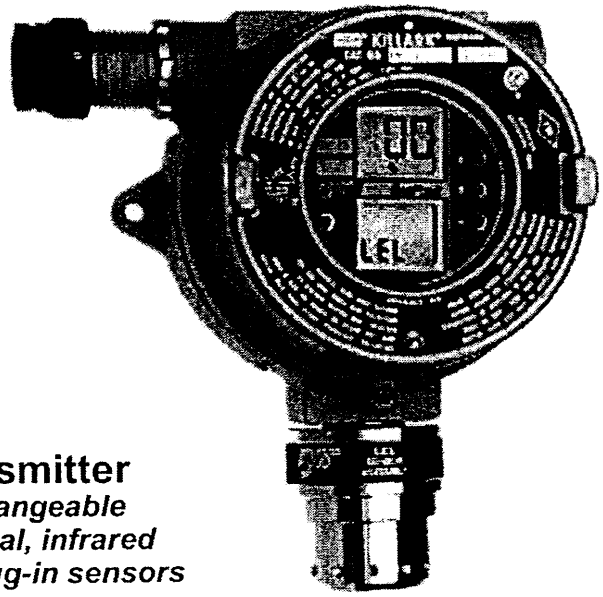
# GasPoint

## $H_2S$, CO, $NH_3$, HCN, $NO_2$, $SO_2$, $O_2$, $Cl_2$ Combustibles (Catalytic 0-100% LEL) or Combustibles (IR 0-100% LEL)

## Gas Transmitter with Internal Alarm Relays

"INNOVATORS IN GAS DETECTION"

BW Technologies



### One Transmitter
*with interchangeable electrochemical, infrared and catalytic plug-in sensors*

### FEATURES:

The GasPoint transmitter provides a 4-20 mA output signal that can be connected to any control system (DCS, PLC, etc.). With advanced sensor technology and microcontroller based operation, the GasPoint provides continuous monitoring of hazardous gases.

- △ The GasPoint transmitter can accept any GasPoint sensor type: electrochemical, catalytic or IR (infrared). All plug-in sensor assemblies are field-interchangeable.
- △ Full function sensor integrity test (auto) continuously advises gas sensing ability and life ended
- △ Non-intrusive, one-person calibration with auto zero and auto span
- △ Equipped with three 5-amp relay contacts—two gas alarm relays (low/high) and fault alarm. Field-selectable normally energized/ de-energized and latching/non-latching alarm relay functions.
- △ Two backlit alphanumeric LCDs advise all environmental and gas hazard conditions as well as instrument and sensor status
- △ Remote toxic/oxygen sensors can be installed over 3,900 ft./ 1,100 m away; combustible sensors over 1,550 ft./475 m. Kit can be installed at any time.
- △ Alarm setpoints displayed on demand—simply press the external button
- △ Field programmable alarm levels
- △ Backlight (auto) in low light conditions and alarm
- △ Extensive fault diagnostics
- △ 2-way digital communication using MODBUS module

ISO 9001:2000 Registered

## Fixed Gas Monitoring Systems

### Ordering Information

| | |
|---|---|
| GP-WD | Gas Transmitter with Combustible Catalytic Sensor |
| GP-IR-WD | Gas Transmitter with Combustible Infrared Sensor |
| GP-HD | Gas Transmitter with $H_2S$ Sensor |
| GP-MD | Gas Transmitter with CO Sensor |
| GP-AD | Gas Transmitter with $NH_3$ Sensor |
| GP-ZD | Gas Transmitter with HCN Sensor |
| GP-DD | Gas Transmitter with $NO_2$ Sensor |
| GP-SD | Gas Transmitter with $SO_2$ Sensor |
| GP-XD | Gas Transmitter with $O_2$ Sensor |
| GP-CD | Gas Transmitter with $Cl_2$ Sensor |

*Accessories and Spares*

| | |
|---|---|
| GP-POWER1 | 120-240 VAC Power Supply |
| GP-MBUS3 | 2-wire MODBUS Communication Expansion Module |
| GP-MBUS3-4 | 4-wire MODBUS Communication Expansion Module |
| GP-SEP | Sensor Separation Kit |
| GP-1 | Gas Transmitter |
| GP-SSPB | Stainless Steel Process Baffle |
| GP-SSCAL4 | Stainless Steel GasPoint Splash Guard |
| GP-DUC-K1 | Duct Mount Adaptor |

*Replacement Sensor Assemblies*

| | | | | | |
|---|---|---|---|---|---|
| SS-RH02 | $H_2S$ | SS-RM02 | CO | SS-RA02 | $NH_3$ |
| SS-RZ02 | HCN | SS-RD02 | $NO_2$ | SS-RC02 | $Cl_2$ |
| SS-RS02 | $SO_2$ | SS-RX02 | $O_2$ | | |
| SS-RW02 | Combustible Catalytic Sensor Assembly | | | | |
| IR-RW03 | Combustible IR Sensor Assembly | | | | |

www.gasmonitors.com
Email: info@bwtnet.com

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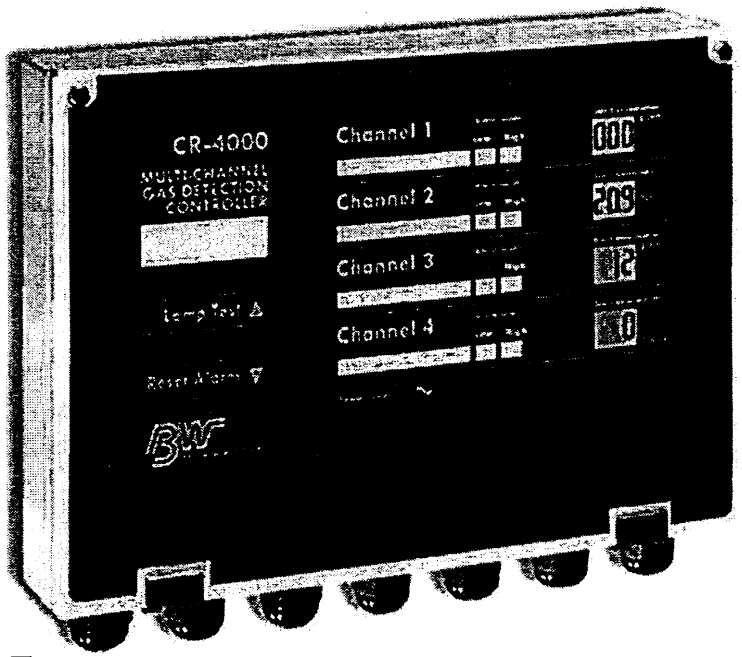
# *CR-4000*

**Four-Channel Controller**

6

**4-20 mA AC/DC**




Print this page

Entirely self-contained, the CR-4000 4-channel, 4-20mA, AC/DC controller provides continuous uninterrupted monitoring and of toxic gases, combustibles and oxygen hazards. The CR-4000 delivers 24 VDC power to any 4-20 mA transmitter.

Application-focused, solution-orientated and competitively priced, the CR-4000 will meet your needs today and in the future. Flexibility is built-in for easy adaptation to changing requirements.

**Features**

- Individual continuous alphanumeric status LCD for each channel
- Slim profile-- only 2.4 inches (6.35 cm) deep
- Easy installation simply hang on the wall, connect the power (AC or DC) and gas transmitters
- Local 85 dB audible alarm
- Extensive system fault diagnostics
- Programmable alarm levels on each channel
- Mix, match, or change the gases monitored
- Three common, 10-amp SPDT relays (standard)
- LOW, HIGH and fault alarms

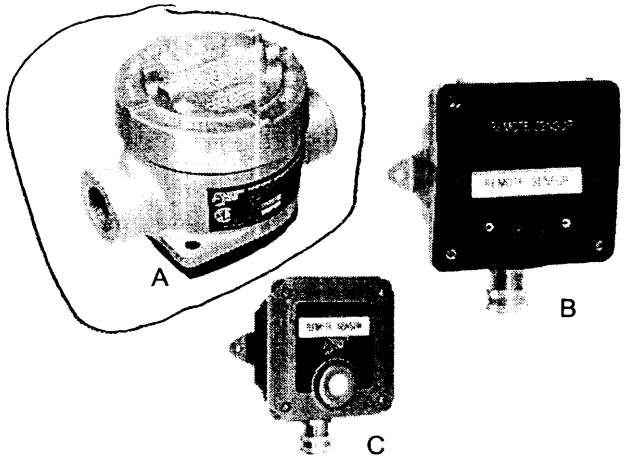
# Fixed Equipment

## Accessories, Spares and Options

*"Innovators in Gas Detection"*

BW Technologies

Accessories and options are designed to meet the special requirements of the individual user, providing the flexibility to work safely and comfortably in diverse working environments. For convenience, accessories are compatible with the different detectors (where applicable).

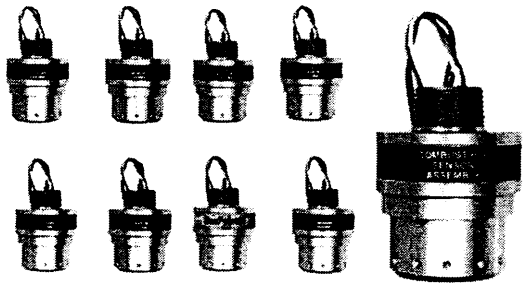



### Remote Sensor Separation Kits

All BW standard Sensor Separation Kits can be added at any time. Mount the Separation Kit in difficult to reach locations such as ceilings, under floor grates and in tanks, etc. The Sensor Separation Kits are powered by the transmitters. Transmission distances from the transmitter are listed below.

**ORDER and COMPATIBILITY INFORMATION**

| | *Transmitter* | *Separation Kit* | *Distance (assumes 22 AWG; 0.64 mm cable)* |
|---|---|---|---|
| **A.** | GasPoint | GP-SEP | 1,548 ft. (472 m) Toxic/$O_2$ Sensor<br>619 ft. (189 m) Combustible Sensor |
| **B.** | I.S. Plant Rat | UA-SEP-K2 | 250 ft. (76 m) |
| | Alarm Rat | UA-SEP-K2 | 250 ft. (76 m) |
| **C.** | CD-420 | CD-SEP-K3 | 250 ft. (76 m) |

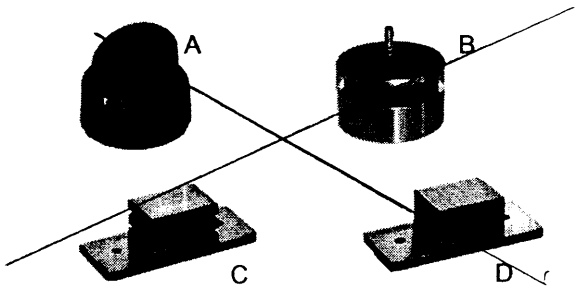


### GasPoint Sensor Assemblies

All GasPoint stainless steel Sensor Assemblies are field interchangeable providing the flexibility as field requirements change and evolve.

**ORDER INFORMATION** *(*Compatible with GasPoints Serial No: 2-000100 up)*

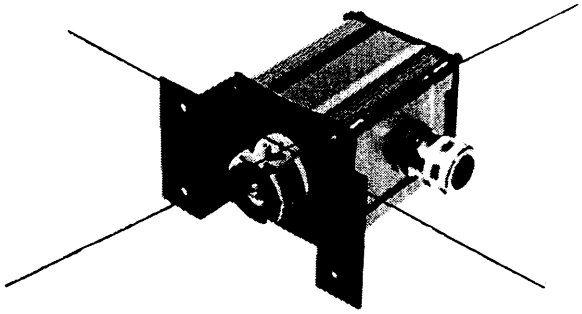
| *Sensor* | *Gas monitored* |
|---|---|
| SS-RW02 | Combustible 0-100% LEL (Catalytic) |
| IR-RW03 | *Combustible 0-100% LEL (IR) |
| SS-RH02 | Hydrogen Sulfide |
| SS-RM02 | Carbon Monoxide |
| SS-RA02 | *Ammonia Sensor |
| SS-RZ02 | *Hydrogen Cyanide |
| SS-RD02 | *Nitrogen Dioxide |
| SS-RS02 | Sulfur Dioxide |
| SS-RX02 | Oxygen |




### Remote Splash Guards/Calibration Cups and Baffles

| | *Transmitter(s)* | *Order No.* | *Application* |
|---|---|---|---|
| **A.** | GasPoint | GP-CAL-3 | Splash Guard / Remote Calibration Cup (ABS) |
| **B.** | GasPoint | GP-SSCAL4 | Stainless Steel Splash Guard / Remote Calibration Cup |
| **C.** | I.S. Plant Rat<br>Alarm Rat | SG-CAL-1 | Splash Guard / Remote Calibration Cup |
| **D.** | I.S. Plant Rat<br>Alarm Rat | PB-CAL-1 | Process Baffle |

*Note: Items C & D are anodized aluminum. For use with $Cl_2$ and $ClO_2$ sensors, add suffix "-T" for teflon coating*



### Duct Mount Kit

Designed to monitor hazardous gases in ducts, the easy-to-install Remote Duct Mount kit can be added at any time. The UA-DUC-K2 is equipped with a Duct Mount Adaptor, Remote Calibration Coupler, pre-drilled mounting flanges and a terminal wiring block.

**ORDER and COMPATIBILITY INFORMATION**

| *Transmitters* | *Duct Mount Kit* | *Distance with 22 AWG (0.64 mm) cable* |
|---|---|---|
| I.S. Plant Rat | UA-DUC-K2 | 250 ft. (76 m) |
| Alarm Rat | | 250 ft. (76 m) |
| CD-420 | | 250 ft. (76 m) |

4

13.1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# Fixed Equipment

## Accessories, Spares and Options

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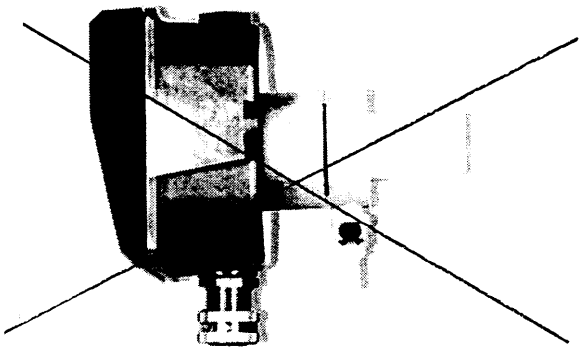
### *Flue Vessel Mount Sensors* *(I.S. Plant Rat/Alarm Rat)*

The I.S. Plant Rat or Alarm Rat models for Flue Vessel Mounting are designed for monitoring hazardous gases in non-pressurized pipes. The flue vessel unit comes complete with quick connect and a remote calibration fitting. The flue vessel adaptor is equipped a 1 in. n.p.t. pipe thread and a plug-in sensor.

**ORDER and COMPATIBILITY INFORMATION**

| *Flue Vessel Sensor Units* | *Order No.* |
|---|---|
| I. S. Plant Rat c/w Flue Vessel Sensor | ISPF5-(N/D)(x)(#) |
| *Sensor Separation Unit | UA-SEP-F5(x)(#) |

***Sensor Separation Unit** (I.S. Plant Rat and Alarm Rat) Transmitters and Flue Vessel Sensor Separation Units must be ordered together. Alarm Rat Flue Vessel is available only in a sensor separation unit.*

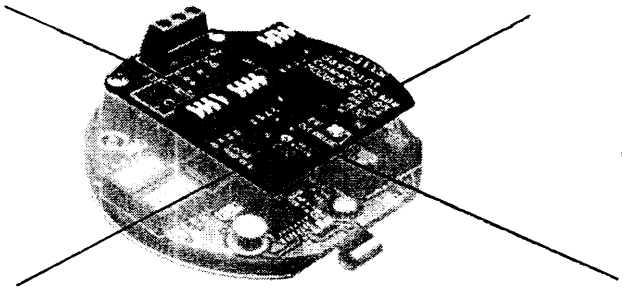


### *GasPoint MODBUS Communications Module*

The GasPoint MODBUS Communications Module is a plug-in card, powered by the GasPoint and provides a MODBUS two-way addressable (1 to 247) communications interface. The RTU-485 output provides status, alarm, fault, relay control, latched alarm control plus other information for operation, troubleshooting or programming the unit.

**ORDER INFORMATION** (Compatible with GasPoints Serial No. 2-000100 and up.)

| *Order No.* | *Description* |
|---|---|
| GP-MBUS1 | GasPoint MODBUS Communications Expansion Module |

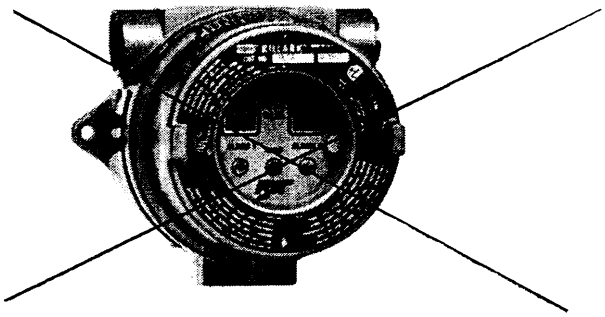


### *Field Relay Module*

The Field Relay Module provides an output to re-transmit the 4-20 mA gas transmitters signal to a central control system or is used as a Controller for a single point system. Equipped with three 5 amp SPDT relays, two field settable alarm levels, the explosion-proof module provides power to the Gas Detector. No calibration is required.

**ORDER and COMPATIBILITY INFORMATION**
Compatible with all BW fixed monitors.

| *Order No.* | *Description* |
|---|---|
| FRM-AC | Includes AC power supply (24 VDC) 110 to 230 AC |
| FRM-1 | DC external power requirements 15-28 VDC |

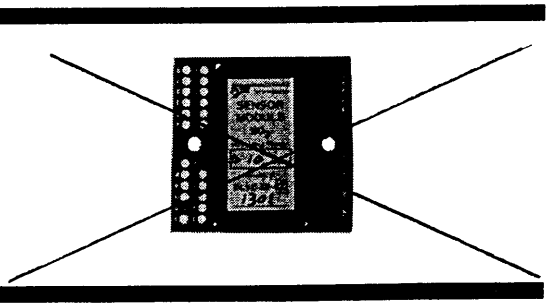


### *Measuring Range Modules and Sensor Change Kits*

To change the Measuring Range or gas sensed, simply plug-in a new gas specific Module to configure the Transmitter to the new range and/or gas. Sensor Change Kits: Order the sensor separately.

**ORDER and COMPATIBILITY INFORMATION**
For use with I.S. Plant Rat, CD-420 and Alarm Rat only.

| *Order No.* | *Description* |
|---|---|
| PL(x)S-50-(#)-2 | Measuring Range Module (specify gas and measuring range) |

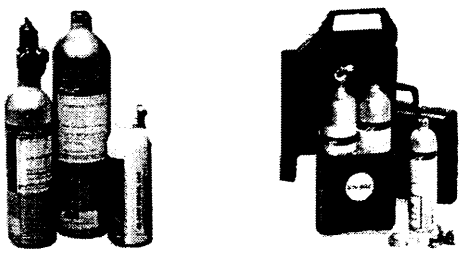


### *Calibration Gases and Equipment*

BW Technologies quality test gases are made to the highest accuracy and trace ability to N.I.S.T. standards. A full range of gases are available in Calibration Cylinders and Calibration Kits.

**ORDER INFORMATION** For a full list of gases available, contact your local BW Distributor or BW office for type and delivery.

1 X 25 PPM H2S
1 X 58 LITRES METHANE



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## Accessories, Spares and Options

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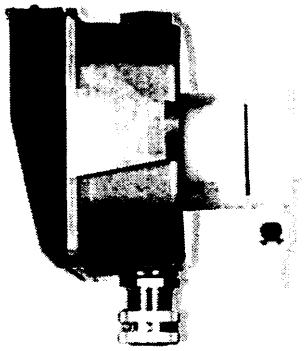

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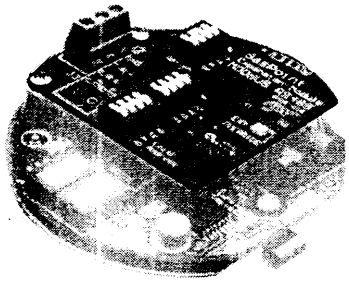

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Compatible with all BW fixed monitors.

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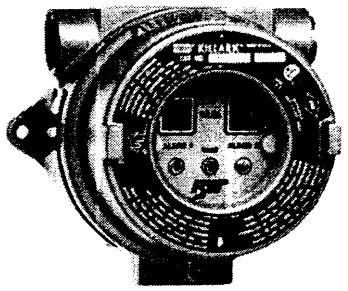
| FRM-1 | DC external power requirements 15-28 VDC |



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**ORDER and COMPATIBILITY INFORMATION**
For use with I.S. Plant Rat, CD-420 and Alarm Rat only.

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|---|---|
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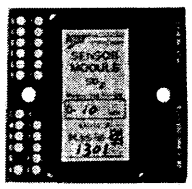

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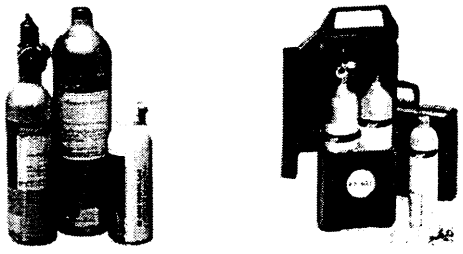



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# Fixed Equipment

## Accessories, Spares and Options

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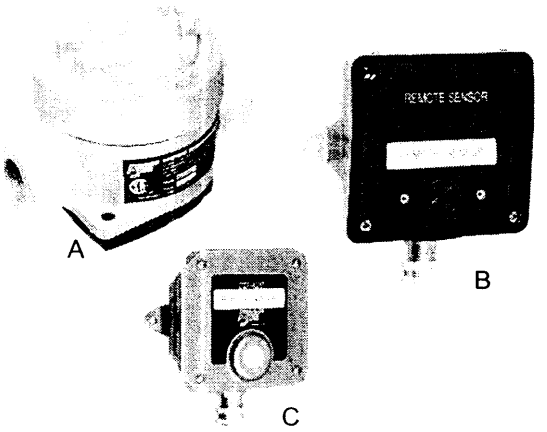
Accessories and options are designed to meet the special requirements of the individual user, providing the flexibility to work safely and comfortably in diverse working environments. For convenience, accessories are compatible with the different detectors (where applicable).

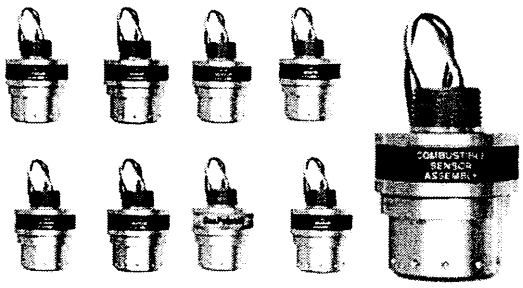



### Remote Sensor Separation Kits

All BW standard Sensor Separation Kits can be added at any time. Mount the Separation Kit in difficult to reach locations such as ceilings, under floor grates and in tanks, etc. The Sensor Separation Kits are powered by the transmitters. Transmission distances from the transmitter are listed below.

**ORDER and COMPATIBILITY INFORMATION**

| | *Transmitter* | *Separation Kit* | *Distance (assumes 22 AWG; 0.64 mm cable)* |
|---|---|---|---|
| **A.** | GasPoint | GP-SEP | 1,548 ft. (472 m) Toxic/$O_2$ Sensor<br>619 ft. (189 m) Combustible Sensor |
| **B.** | I.S. Plant Rat | UA-SEP-K2 | 250 ft. (76 m) |
| | Alarm Rat | UA-SEP-K2 | 250 ft. (76 m) |
| **C.** | CD-420 | CD-SEP-1 | 250 ft. (76 m) |

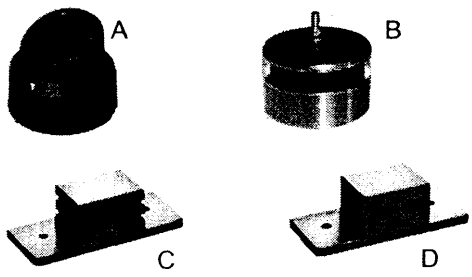


### GasPoint Sensor Assemblies

All GasPoint stainless steel Sensor Assemblies are field interchangeable providing the flexibility as fi requirements change and evolve.

**ORDER INFORMATION** (*Compatible with GasPoints Serial No: 2-000100 up)

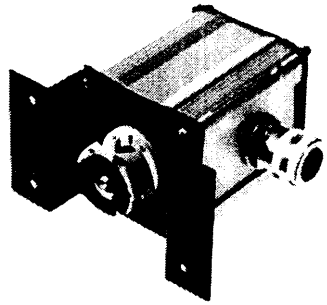
| *Sensor* | *Gas monitored* |
|---|---|
| SS-RW02 | Combustible 0-100% LEL (Catalytic) |
| IR-RW03 | *Combustible 0-100% LEL (IR) |
| SS-RH02 | Hydrogen Sulfide |
| SS-RM02 | Carbon Monoxide |
| SS-RA02 | *Ammonia Sensor |
| SS-RZ02 | *Hydrogen Cyanide |
| SS-RD02 | *Nitrogen Dioxide |
| SS-RS02 | Sulfur Dioxide |
| SS-RX02 | Oxygen |




### Remote Splash Guards/Calibration Cups and Baffles

| | *Transmitter(s)* | *Order No.* | *Application* |
|---|---|---|---|
| **A.** | GasPoint | GP-CAL-3 | Splash Guard / Remote Calibration Cup (ABS) |
| **B.** | GasPoint | GP-SSCAL4 | Stainless Steel Splash Guard / Remote Calibration Cup |
| **C.** | I.S. Plant Rat<br>Alarm Rat | SG-CAL-1 | Splash Guard / Remote Calibration Cup |
| **D.** | I.S. Plant Rat<br>Alarm Rat | PB-CAL-1 | Process Baffle |

*Note: Items C & D are anodized aluminum. For use with $Cl_2$ and $ClO_2$ sensors, add suffix "–T" for teflon coating*



### Duct Mount Kit

Designed to monitor hazardous gases in ducts, the easy-to-install Remote Duct Mount kit can be added at any time. The UA-DUC-K2 is equipped with a Duct Mount Adaptor, Remote Calibration Coupler, pre-drilled mounting flanges and a terminal wiring block.

**ORDER and COMPATIBILITY INFORMATION**

| *Transmitters* | *Duct Mount Kit* | *Distance with 22 AWG (0.64 mm) cable* |
|---|---|---|
| I.S. Plant Rat | UA-DUC-K2 | 250 ft. (76 m) |
| Alarm Rat | | 250 ft. (76 m) |
| CD-420 | | 250 ft. (76 m) |



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# CR-4000

## Four Channel Controller

# Installation and Operating Instructions

## 4-20 mA Fixed Gas Monitoring System

I

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BW TECHNOLOGIES

13.2

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## Safety Information - Read First

**⚠IMPORTANT**

FOR SAFETY REASONS, THIS EQUIPMENT MUST BE OPERATED AND SERVICED BY QUALIFIED PERSONNEL ONLY. READ AND UNDERSTAND THE USER MANUAL COMPLETELY BEFORE OPERATING OR SERVICING.

- ⇒ **Warning: Substitution of components may impair intrinsic safety.**
- ⇒ **The controller warranty will be void if the unit is disassembled, adjusted, or serviced by non-BW Technologies personnel.**
- ⇒ **Do not use the controller if it or any system components are damaged. Inspect the system on a regular basis and keep a log. If the controller is damaged or something is missing, contact BW Technologies immediately.**
- ⇒ **Do not attempt to disassemble, adjust, or service the controller unless instructions are contained in the manual for that procedure and/or that part is listed as a replacement part. Use only BW parts.**
- ⇒ **Do not expose the controller to electrical shock and/or severe continuous mechanical shock.**
- ⇒ **Do not change or charge batteries in a hazardous location. Doing so will impair the intrinsic safety of the controller and may lead to fire or explosion.**
- ⇒ **Warning: Do not disconnect or replace assemblies/equipment unless power has been switched off or the area is known to be non-hazardous.**
- ⇒ **Any rapid up-scaling reading followed by a declining or erratic reading may indicate a gas concentration beyond upper scale limit, which may be hazardous.**
- ⇒ **Electromagnetic Interference (EMI) signals may cause incorrect operation.**

**Ratings and Certifications**

| Symbol | Meaning |
|---|---|
| | Approved to both U.S. and Canadian Standards by the Canadian Standards Association. |
| IEC | Certified to IEC (International Electrotechnical Commission) |
| CE | Conforms to European Union directives |

**International Symbols**

| Symbol | Meaning |
|---|---|
| | Protective Earth Conductor Terminal (Ground) |
| | Caution (consult all accompanying documents, product labels and markings) |
| | Recyclable |
| | Waste Disposal |

## *Contacting BW Technologies*

To contact BW Technologies call:

1-888-749-8878 USA
+44 (0) 1869 233004 Europe
+011-852-2974-1783 China
+61-7-3818-8244 Australia
1-800-663-4164 Canada
+971-4-8871766 Middle East
+65 6872 1629 South East Asia
+1-403-248-9226 Other Countries

Address Correspondence to:

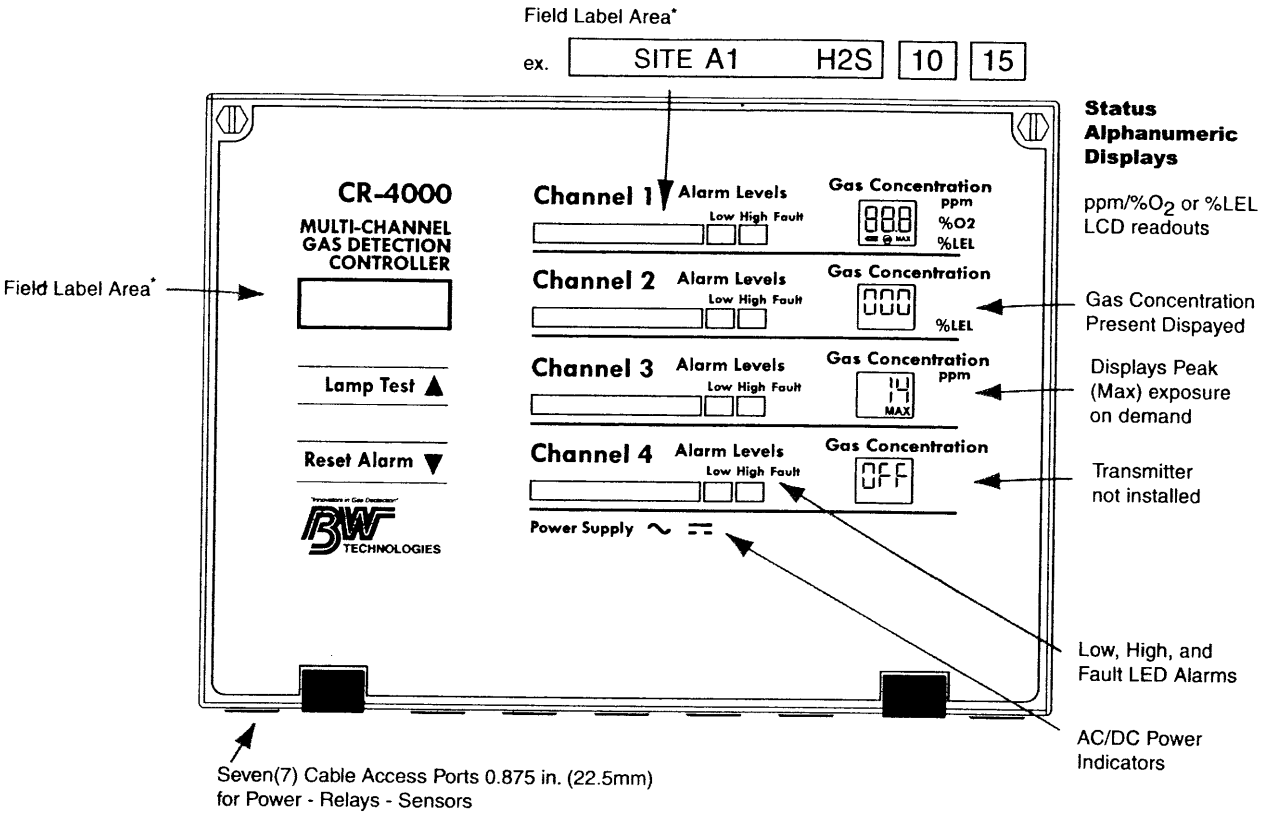
BW Technologies Ltd.
2840 2nd Ave. S.E.
Calgary, AB T2A 7X9
Canada

BW Technologies America Inc.
3279 West Pioneer Parkway
Arlington, TX 76013
USA

BW Europe Ltd.
101 Heyford Park
Upper Heyford, Oxfordshire, OX25 5HA
United Kingdom

# Installation and Operating Instructions

## Figure 1: Elements Drawing




*Field Label Areas: White Blank areas provided for customer to label.

***NOTE:** White area blocks provide space for the customer to label the Controller for field specific information: General Controller Label, Three Labels per Channel (General and Low/High Alarm setpoints).

### COMPATIBILITY

The CR-4000 Controller has a direct linear isolated output making it compatible with almost all 4-20 mA gas transmitters, as well as the following BW Technologies Transmitters:

- GasPoint
- GasPoint IR
- I.S. Plant Rat
- CD-420 Series
- ToxyPoint
- RRJ-sensor/transmitters

## INTRODUCTION

The CR-4000 is a microprocessor based four-channel controller with four independent LCD displays. Each individual channel is capable of measuring and controlling commonly used gas detectors with 4-20 mA output with varying measuring ranges (see **Channel Select**). The controller channel field selectable switches are programmed for easy setup when selecting the desired measurements. Two dip switches along with a rotary switch are used to set up each channel. The rotary channel select switch is used to select the desired range and type of gas. The two dip switches are used to set the low and high alarm points and configure the audible alarm and relays.

Each LCD display is accompanied with six LED indicators. The LEDs indicate low alarm, high alarm, fault alarm, and gas type (O2, PPM, %LEL). In fault conditions, a special string will be displayed on the LCD indicating open circuit (-OC) for "no gas detector" installed, short circuit (-SC) if the detector is causing a short in the power line of the channel, and fault condition (-FC) if the input signal is below 2 mA.

The audible alarm (two 75dB buzzers) are common to all channels and are activated whenever an alarm condition exists on any channel(s). Each channel can be isolated (disabled) from the common audible alarm, using the AUDIBLE dip switch.

The standard CR-4000 is equipped with: a non-latching, de-energized, common low alarm relay; a latching, de-energized, common high alarm relay; and an energized common fault relay. The controller can be ordered with two optional relays (low and high) per channel. Optional relays are function selectable using the dip switches. Low and high alarm optional channel relays are field selected to function as energized or de-energized and latching or non-latching.

Two front panel touch-pad switches - **Reset Alarm** ▼ and **Lamp Test** ▲ - are used as control switches to acknowledge (alarm reset) alarms and as a general system test. The control switches are also used to calibrate the LCD display (if necessary) and to adjust the alarm set points when in calibration mode.

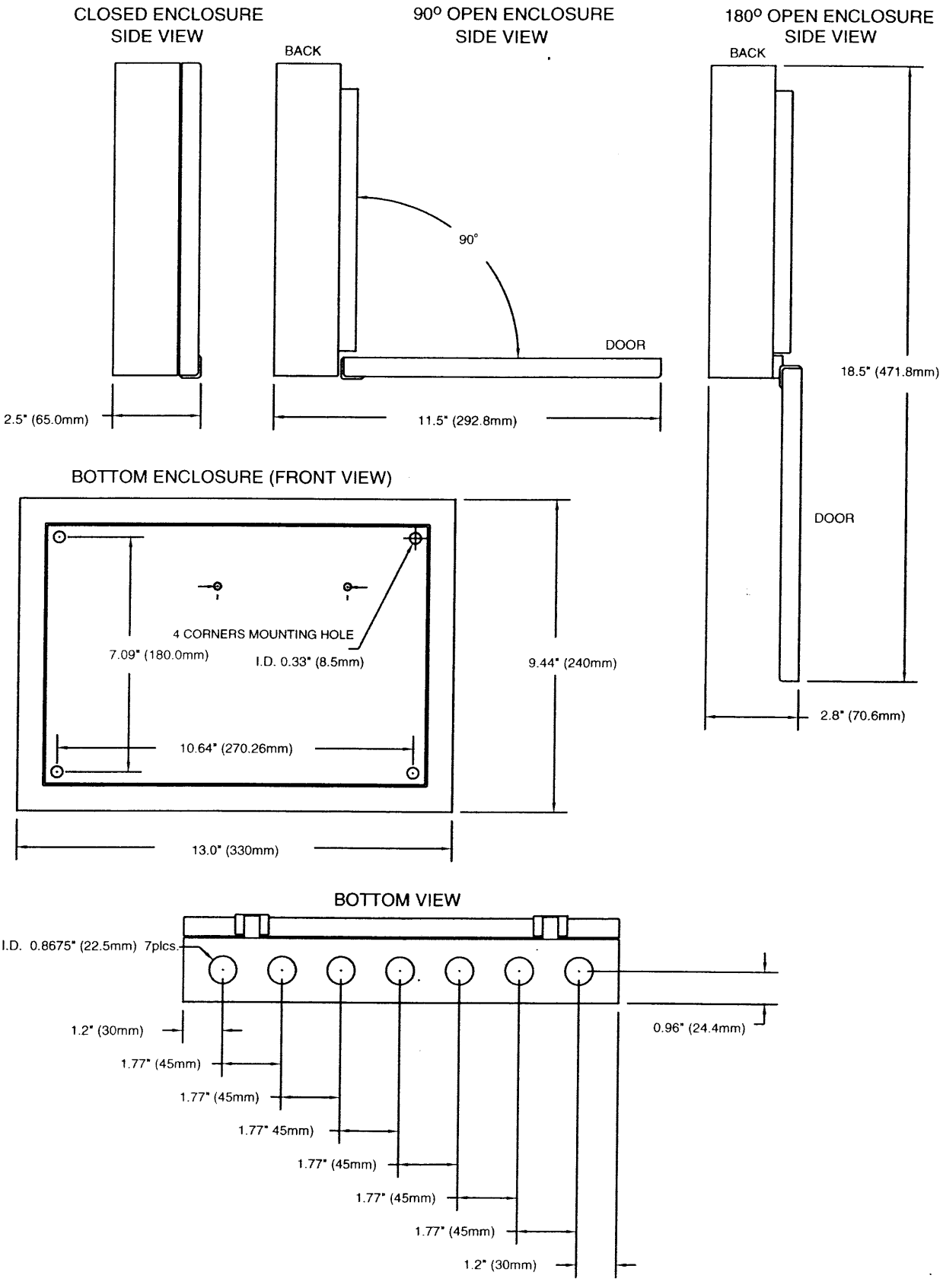
The controller power is field selectable for either 110 VAC or 220 VAC 50/60 Hz or 24 VDC by selecting the position of the power select slide switch. The controller can also operate on external power of 18-28 VDC 1.5A. Optional battery backup (2 x 12V 1.8 amphr. in series) is also available.

**NOTE:** The power is not field selectable in the Hazardous Location Division 2 version.

Designed for easy installation, the instrument is housed in a slim wall mounted, hinged swing-down door enclosure. All the wiring terminals are located inside, opposite the applicable port for conduit/compression fitting. The RFI/EMI protected enclosure is enameled steel.

## Installation

### Figure 2: Enclosure Outline Drawing



## GENERAL

The CR-4000 Controller is designed for installation in general-purpose or Class I, Division 2 hazardous (provided Division 2 installation rules are followed for Division 2 version) areas. Installation personnel should be qualified technicians. All the required electrical codes and safety standards MUST be observed during installation. If the CR-4000 is to be located in Division 2 areas, see the section **Class I, Division 2 Installation**.

**RECOMMENDED:** Please use the recommended (supplied) port glands in all unused ports.
**CAUTION:** Circuit has live terminals - Installation and maintenance should be performed by qualified personnel.

## MOUNTING (See Figure 2)

Prior to mounting the Controller, locate a mounting wall where there is minimum vibration, away from local heat with room for ventilation, and within easy reach of operating personnel.

The mounting wall must provide support for the 2.2 kg (4.85 lbs.) Controller. Make sure that the electrical cable/ conduit routing and support are planned. (See figure 2 for cable/conduit port location and enclosure mounting holes.)

1. Remove the two #10 Phillips top screws and open the swing-down door of the Controller. Remove the four small rubber bumpers on the back of the enclosure. Use the four holes as a template to mark the mounting holes location. Drill the wall using the correct drill bit for the preferred screws.

   **NOTE:** You may remove the front door. First remove the grounding wire from the front enclosure (see **Grounding** below). Then with a small tool depress the lock side of the white hinge pins and pull out. To replace the pins simply line up the hinges and reinsert the hinge pins. Reinstall the grounding wire. (See illustration below.)

2. Replace the four rubber bumpers. Mount the enclosure by inserting the four screws through the rubber bumpers into the wall, thus maintaining the enclosure rating. Secure in place.

   **Grounding:** Ensure ground (earth) wire is left connected between the lid and the case. Ensure it is installed correctly.

3. Ensure the enclosure is grounded using the 5 mm x 12 mm stud at the bottom left side of the enclosure back.

4. Ensure the enclosure door is grounded using the stud at the bottom left side of the door PCB next to the transformer.

### CLASS I, DIVISION 2 INSTALLATION

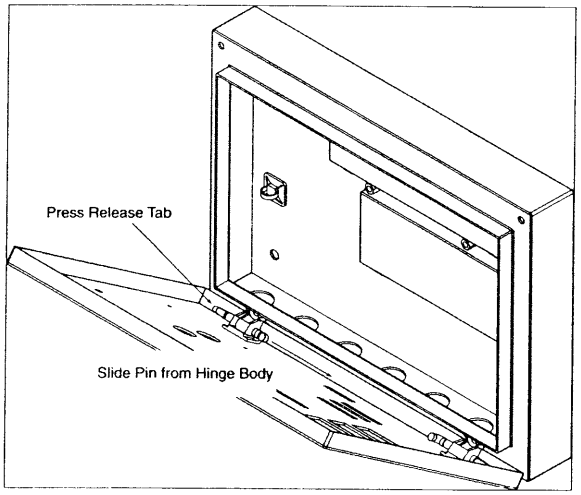
A version of the CR-4000 Controller has been certified for installation in a Division 2 hazardous location. Follow these rules when ordering the Division 2 version.

Conduit or approved hazardous location cables must be used when connecting devices to the Controller.

Approved sealing fittings must be installed within 18 inches (45.72 cm) of the Controller at each port.

Hazardous location cable and sealing fittings must be approved for Class I, Div. 2 Gr. A, B, C, D hazardous locations.

Use approved National Electrical code installation methods.



## Installation

### Figure 3: System Wiring Diagram

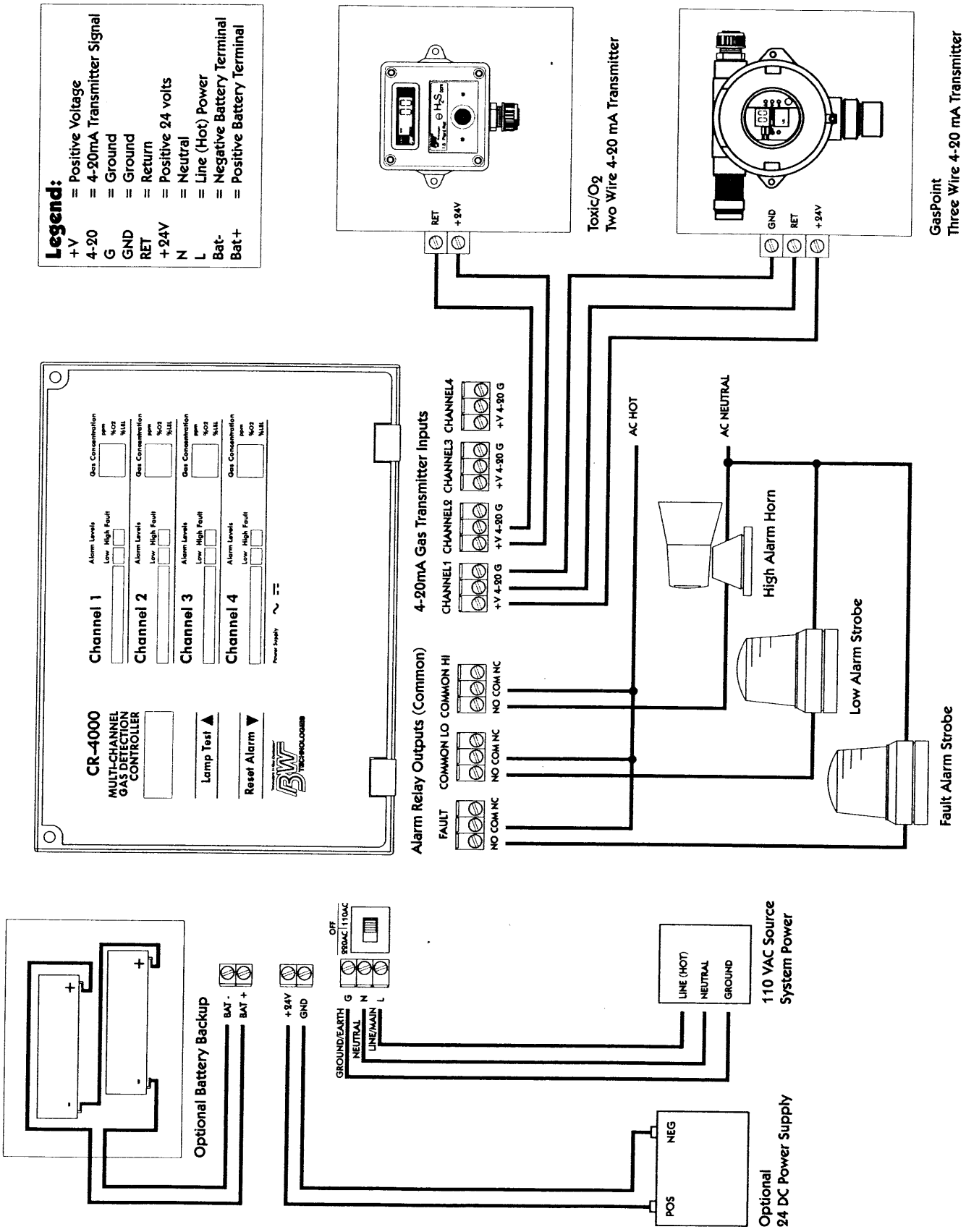
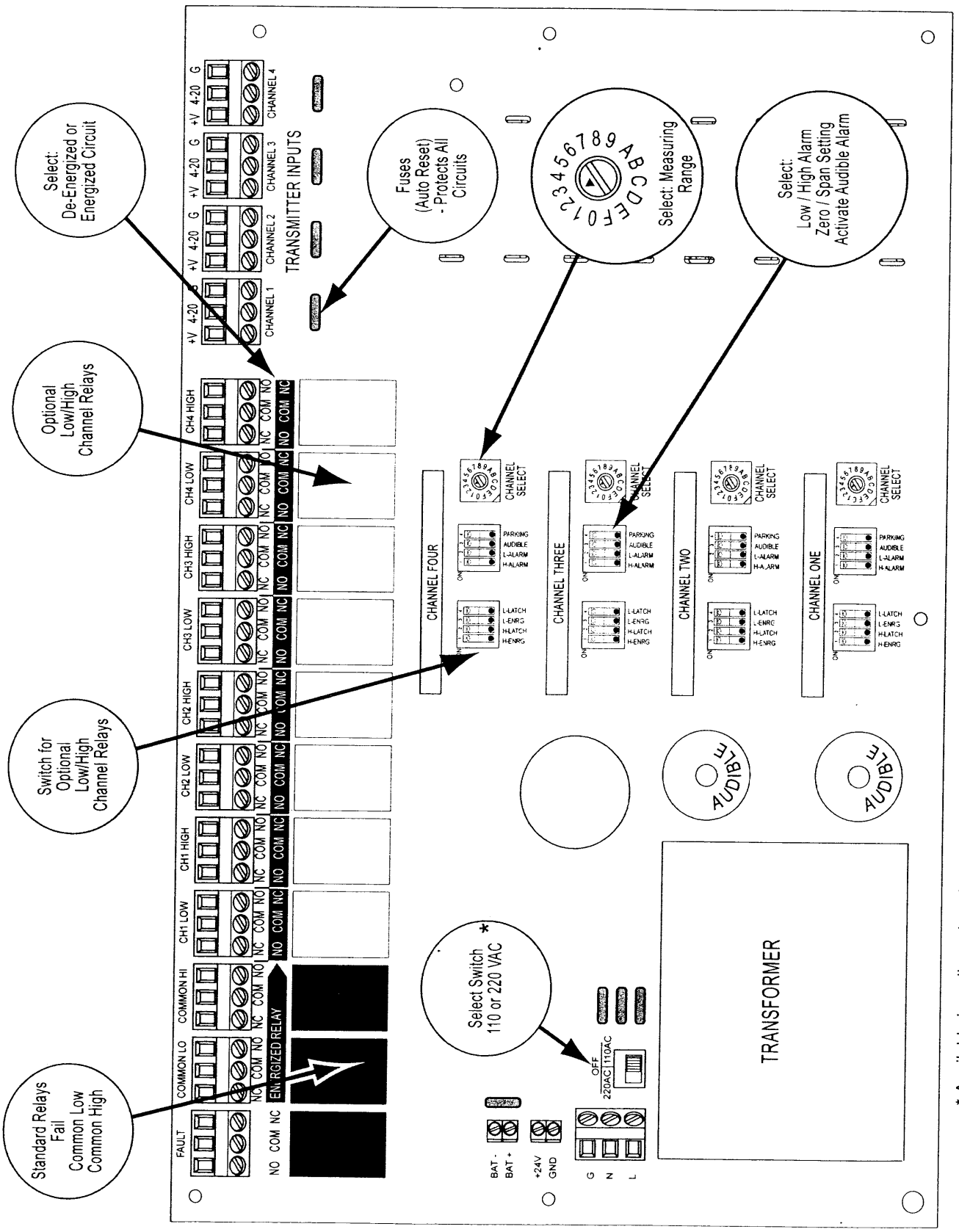


**Figure 4: Main Board Elements Diagram**




* Available in ordinary location version.

## Installation

### 4-20 mA TRANSMITTER WIRING: (See Figure 3 and Figure 4)

**Specifications**

| | |
|---|---|
| Cable Power: | 16-20 AWG (dependant on distance) |
| Relays: | 16-22 AWG |
| Electrical Supply: | 115 VAC, 0.18 A; 230 VAC, 0.36 A; 50-60 Hz; 24 VDC, 1.5 A (field selectable) |
| Controller Resistance: | 121 ohm |
| Wiring Ports: | 3.4 inch (1.77 in; 44.98 mm) |

**NOTE 1:** A layout diagram is fixed inside the case. Review it before proceeding.

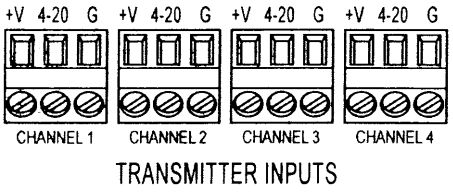
**NOTE 2:** Extend wiring leads a minimum of 5.5 inches in length inside the unit (see wire cut line in case drawing). **Exception:** Power line, extend a minimum of 9 inches inside the case.

**General**

The 4-20 mA input of the Controller receives its loop current from +24 VDC supply (+V terminal) built into the Controllers. The DC supply is connected to the transmitter when the transmitter wiring connection is made. The +V terminals are protected by a resettable (auto) fuse and each can handle up to 250 mA of load current.

1. Route the signal cable through the signal port, using the port closest to the selected channel terminal block. Extend the cable until it reaches the selected channel terminal block, (cable length a minimum 5.5 inches (14 cm) inside the unit.) .
2. Use a small, flat screwdriver to loosen the screw on the channel terminal block.
3. Strip approximately 5/16 inch (8 mm) of insulation from one end of each wire and insert the wire at the assigned terminal. Do not over tighten the terminal screws. The two-wire and three-wire 4-20 mA transmitter wiring is shown in Figure 5 below.

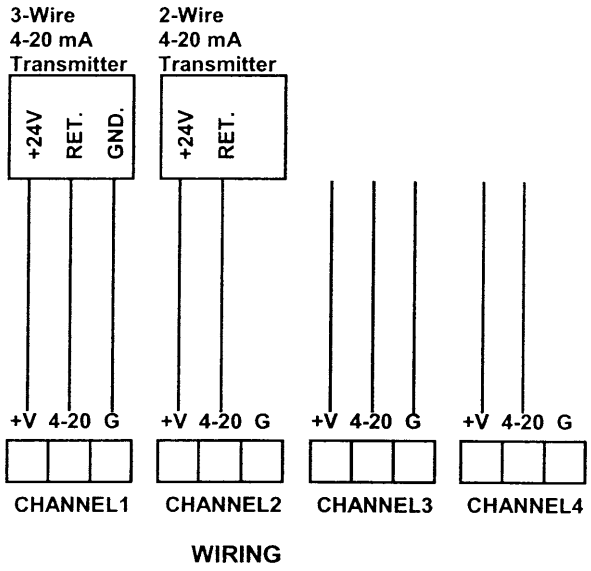
### Figure 5: 4-20 mA Wiring Guide




(Board Layout)

**3-Wire Transmitter Wiring:**
Applicable for any 3-wire, 4-20 mA transmitter and the BW LEL Plant Rat.

**2-Wire Transmitter Wiring:**
Applicable for any 2-wire, loop-powered, 4-20 mA transmitter and the BW I.S. Plant Rat, CD-420 gas detectors.



## POWER CONNECTION

**WARNING:** To avoid electrical shock, AC power must not be connected to the distribution panel (AC source) until all wiring procedures are completed.

**NOTE 1:** Be advised that main supply voltage fluctuations are not to exceed 10% of the nominal supply voltage.

**NOTE 2:** A circuit breaker shall be included in the building installation as a disconnect device for the equipment. The disconnect device shall be installed in close proximity to the equipment and the device shall be marked as a disconnecting means for the equipment.

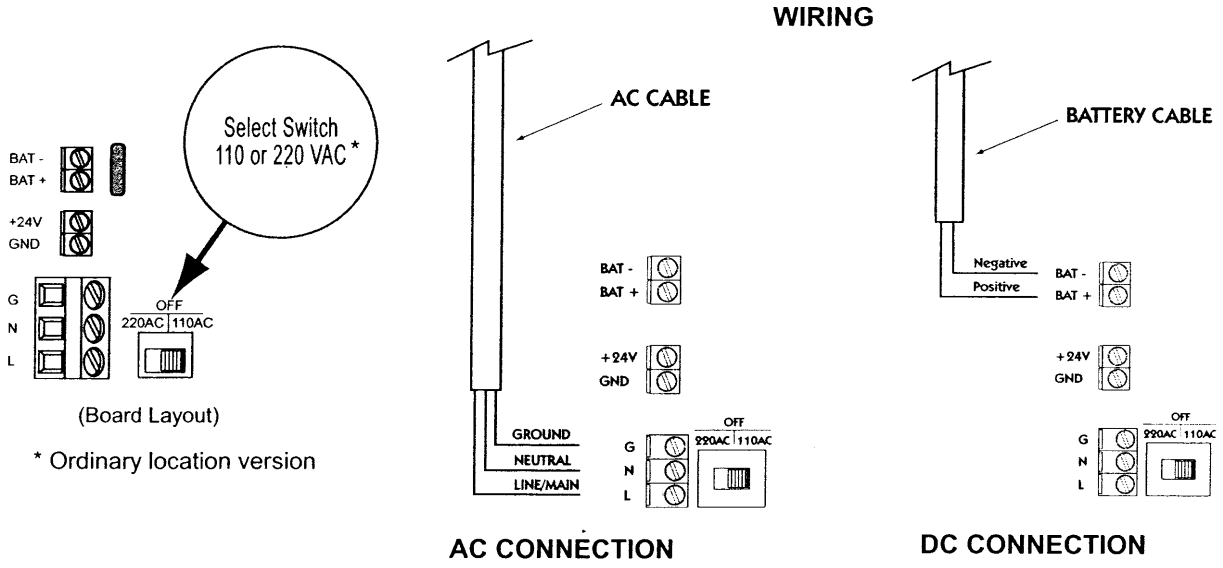
**NOTE 3:** Before applying power, set up the channel select switches. See page 12.

All power wiring must be in compliance with the requirements of applicable local electrical codes and regulations, as well as industry regulations.

1. Route the power cable through the far left cable/conduit port. Extend the cable until it reaches the AC terminal block.
2. Use a small, flat screwdriver to loosen the screw on the AC terminal block.
3. Strip approximately 5/16 inch (8 mm) of insulation from one end of each wire and insert wire at the assigned terminal. Secure terminal screws (do not overtighten the terminal screws). The AC power connections are made to the three-pin terminal block and are labeled N (neutral), L (line/hot), and G (ground).
4. Secure the wire in the grey cable tray.
5. Select either 110 or 220 VAC power by switching the power slide switch to 110 V or 220 V.
   **NOTE 4:** You can only select the power on the ordinary location version of the Controller.

**NOTE 5:** If External DC Power is preferred, the two pin terminal block labeled EXTERNAL +24 VDC can be used.

### Figure 6: Power Select Wiring Guide




## AUTO RESET

Fuses reset automatically when the circuit power returns to normal. No fuse replacement is required.

## RELAY CONNECTION

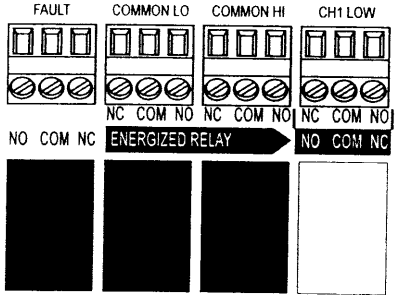
**Specifications**

| | |
|---|---|
| Type: | SPDT |
| Load: | Resistive Load (p.f. = 1) |
| Rated Load: | 10 amps at 120 VAC; 8 amps at 30 VDC |
| Carry Current: | 10 amps |
| Max. Operating Voltage: | 250 VAC; 125 VDC |
| Max. Operating Current: | 10A AC; 8A DC |
| Max. Switching Capacity: | 1250VA, 240W |

Four relay wiring ports are provided for your convenience. All Controllers are equipped with three standard relays: common fault; common low alarm, and common high alarm. Individual low and high channel alarms are a factory installed option.

1. Route the relay cable through each relay cable/conduit port. Extend the cable about 5.5 inches. Use a small, flat screwdriver to loosen connection on the relay terminal blocks required.
2. Strip approximately 5/16 inch (8 mm) of insulation from one end of each wire and insert wire at the selected terminal. Secure terminal screws (do not over tighten the terminal screws). The relay connections are made to the three-pin terminal block and are labeled NO (normally open), COM (common), NC (normally closed).
3. Select the configuration your require.

**Important:** See the **Alarm Relay Configurations** section before wiring optional channel relays to select energized or de-energized relay.




Common Relays

Channel Relay

## BATTERY BACKUP

The battery backup is an optional accessory to the CR-4000. Two 12 V, 1.8 Ah, rechargeable, sealed, lead acid batteries are connected in series to supply the 24 V backup. If the battery backup is included in the Controller, the battery wire harness has to be connected to the BAT+ and BAT- terminals during installation (see **Battery Connections** below). The battery backup is being charged all the time when an AC source or DC source is present.

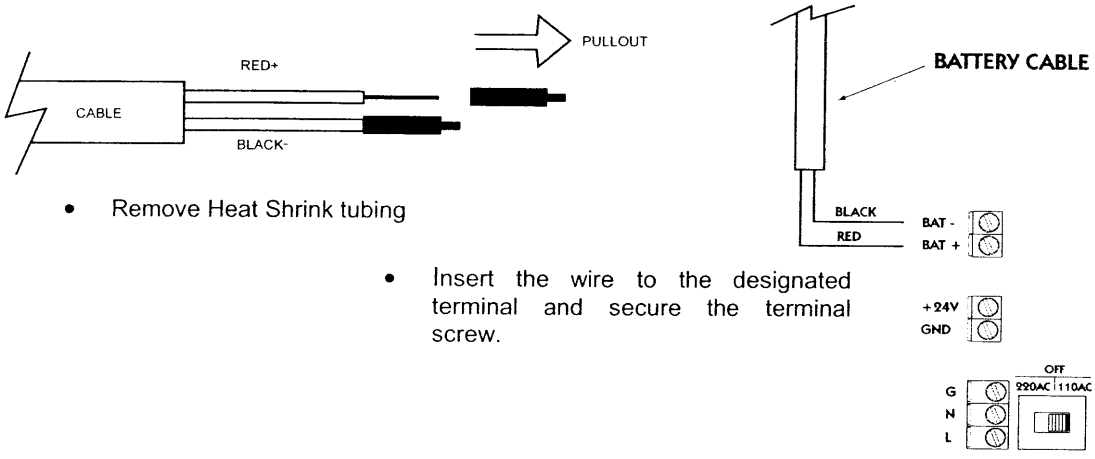
If the DC source is being used and the battery backup is required, the DC supply voltage should be at least equal to or higher than 24 V (27.5 V recommended) to charge the two batteries in series to its maximum capacity.

See **Figure 8: Battery Backup Kit Assembly Drawing** for field installation of optional battery.

## BATTERY CONNECTIONS

**CAUTION:** Pull out the heat shrink tubing from either the red or black wire. The heat shrink tubing has to be removed from each wire (red or black) one at a time to avoid shorting the wires.

### Figure 7: Battery Backup Connection




- Remove Heat Shrink tubing
- Insert the wire to the designated terminal and secure the terminal screw.

# SETUP

## INTRODUCTION

After installation is complete, controller setup must be performed prior to operation. Controller setup includes:

- ▲ selecting the proper sensor types and measuring ranges for each individual channel;
- ▲ low and high alarm settings;
- ▲ LCD zero and span calibration ;
- ▲ alarm relays setting (optional).

The following are the five basic steps of setting up the CR-4000 Controller and should be performed in this order.

A. **CHANNEL SELECT** – The channel select switches are factory set to 0 (zero) position. Setup the channel select switches before applying power to the Controller. (See Table 1 on page 12.)

B. **POWER UP** – Apply power to the controller.

C. **LCD DISPLAY CALIBRATION** – Follow the LCD display calibration procedures to zero and span the LCD of Channel 1. Repeat the LCD calibration for Channel 2, Channel 3, and Channel 4.

D. **ALARM SETUP** – Set the low alarm and high alarm trip-point as outlined in the alarm setup section. Repeat the alarm setup for Channel 2, Channel 3, and Channel 4.

E. **ALARM RELAY CONFIGURATIONS (OPTIONAL)** – If the optional alarm relays are present, follow the alarm relay configurations procedure to setup the low alarm and high alarm relays.

## A. CHANNEL SELECT

Set or change the gas measuring range by rotating the channel select switch - with the provided screwdriver - until the pointer of the rotary switch is positioned to the selected measuring range as described in the table below.

1. Identify the measuring range of the 4-20 mA transmitter installed to the Channel 1 terminal connection.
2. Setup the measuring range of the channel as described by channel select.
3. Repeat step #2 for Channel 2, Channel 3, and Channel 4.
4. If there is no transmitter installed to the channel terminal connection, leave the channel select switch at position 0 (zero).

Switch position to 0 (zero): If the channel select switch is positioned at zero, the power of the terminal connection is disabled and the LCD displays **OFF**.

*Sample*

0 - OFF

A - 0 to 200 ppm

**Table 1: Measuring Range Selection**

| Switch Position (Arrow Point) | LED Gas Indicator | Range | Display/Resolution |
|---|---|---|---|
| 0 | None | None | OFF |
| 1 | $O_2$ (% by vol.) | 0-25 (% by vol.) | 0.2 (% by vol.) |
| 2 | %LEL | 0-100% | 1% |
| 3 | PPM | 0-1.0 | 0.1 ppm |
| 4 | PPM | 0-5.0 | 0.1 ppm |
| 5 | PPM | 0-10 | 1 ppm |
| 6 | PPM | 0-10.0 | 0.1 ppm |
| 7 | PPM | 0-20 | 1 ppm |
| 8 | PPM | 0-50 | 1 ppm |
| 9 | PPM | 0-100 | 1 ppm |
| A | PPM | 0-200 | 1 ppm |
| B | PPM | 0-500 | 5 ppm |
| C | PPM | 0-1000 | 5 ppm |
| D | PPM | (Multi) 0-20mA | On |
| E | None | (Smoke) 0-20mA | On |
| F | N/A | N/A | N/A |

**NOTE 1** (Multi-Gas (0-20 mA) Application): For future use.

**NOTE 2** (Smoke Sensing Device (0-20 mA) Application): The smoke sensing device channel is used for devices with high output current in standby or non-alarm condition. Since the output current is too high to zero adjust, the LCD shows **On** when the channel is below the alarm trip-point and displays **AL** when the current of the device goes over the alarm trip-point. When setting the low and high alarm setpoints, the LCD display is the equivalent mA units. If the desired alarm setpoint is 18.5 mA, adjust the display to read 18.5 mA. All alarm indications will react to the detector the same as way it reacts to the 4-20 mA gas transmitter.

## B. POWER UP

On power up, the transmitter power of Channel 1 is enabled and the LCD of Channel 1 starts to countdown from 5. After the countdown, the LCD displays the signal level of the 4-20 mA transmitter installed to Channel 1. The startup continues with Channel 2 and so on until all the channels are enabled.

## C. LCD DISPLAY CALIBRATION

Since the measuring ranges of the channel select switches are fixed, the LCD reading is normally the equivalent value of the 4-20 mA transmitter measured by the particular channel.

The LCD zero and span adjustments of the Controller are useful to 4-20 mA transmitters that do not have zero and span adjustments and to fine adjust transmitters with significant tolerance between LCD display reading and the measured value of the transmitter.

**IMPORTANT:** Do the **zero adjust** procedure first before completing the LCD calibration with the **span adjust** procedure.

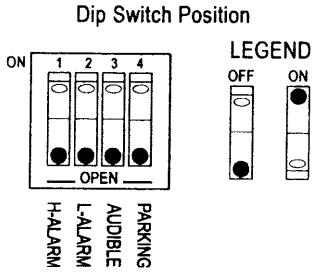
### ZERO ADJUST

1. Setup the calibration dip switches for zero adjust as described below in Table 2.
2. The LCD will alternately display the message **CAL** and the zero value of the transmitter.
3. Apply zero gas to the sensor of the 4-20 mA transmitter. Ambient air can be used as long as there is no surrounding gas present.
4. If the 4-20 mA transmitter is equipped with LCD display and zero/span adjust, adjust the zero of the transmitter until the display reads zero.
5. Press **Lamp Test** ▲ or **Reset Alarm** ▼ located in the front panel of the Controller to increase or decrease the existing value until the LCD of the selected channel reads zero.

### SPAN ADJUST

1. Set-up the calibration dip switches for span adjust as described below in Table 2.
2. The LCD will alternately display the message **SPn** and the span value of the transmitter.
3. Apply a known concentration of gas to the sensor of the 4-20 mA transmitter.
4. Press **Lamp Test** ▲ or **Reset Alarm** ▼ located in the front panel of the Controller until the LCD reading of the selected channel is the same as the concentration of test gas being used.

**NOTE:** It is recommended to use a test gas with a concentration of at least 25% of the full scale of the measuring range.




### Table 2: LCD Calibration - Dip Switch Position

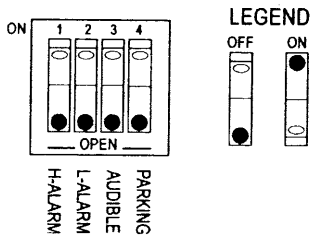
| | DIP SWITCH POSITION | | | |
|---|---|---|---|---|
| | **Alarm 1 (High)** | **Alarm 2 (Low)** | **Audible** | **Parking** |
| **Zero Adjust** | ON | ON | ON/OFF | OFF |
| **Span Adjust** | ON | ON | ON/OFF | ON |

A25 - Low 10 High 15

IR - 10 20

## D. ALARM SETUP

Each controller channel has a bank of four dip switches to setup the low alarm, high alarm, audible alarm, and parking mode. The alarm trip-point for low and high alarms are adjustable using the corresponding pushbutton switches and the configuration dip switch.




### LOW ALARM

To change the low alarm trip-point of the selected channel, toggle the **L-ALARM** dip switch to the **ON** position and the **H-ALARM** to **OFF**. The low alarm LED is turned on to indicate the alarm point is being changed. Press **Lamp Test** ^ or **Reset Alarm** v to increase or decrease the existing value.

### HIGH ALARM

To change the high alarm trip-point of the selected channel, toggle the **H-ALARM** dip switch to the **ON** position and the **L-ALARM** to **OFF**. The high alarm LED is turned on to indicate the alarm point is being changed. Press **Lamp Test** ^ or **Reset Alarm** v to increase or decrease the existing value.

### AUDIBLE ALARM

The audible alarm is common to all channels of the Controller. Any alarm conditions (low, high, or fault) of any channels will activate the audible alarm depending on the **AUDIBLE** switch position. To isolate the particular channel from the common audible alarm, toggle the **AUDIBLE** dip switch to the **OFF** position. A speaker off symbol is displayed on the LCD to indicate the channel is disabled from the common audible alarm.

### PARKING MODE

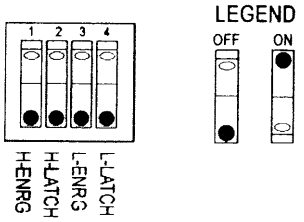
The parking mode is used specifically for the low and high alarm relays. When **PARKING** is selected (switch is **ON**), only one of the relays will be activated if the channel goes into alarm. That is, when the channel alarm condition changes from low alarm to high alarm, the low alarm relay will be deactivated and only the high alarm relay will be activated. If the **PARKING** switch is in the **OFF** position, the low alarm relay will remain activated.

## E. ALARM RELAY CONFIGURATIONS (OPTIONAL)

These procedures apply to Controllers with optional relay models only (CR4-R1000, CR4-R1200, CR4-R1230, and CR4-R1234).

Each controller channel has a bank of four dip switches designated to individually control the low alarm and high alarm relays. These control switches can be set to configure the desired relay to function as energized or de-energized, and to operate as latching or non-latching (self-clearing).

**Optional Low/High Alarm Relay Dip Switches**




When **L-ENRG** is selected (switch is **ON**), the low alarm relay of that particular channel is energized. Two wiring labels for normally open (N/O) and normally closed (N/C) contacts identify the terminal wiring of the relay. Use the label indicated by ENERGIZED RELAY if the energized relay is being selected.

When **L-LATCH** is selected (switch is **ON**), the low alarm relay of that particular channel will operate in latching mode. An alarm condition will activate and latch the selected relay and stay activated even if the channel goes out of alarm.

When **H-ENRG** is selected (switch is **ON**), the high alarm relay of that particular channel is energized. Two wiring labels for normally open (N/O) and normally closed (N/C) contacts identify the terminal wiring of the relay. Use the label indicated by ENERGIZED RELAY if the energized relay is being selected.

When **H-LATCH** is selected (switch is **ON**), the high alarm relay of that particular channel will operate in latching mode. A high alarm condition will activate and latch the selected relay and stay activated even if the channel goes out of alarm.

# OPERATION

## INTRODUCTION

Simple to use touch pads make the operation easy.

1. Display panel shows the status of the Transmitter
   - Alarms: Low (red), High (red), and Fault (amber)
   - Power: On, AC or DC (green)
   - Gas: Measuring ppm, % $O_2$, or % LEL
2. To perform a general system test, press **Lamp Test** ⮝ and all (6 per channel) LEDs are illuminated and the audible alarm is activated.
3. To display the maximum gas level detected (MGLD), press **Reset Alarm** ⮟. The **MAX** symbol and the MGLD will be displayed. The maximum gas level is continuously saved and will over write the previous level if a new, higher level is detected. To clear the MGLD, press and hold **Reset Alarm** ⮟ until the display reads **CLr** (approximately 3 seconds).
4. To reset the relay from latching, press **Reset Alarm** ⮟. Once the reset alarm switch is pressed, the alarm is acknowledged and the LED alarm indicator and relay will reset when the gas level drops below the latching alarm set point.

### Table 3: LCD Display Symbol/Message

| Message | Description |
|---|---|
| **OFF** | The channel is off. The channel select switch is positioned to 0 (zero). When the channel is in off mode, the power is not available to the channel power terminal (V+). |
| **-OL** | **Overload:** The signal level of the 4-20 mA transmitter is over 20 mA. |
| **-OC** | **Open Circuit:** No gas detector is installed. The common fault relay is activated and the LED fault indicator is turned on. |
| **-SC** | **Short Circuit:** The gas detector installed is causing a short in the power line of a particular channel. The common fault relay is activated and the LED fault indicator is turned on. |
| **-AL** | Channel in alarm if in smoke detector mode. |
| **-FC** | **Fault Condition:** The signal level of the 4-20 mA transmitter is below 2 mA. The common fault relay is activated and the LED fault indicator is turned on. |
| **Err** | **Calibration Error:** More than one channel is in calibration mode. The **Err** display ensures that only one channel at a time can be set for calibration. To clear the error message, switch **ALARM 1** and **ALARM 2** of the channels not being calibrated to the **OFF** position. |
| **MAX** | **Maximum Gas Level Detected (MGLD):** ppm / %LEL / %O2 (lowest level detected). |
| **CLr** | Maximum Gas Levels Detected (MGLD) are cleared. |
| 🔇 | **Disabled Audible Alarm:** The audible alarm is common to all channels and will be activated if any alarm condition exists. If the **AUDIBLE** switch of the selected channel is switched to the **OFF** position, that particular channel is isolated from the common audible alarm. A speaker off symbol is displayed on the LCD to indicate that channel is disabled from the common audible alarm. **NOTE:** If one of the other channel **AUDIBLE** switches are on, the audible alarm will still activate if that particular channel goes into alarm. |
| **CAL** | LCD display in calibrate mode (alternates with zero value of the transmitter). |
| **SPn** | LCD display is being spanned (alternates with the span value of the transmitter). |

## MAINTENANCE

The CR-4000 is designed to provide years of service with only regular care and minimal maintenance. At regular intervals inspect the instrument and check that it is operating normally.

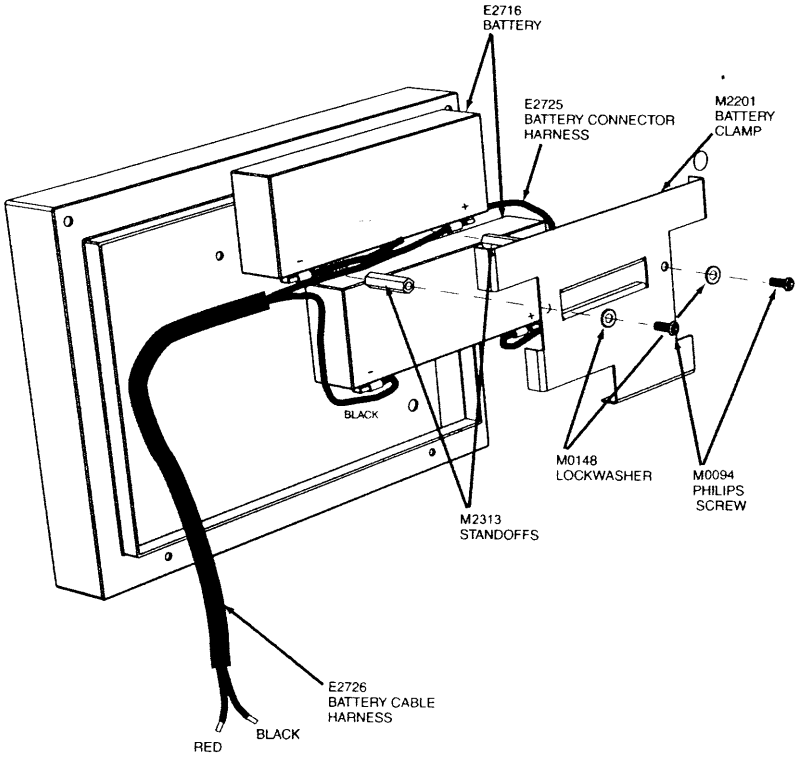
To clean the CR-4000 exterior, wash it with a mild soap and clean water.

### Table 4: Troubleshooting Guide

| PROBLEM | POSSIBLE CAUSE | SOLUTION |
|---|---|---|
| The AC power is activated and the LCD is blank. The LCD backlights are off. | The power slide switch is positioned to OFF. | Position the power slide switch to 110 AC or 220 AC depending on the voltage of the power source.* |
| The DC power is activated and the LCD shows blank. The backlights are off. | Blown fuse of the DC power supply.<br><br>The DC power supply has low current rating and cannot handle the load of the Controller. | Replace the fuse of the DC power supply.<br><br>Replace the external power supply. Make sure the external power supply has a minimum 1.5 A rating. |
| LCD shows **-OC**. Fault LED indicator is lit. | The 4-20 mA transmitter is not installed.<br><br>If installed, the wiring is not secured. | Make sure the transmitter wiring is connected properly to the terminal block.<br><br>Secure the wiring from the terminal block. |
| LCD shows **-FC**. Fault LED indicator is lit. | The signal from the 4-20 mA transmitter is less than 2 mA.<br><br>The 4-20 mA transmitter is not calibrated properly. | If the transmitter does not have zero and span adjustment, replace the transmitter.<br><br>Calibrate the zero and span of the 4-20 mA transmitter. |
| LCD shows **Err**. | Two or more channels are being calibrated at the same time. | Toggle all the **L-ALARM** and **H-ALARM** dip switches to off except for the channel. |
| LCD shows **-OL**. | The signal from the 4-20 mA transmitter over 20 mA. | Wait for the sensor to stabilize (common to any biased sensor, e.g., Ammonia). |
| High LED indicator is lit, common high alarm relay is activated, and the LCD display shows less than high alarm trip-point. | High alarm is latched. | Press **Reset Alarm** ▼ to acknowledge the alarm. |
| No audible alarm when low or high alarm condition exists. The speaker off icon is displayed. | The **AUDIBLE** switch is set to **OFF**. | Toggle the **AUDIBLE** switch to the **ON** position. The speaker off icon will disappear. |
| The green DC LED indicator is blinking.<br>**NOTE:** This indicates the power supply of the controller is low (below 17 V). | The Controller is using an external +24 VDC supply and the supply can not handle the load.<br><br>The Controller is using the backup battery and the battery is low. | Replace the external power supply. Make sure the external power supply has a minimum 1.5 A rating.<br><br>Recharge the battery backup. |

* Applicable in ordinary location version.

## Figure 8: Battery Backup Kit Assembly Drawing




**Field Installation**

1. Assemble as shown in the enclosure.
2. See page 8 for wiring connections.

To replace one of the sealed lead acid rechargeable batteries, remove the old batteries as shown in Figure 8, replace, and reassemble.

Replacement batteries must be lead acid 12 volt, 2.2 Ah. (Rechargeable batteries, Panasonic LCR12V2.2P or equivalent.) Do not use non-rechargeable batteries.

***Note***

*This instrument contains sealed lead acid rechargeable batteries. Spent batteries should be disposed of in accordance with local regulations and guidelines.*

## Table 5. Replacement Parts

| Qty. | Description | Part No. |
|---|---|---|
| 2 | 12 volt 2.2 Ah rechargeable battery | E2716 |
| 1 | Battery clamp | M2201 |
| 2 | Aluminum hex standoff | M2313 |
| 2 | Stainless steel lockwasher | M0148 |
| 2 | Philips screw | M0094 |
| 1 | Battery cable harness | E2726 |
| 1 | Battery connector harness | E2725 |

## NOTES

## SPECIFICATIONS

| | |
|---|---|
| **Power:** | Field Selectable for AC (115 and 230) or DC (24 VDC) |
| Electrical Supply: | 115 VAC, 0.36 A; 230 VAC 0.18 A; 50/60 Hz; 24 VDC, 1.5 A |
| Optional Back-up: | Rechargeable 12 volt battery kit supplies approx. 3 hours in normal operation dependant on the draw of each transmitter connected. |
| Fuse Rating: | 250 mA @ 30 watts |
| Fuse Type: | Resettable (Auto) |
| **Environmental:** | |
| Operating Temperature: | -4 to +122°F (-20 to +50°C) |
| Relative Humidity: | 5 to 99% (non-condensing) |
| Altitude: | Up to 2000 m (6,565 ft.) |
| Enclosure Rating: | NEMA 12 |
| **Physical:** | |
| Dimensions (d x w x h): | 2.4 x 13 x 9.5 in. (6 x 33 x 24 cm) approx. |
| Weight: | 4.85 lb. (2.2 kg) |
| Enclosure: | Enameled Steel RFI/EMI protected |
| Wire Terminations: | Screw type terminal block |
| Wiring Ports: | Seven 3/4 in. (22 mm) NPT ports |
| Mounting: | Wall mounted - equipped with hanging slots and hinged door |
| **Alarms:** | Two setpoints - user programmable - with simple rotary switch |
| Audible: | 85 dB buzzer |
| **Relay Outputs:** | SPDT Relays<br>Rated Load: 10 amps at 115 VAC; 8 amps at 230 VDC amp<br>Operation Load (Max): 250 VAC; 125 VDC |
| Alarm Relays: | Standard: One common low gas alarm, de-energized, non-latching<br>One common high gas alarm, de-energized, latching<br>One common fault, normally energized, non-latching<br>Optional: One low gas alarm and one high gas alarm (2) per channel<br>Field selectable energized/de-energized, latching/non-latching;<br>Zoning (Park) function and audible alarm ON/OFF |
| **Display Panel:** | Backlit LCDs: Four independent 3-digit alphanumeric status displays<br>%LEL, PPM, or $O_2$% by vol. readouts (field selectable)<br>LED Indicators: Alarms: Low (red), High (red), and Fault (amber)<br>Power: On, AC or DC (green)<br>Gas: Concentration Icon - ppm, $O_2$%, and %LEL |
| **Controls:** | Two large pushbutton controls:<br>Reset Alarm ▼ (acknowledge, peak exposures)<br>Lamp Test ▲ (audible/visual alarm test)<br>Alarm Setpoints: Simple up/down buttons |
| **Ratings and Certifications:** | |
| Area Classification: | General Purpose/Class I, Division 2 (under proper installation practices)<br>CE: Declared to electromagnetic compatibility directive and low voltage directive.<br>CAN/CSA C22.2 152 ANSI/ISA –S12.13 Part 1<br>ANSI/UL 913 C22.2 213<br>ANSI/ISA S82.01; CAN/CSA C22.2 No. 1010-1<br>IEC 61010-1 |
| Pollution Degree: | 2 |
| Installation Category: | II |
| **Warranty:** | Two years, non-prorated |

*DUE TO ON-GOING RESEARCH AND PRODUCT IMPROVEMENT, SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.*

## Limited Warranty & Limitation of Liability

BW Technologies Ltd. (BW) warrants this product to be free from defects in material and workmanship under normal use and service for a period of two years, beginning on the date of shipment to the buyer. This warranty extends only to the sale of new and unused products to the original buyer. BW's warranty obligation is limited, at BW's option, to refund of the purchase price, repair, or replacement of a defective product that is returned to a BW authorized service center within the warranty period. In no event shall BW's liability hereunder exceed the purchase price actually paid by the buyer for the Product.
This warranty does not include:

a) fuses, disposable batteries or the routine replacement of parts due to the normal wear and tear of the product arising from use;
b) any product which in BW's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation, handling or use;
c) any damage or defects attributable to repair of the product by any person other than an authorized dealer, or the installation of unapproved parts on the product; or

The obligations set forth in this warranty are conditional on:

a) proper storage, installation, calibration, use, maintenance and compliance with the product manual instructions and any other applicable recommendations of BW;
b) the buyer promptly notifying BW of any defect and, if required, promptly making the product available for correction. No goods shall be returned to BW until receipt by the buyer of shipping instructions from BW; and
c) the right of BW to require that the buyer provide proof of purchase such as the original invoice, bill of sale or packing slip to establish that the product is within the warranty period.

**THE BUYER AGREES THAT THIS WARRANTY IS THE BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. BW SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, WHETHER ARISING FROM BREACH OF WARRANTY OR BASED ON CONTRACT, TORT OR RELIANCE OR ANY OTHER THEORY.**

Since some countries or states do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any provision of this warranty is held invalid or unenforceable by a court of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

# GasPoint

## Gas Transmitter

# Installation and Operating Instructions

## 4-20mA Fixed Gas Monitor

"INNOVATORS IN GAS DETECTION"

BW Technologies

13.2

BW Technologies LP
Calgary, Alberta

# ERRATA

GasPoint
118238

## The following information has changed in the user manual.

***Introduction*** (page 2)

The LCD is an intuitive user interface, indicating:
- when a toxic or combustible sensor has "failed" its self-test

**Changing the Alarm and Calibration Gas Setpoints** (page 10)

**Table 4. Factory Default Setting - Select Measuring Ranges**

| Gas Sensed | Units of Measure | Select Measuring Range | | | Range LO 4 Range HI 5 | Alarm Setpoints | | Calibration Gas |
|---|---|---|---|---|---|---|---|---|
| | | Factory Default 4. Open 5. Open | Or Select 4. Closed 5. Open | Or Select 4. Open 5. Closed | Or Select 4. Closed 5. Closed | Factory Defaults (Field Settable) | | Factory Default Value Level Expected Note 2 |
| | | 1 | 2 | 3 | 4 | LOW | HIGH | |
| Hydrogen Cyanide (HCN) | ppm | 0 to 20.0 | N/A | N/A | N/A | 4.7 ppm | 10 ppm | 17 ppm |

***Connecting the Controller and Power Supply*** (page 12)

3. During the countdown to normal operation, the transmitter will communicate with the sensor, determine the sensor type, test the sensor integrity, test all circuitry, and allow the sensor to stabilize before normal operation begins. The transmitter will also determine the sensor range. Once the initialization is complete, the transmitter enters normal operational mode (in the system loop) providing a signal to the controller of the gas present.

***Fault Alarm Conditions and Advice*** (page 17)

| Fault Condition | |
|---|---|
| **SENSOR SELF-TEST FAIL** (At start-up, the self-test has failed) | |

***Order Numbers*** (page 29)

**Transmitters c/w Sensor Assemblies and Relays**

GP-LD Transmitter c/w hydrogen chloride sensor

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# Installation and Operating Instructions

### *Manufacturer's Notes and Warnings*

1. Read the Safety Warnings and Cautions at the beginning of this manual.
2. The GasPoint is fully tested and calibrated in the factory.
   Installation of the GasPoint should be done by qualified personnel.

## *GasPoint Element Drawings (1a, 1b, and 1c)*

**Figure 1a: GasPoint Monitor**

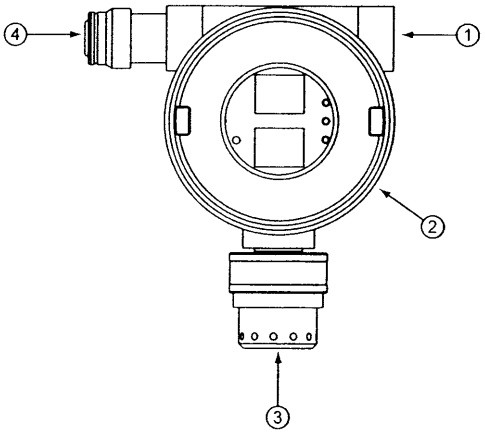



**Table 1a: GasPoint Monitor**

| Item | Description |
|---|---|
| 1 | Cable conduit access |
| 2 | Explosion-proof enclosure |
| 3 | Sensor |
| 4 | Calibration pushbutton |

**Figure 1b: Control Bay**

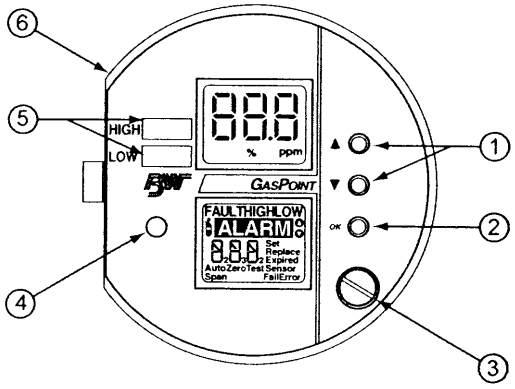



**Table 1b: Control Bay**

| Item | Function |
|---|---|
| 1 | Edit buttons: increment/decrement value |
| 2 | OK button: access user setpoints, or save displayed values |
| 3 | Faceplate security screw |
| 4 | Low light sensor |
| 5 | High/Low alarm settings: user label |
| 6 | Slip hinge |

**Figure 1c: Liquid Crystal Display**

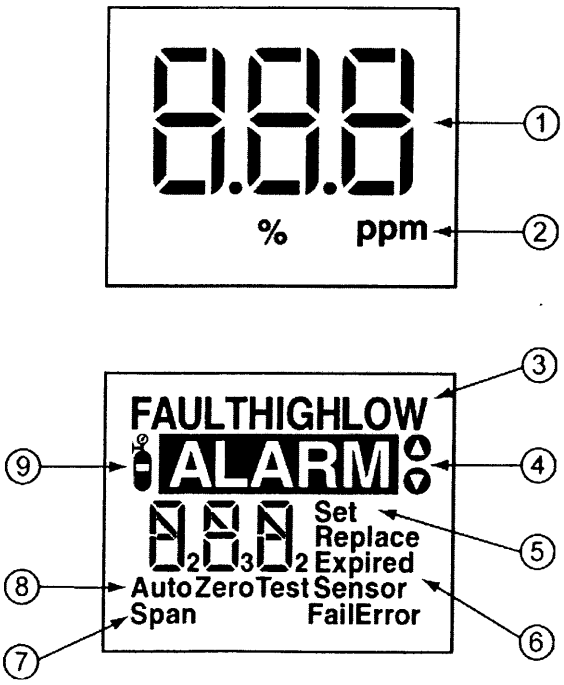



**Table 1c: Liquid Crystal Display**

| Item | Function |
|---|---|
| 1 | Numeric reading |
| 2 | Units of measure (ppm or %) |
| 3 | Alarm level/type |
| 4 | Increment/decrement prompt arrows |
| 5 | Set value arrow prompts |
| 6 | Sensor advice |
| 7 | Span advise icon |
| 8 | Automatic zero advise icon |
| 9 | Apply gas advise icon |

## *Mounting the Enclosure*

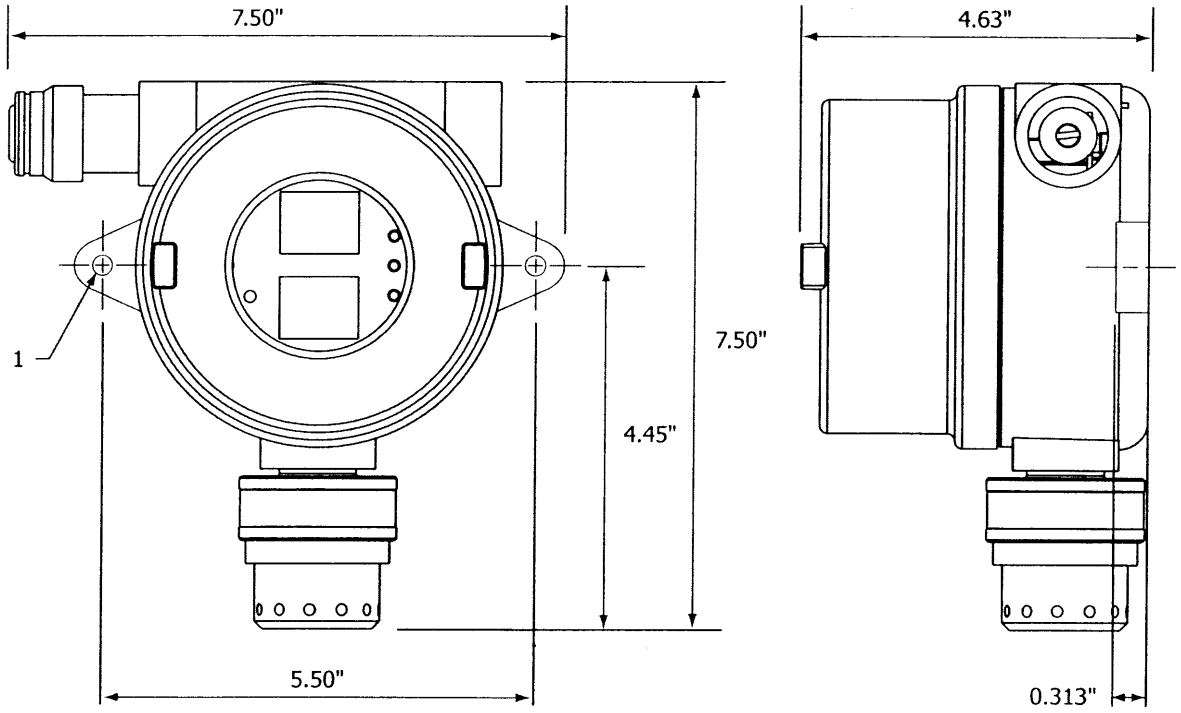
Modular design simplifies the installation of the GasPoint. The Transmitter's main board is mounted to the inner control door, which is equipped with slip hinges. The Transmitter's back enclosure contains the relays and power board and is equipped with a threaded 3/4 inch NPT conduit fitting outlet and pre-drilled mounting flanges. Power and signal lines connect to the plug-in terminal block on the power board. The GasPoint may be disassembled, simplifying the installation.

**Recommend:** Qualified personnel should perform the installation according to applicable electrical codes, regulations, and safety standards. Ensure correct cabling and sealing fitting practices are implemented.

Install the GasPoint. The predrilled mounting flanges: I.D. 0.25 on 5.5 inch centers.
It is preferable to attach the Transmitter to a wall or bracket, using bolts through the two mounting holes. These mountings, however, may be omitted if the electrical conduit is sufficiently rigid to support the weight of the Transmitter.

**Note:** The sensor should never be installed pointing upwards.

**Figure 2: Outline Drawing**




1 Mounting Holes (0.250 inch diameter)

## 4-20 mA Loop Installation

**Cable Routing:** Separate cables are required for each GasPoint. In classified areas cable should be in conduit or should be approved hazardous location cable.

**Power Supply:** Ensure power supply meets the minimum requirements of all components of your system (i.e., alarms, relays, etc.). BW recommends that the power supply be regulated.

**Caution:** Polarity must be observed. If the RETURN and +24 volt wires are reversed, the GasPoint Transmitter will not work. Do not apply electrical power to the GasPoint until all connections are made, the sensor is in place, and the Transmitter is complete.

1. Remove the GasPoint cover, open the inner hinged control door and remove, if desired.
2. Attach the conduit, if applicable, and pull cable(s) into the enclosure.
3. Connect the 3-pin power terminal block.

   Return (R): 4-20 mA signal to the labeled terminal
   Supply (V): (+) positive (12-32 volts) to the labeled terminal
   Ground (G): Ground wire to the labeled terminal

**Note 1:** (If using shielded cable) To avoid radio frequency (RF) interference, the shield (including mylar) must be grounded. Simply tying a bare drain wire to ground will not ground a shield. Keeping the shield as short as possible, tie the shield to the internal grounding screw. Tie any unused wires to ground.

## Relay Cable Installation

GasPoint is equipped with three relays: low gas alarm, high gas alarm, and fault alarm. Select to connect the applicable relays required in each situation. Relay connections are labeled: NO (normally open), C (common), and NC (normally closed). Attach wires as required to the applicable terminals.

**Note 2:** The fault relay connections are reversed.

**Note 3:** Set the alarm dip switches before applying power. Once power is applied, if desired, change the alarm setpoints.

## Connecting the Controller and Power Supply

Ensure the GasPoint Transmitter is complete with external cover in place before applying power. Follow the procedures and recommendations in the Control Systems manuals to complete the installation.

1. Ensure the GasPoint is tied to the Controller ground, to the earth ground, and to the negative terminal of the power supply.
2. Attach wires to the Controller and power supply as shown in the wiring diagram.

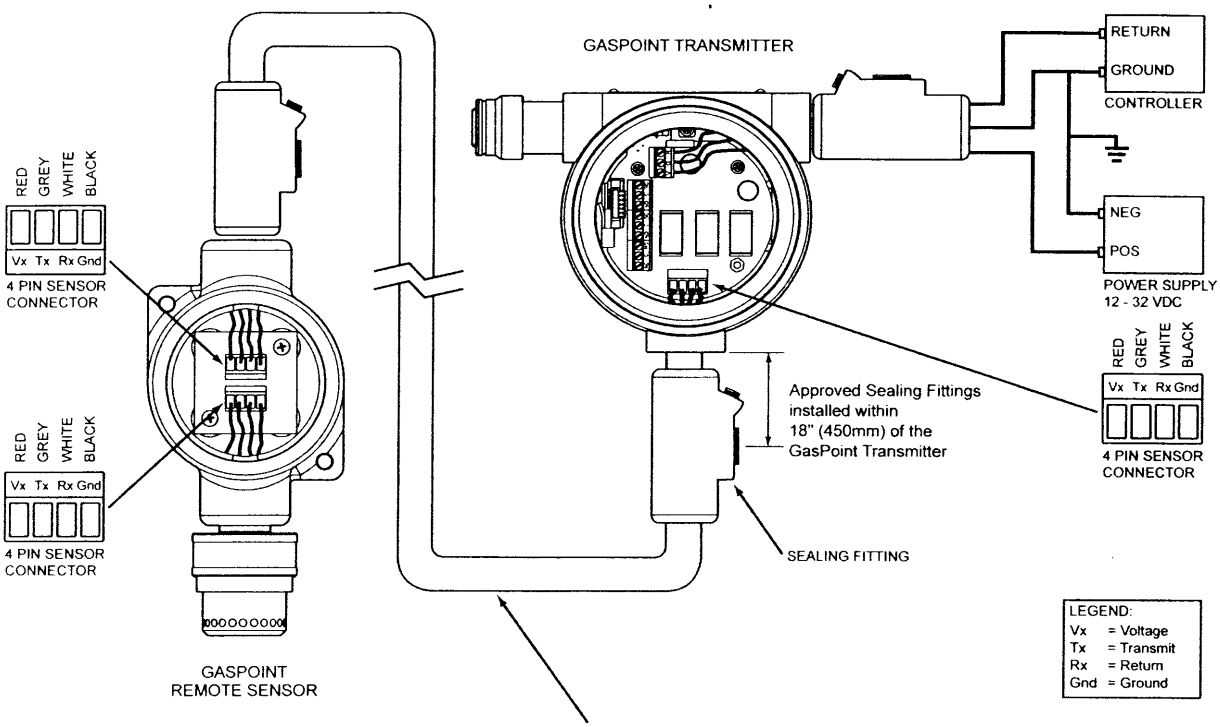
## Remote Sensor Separation Kit

The GasPoint sensor separation kit can be mounted at the following distances dependent of the cable size.

**Table 3: Distances for Sensor Separation Kit (equipped as follows)**

| Conductor Size | | Catalytic/IR Combustible Sensor | | Toxic/$O_2$ Sensor | |
|---|---|---|---|---|---|
| Sq mm | AWG | feet | meters | feet | meters |
| 0.64 | 22 | 619 | 188.5 | 1,548 | 472 |
| 0.75 | 20 | 985 | 300 | 2,463 | 750 |
| 1.0 | 18 | 1,564 | 476 | 3,912 | 1,174 |
| 1.5 | 16 | 2,487 | 758 | 6,218 | 1,895 |

**Figure 4: Sensor Separation Kit Wiring Diagram**




**APPROVED NATIONAL ELECTRICAL CODE INSTALLATION**

**CONDUIT** or **APPROVED HAZARDOUS LOCATION CABLE** connecting the Remote Sensor and Transmitter must have Sealing Fittings at both ends within 18" (450mm) of each unit.

**HAZARDOUS LOCATION CABLE** and **SEALING FITTINGS** must be approved for Class 1. Div. 1 Gr. B,C,D Hazardous Locations.

## Mounting the Sensor Separation Kit Enclosure

1. The separation kit is equipped with predrilled flanges: I.D. 3065 (7.68 mm) on 4.35 in (10.6 mm) centers.
2. Disconnect the wires from the Transmitter terminal block and remove the sensor from the Transmitter. Screw the sensor fully into the separation kit housing and install the wires, as shown on the diagram, to the adjacent terminal block in the separation kit.
3. Install cable as shown. Ensure correct cabling and sealing fitting practices are implemented.

## *Dip Switch Settings*

The dip switches are located on the upper control board. To access the dip switch banks, remove the top of the explosion-proof enclosure, loosen the control board access screw (located just below the buttons), and open the control door which is on slip hinges. The dip switches are clearly labeled.

**Caution:** The GasPoint must be powered down before removing the outer cover. If it is in a classified area, either remove the GasPoint or declassify the area.

**Note:** Any latched relay will be released upon one push of the external button.

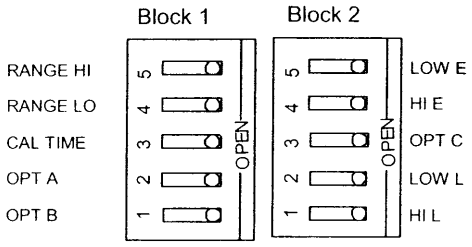



**Table 5: Dip Switches**

| Dip Switch | | Function |
|---|---|---|
| Block 1: Calibration and Measuring Ranges | | |
| 1 | OPT B | Not used |
| 2 | OPT A | Not used |
| 3 | CAL TIME | Calibration wait period<br>Open - 0.5 min.<br>Closed - 6 min. |
| 4 | RANGE LO | Set measuring range |
| 5 | RANGE HI | Set measuring range |
| Block 2: Gas Alarm Relay Settings | | |
| 1 | HI L<br>(High alarm) | Open - Non-latching relay<br>Closed - Latching relay |
| 2 | LOW L<br>(Low alarm) | Open - Non-latching relay<br>Closed - Latching relay |
| 3 | OPT C | Not used |
| 4 | HI E<br>(High alarm) | Open - De-energized relay<br>Closed - Energized relay |
| 5 | LOW E<br>(Low alarm) | Open - De-energized relay<br>Closed - Energized relay |

## Changing the Alarm Setpoints and Calibration Gas Setpoints

The setpoint mode allows the user to change the calibration gas concentration level, the low alarm setpoint, and the high alarm setpoint. See **Select Field Settings** for factory default settings. To change the values:

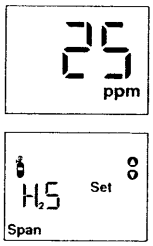
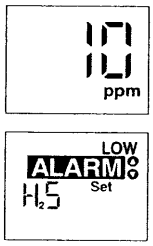
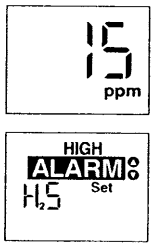
1. Screw off the enclosure top. (Allows access to edit buttons).
2. Press OK button for 2 seconds to access setpoint mode and change factory default settings.

GAS ALARM SETPOINTS:

1. GasPoint is equipped with two setpoints, low and high.
2. If only one setpoint is required, set one level to zero to turn it off. Set the other setpoint as desired.

**Note:** If both low and high are set to the same value, the GasPoint will trigger a high alarm condition if that setpoint is met or exceeded.

3. To turn off both alarm levels, set both setpoints to zero.

| Changing Setpoints | LCD Icons Displayed | Display |
|---|---|---|
| **CHANGE THE CAL GAS CONCENTRATION LEVEL**<br>The LCD will first display the current cal gas concentration value. Press OK to accept the current displayed value or proceed to change the value.<br>**Set new calibration gas level**<br>• Press ▲up button to increase the value.<br>• Press ▼down button to decrease the value.<br>• Press OK button to accept the new value displayed on the screen and end the set calibration gas level.<br>**Note 1:** The factory default span for $O_2$ is set at 20.9% and cannot be adjusted. | • Numeric display shows current calibration gas value expected<br>• **Set Span** advice flashes<br>• Gas cylinder icon flashes<br>• Up/down arrow icons flash<br>• Gas monitored is constantly displayed |  |
| **CHANGE THE LOW ALARM SETPOINT**<br>The next screen displays the current low alarm setpoint as shown. Press OK to accept the current displayed value or proceed to change the value.<br>**Set new low alarm setpoint**<br>• Press ▲up button to increase the value.<br>• Press ▼down button to decrease the value.<br>• Press OK button to accept the new low alarm value displayed on the screen.<br>• For $O_2$, see Note 2 below. | • Numeric display shows current low alarm setpoint<br>• **LOW ALARM Set** advice lights<br>• Up/down arrow icons flash<br>• Gas monitored is constantly displayed |  |
| **CHANGE THE HIGH ALARM SETPOINT**<br>The next screen displays as shown.<br>**Set new high alarm setpoint**<br>• Press ▲up button to increase the value.<br>• Press ▼down button to decrease the value.<br>• Press OK button to accept the new high alarm value displayed on the screen.<br>• For $O_2$, see Note 2 below.<br>GasPoint will return automatically to normal operation and display gas currently present. | • Numeric display shows current high alarm setpoint<br>• **HIGH ALARM Set** advice lights<br>• Up/down arrow icons flash<br>• Gas monitored is constantly displayed |  |

3. **Settings Complete—Verification (optional)**
   Test the GasPoint using a gas cylinder other than the one used in the calibration steps. The gas concentration should not exceed the sensor's detection range. Confirm that the display shows the expected concentration.

**Note 2:** Oxygen low and/or high gas alarm setpoints can be set to either enrichment and/or deficiency alarms as desired. If the alarm setpoint is set below 20.9% (deficiency alarm), an alarm will be triggered if the concentration present is below 20.9%. If the alarm setpoint is set above 20.9% (enrichment alarm), an alarm will be triggered if the concentration present exceeds 20.9%. You can choose to set both alarms above or below 20.9%, or one alarm above and one below 20.9%.

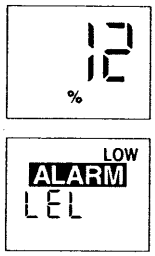
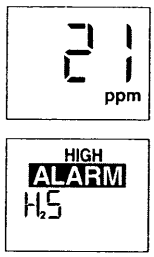
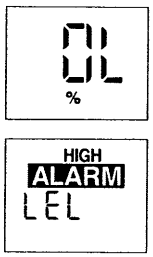
## *Gas Alarm Conditions and Advice*

If the current gas concentration meets or exceeds either alarm setpoint, the GasPoint gas alarm functions will activate.

**Note 1:** If both or either gas alarm is turned off (set to zero or set to the same value), then no gas alarm condition will exist for that alarm level.

The following alarm advice will activate in any gas alarm condition (low or high):

- The backlight will activate.
- The 4-20 mA loop output will be normal (from 4 to 20 mA according to calibrated values).
- When the alarm condition no longer exists, GasPoint will exit alarm mode and enter normal operations. **Exception:** If a relay is set to the latching position on either low or high gas alarm, the relay will remain on until the alarm is reset (acknowledged). Press the external button to reset the relay.

| Alarm Condition | Alarm Relay | LCD Icons Displayed | Display |
|---|---|---|---|
| **LOW GAS ALARM**<br>The current gas concentration present meets or exceeds the low alarm setpoint.<br><br>For $O_2$, see Note 2 below. | Low alarm relay triggers field interface if the relay is connected and a low alarm setpoint is entered. | • Numeric display will show the gas currently present (ppm/%)<br>• **LOW** icon lights<br>• **ALARM** icon flashes<br>• Gas type monitored is constantly displayed |  |
| **HIGH GAS ALARM**<br>If the current gas concentration present meets or exceeds the high alarm setpoint.<br><br>For $O_2$, see Note 2 below. | High Alarm Relay triggers a field interface if the relay is connected and a high alarm setpoint is entered. | • Numeric display will show the gas currently present (ppm/%)<br>• **HIGH** icon lights<br>• **ALARM** icon flashes<br>• Gas type monitored is constantly displayed |  |
| **OVER RANGE (over level or over range) GAS CONDITION**<br>If the gas concentration present meets or exceeds the full measuring range. | | • **OL** icon lights<br>• Gas type monitored is constantly displayed<br>• **Note:** If the alarms are turned off, then no alarm icons will be displayed. |  |

**Note 2: (Also see Note 2 on page 13)** An Oxygen alarm level will depend on which alarm setpoints have been set to low and high. The Oxygen low and/or high gas alarm setpoints are user selectable for either enrichment and/or deficiency alarms as desired.

**Caution:** High off-scale readings may indicate an explosive concentration.

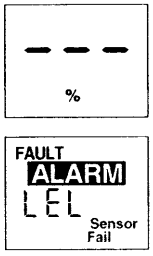
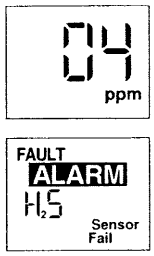
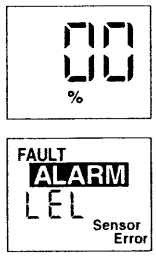
## *Fault Alarm Conditions and Advice*

In the event of a fault condition, the fault alarm will trigger activating any connected field interface. GasPoint will advise which fault condition has occurred.

Under the fault alarm conditions:

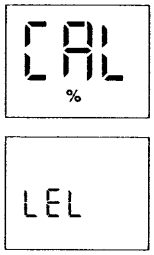
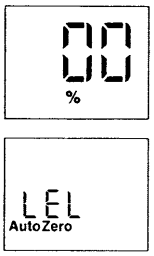
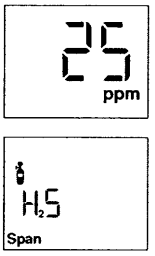
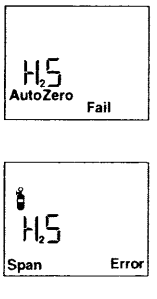
- The non-latching fault relay will be on (de-energized) during a fault condition.
- The backlight will activate.

When the problem is corrected, GasPoint automatically returns to normal operation.

| Fault Condition | 4-20 mA Output | LCD Icons Displayed | Display |
|---|---|---|---|
| **SENSOR SELF-TEST FAIL** (The self-test has failed) | 2.00 mA | • Three (3) bars will flash on numeric display.<br>• **FAULT** icon lights<br>• **ALARM** icon flashes<br>• **Sensor Fail** advice lights<br>• Gas type monitored is constantly displayed |  |
| **SENSOR FAULT** (No communication) | 2.00 mA | • Numeric display will read the last value (ppm/%) present before sensor fault occurs<br>• **FAULT** icon lights<br>• **ALARM** icon flashes<br>• **Sensor Fail** advice lights<br>• Gas type monitored is constantly displayed |  |
| **SENSOR DRIFT** | 2.00 mA | • Numeric Display will read **00**<br>• **FAULT** icon lights<br>• **ALARM** icon flashes<br>• **Sensor Error** advice lights and flashes<br>• Gas type monitored is constantly displayed |  |

## *Automatic Calibration Routine*

Calibration can be run at any time during normal operation except the self-test period (from 10 minutes before the self-test until the self-test is complete). Calibration is a one-man operation and virtually automatic.
**Note:** For calibration gas concentrations and flowrates for each gas, see **Appendix A**.

| Calibration Steps | LCD Icons Displayed | Display |
|---|---|---|
| **START CALIBRATION**<br>1. Press and hold the external button down while the LCD displays the alarm setpoints. Continue to hold the button until the display reads **CAL** (approximately 5 seconds) and then release the button.<br>• The 4-20 mA output will be 3 mA throughout calibration. Calibrating the GasPoint will not cause false alarms at the Controller. | • First, the low and high alarm setpoints will be displayed (8 seconds approximately)<br>• Next, the **CAL** icon lights for 3 seconds<br>• Gas type is constantly displayed<br>• Backlight is activated |  |
| **AUTO ZERO**<br>2. The GasPoint will then take a zero level reading.<br>• Combustible and Toxic sensors: If background gas is present, apply zero gas (pure air or 100% Nitrogen) to zero the sensor. Restart the calibration sequence.<br>• Oxygen sensor: Gas is not required. Auto zero sequence will take 30 to 60 seconds. | • Numeric display will read **00**<br>• **Auto Zero** advice flashes<br>• Gas monitored is constantly displayed |  |
| **AUTO SPAN**<br>3. Insert cal cap (1) and apply gas to the sensor for approximately 2 minutes (Ammonia 5 minutes). (See **Appendix A** for concentrations and flowrates.)<br>4. When the countdown (300 to 00) begins, span is complete. Disconnect the gas.<br>• If Span Fails: Check calibration gas cylinder used and concentration expected. Replace the cylinder and/or change the cal gas expected value, if required. Recalibrate.<br>• Oxygen Sensor: Use pure air calibration gas (20.9% $O_2$) in case of deficient to enriched atmosphere. | • Numeric display will show calibration gas value expected<br>• Gas cylinder icon flashes<br>• **Span** advice lights<br>• Gas type is constantly displayed<br>• After a successful calibration, GasPoint automatically returns to normal operation and displays the current reading (ppm or %) present |  |
| **CALIBRATION FAIL OR ERROR**<br>**Auto Zero Fail**: If the **Fail** icon lights, the LCD will display a countdown from 300 to 00, before GasPoint begins normal operation.<br>**Auto Span Error**: If the **Error** icon lights, the LCD will display a countdown from 300 to 00, before GasPoint begins normal operation.<br>**Note:** If either fail condition occurs, all previous information values are retained. Retry calibration. | • **Auto Zero:** If the target or an interfering gas is present, GasPoint will refuse to auto zero. The **Fail** icon lights. The **Fail** icon will also light if the external pushbutton is pressed during auto zero.<br>• **Span:** If the calibration gas is not within expected values, the GasPoint will refuse to span. The **Error** icon will light. |  |

Calibration is complete.



13.2

# MAINTENANCE SERVICE

## *Servicing the GasPoint*

**Disassembling:** Observe all safety and electrical codes and regulations before removing front cover. Unscrew the thumbscrew and open the service bay door.
**Assembling:** When reassembling the GasPoint, ensure that it is electrically complete. Close the service bay door. Ensure the thumbscrew is aligned and tighten it down. Replace the outside glass cover. Reapply power and reinitialize the Transmitter's power-up procedure (see **Power-Up**). Change the alarm setpoints if desired.
**Important:** Calibrate the GasPoint whenever a component is replaced.

## *Sensor Assembly Replacement*

To replace the entire sensor assembly:

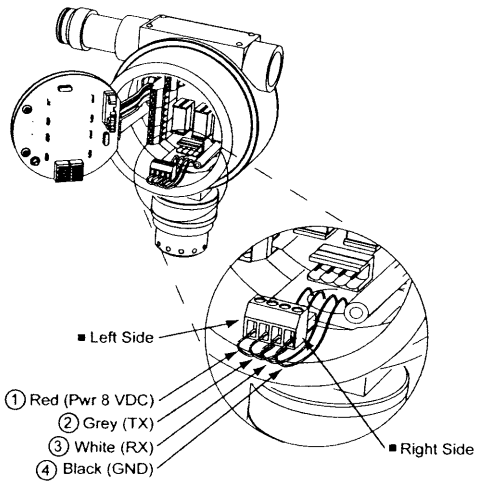
1. Disconnect the wires from the 4-pin plug-in terminal block at J5 on the power board and remove the old sensor.
2. Feed the new wires through the opening. Fully screw in the new sensor. Attach the wires to the plug-in terminal block. Ensure that all colored wires are correctly matched to the board labels from left to right. See Figure 5.

**Caution:** Check that all connections are correct. Incorrect wiring may damage the sensor and/or the power board.

3. See **Dip Switch Settings** (Table 5) to select a measuring range if required.

For sensor replacement part numbers see **Appendix A**.

**Figure 5: Sensor Wiring Diagram**




| Sensor Wiring Configuration | | | |
|---|---|---|---|
| # | Board Label | Wire Color | Description |
| 1 | Pwr 8 VDC | Red | Power 8 VDC (left) |
| 2 | TX | Grey | Transmission |
| 3 | RX | White | Signal |
| 4 | GND | Black | Ground (right) |

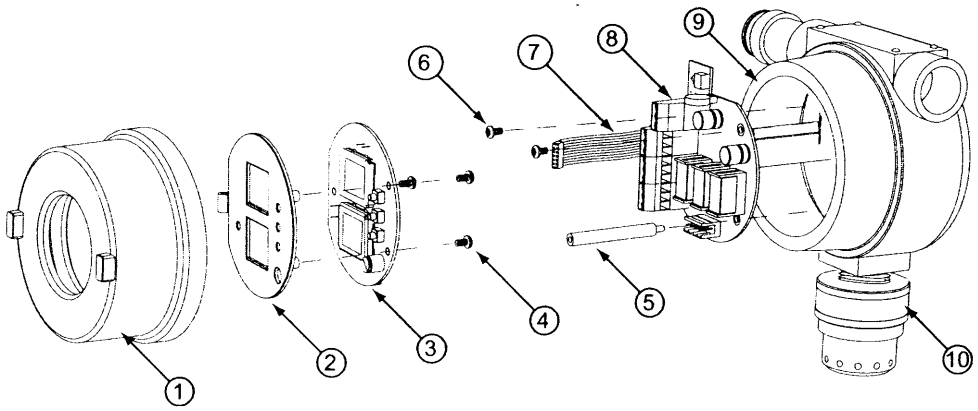
## *Other Component Replacement*

1. Unplug the sensor terminal block from the power board if required.
2. Replace the component, ensuring all wiring connections are complete and reassemble as shown below. (Also refer to the **Installation** section.)
3. Ensure all field selectable options are set (measuring range, etc.).
4. Apply power and reinitialize power-up.
5. Set the alarm setpoints if required.

**Table 6: GasPoint Replacement Parts**

| # | Qty. | Description Rating/TOL | Part # |
|---|---|---|---|
| 1 | 1 | External faceplate window cover | M1147 |
| 2 | 1 | Internal hinged door faceplate cover | M2345 |
| 3 | 1 | Transmitter main LCD board (PCB) | E2737/2 |
| 4 | 3 | #6-32 x 1/4 inch machine Phillips screws | M0262 |
| 5 | 1 | Threaded stand-off – accepts thumbscrew | M2394 |
| 6 | 2 | #6-32 x 1/4 inch machine Phillips screws | M0262 |
| 7 | 1 | Plug-in ribbon cable | E2802 |
| 8 | 1 | Power/Relay Board (PCB) | E2739/1 |
| 9 | 1 | Transmitter housing c/w external switch | M2346K |
| 10 | 1 | Sensor Assembly | Appendix A |

**Figure 6: Assembly Drawing**






13.2

# *Appendix A*

Sensor Information
Sensor Specifications ..... 26
Relative Sensitivity of Combustible Gases ..... 27
Instrument Specifications ..... 28

## *Relative Sensitivity of Combustible Gases/Vapors*

**Recommend:** For the most accurate measurements, calibrate using the gas or vapor under investigation. Where this is not possible see the applicable catalytic or infrared relative sensitivity table for combustible gases/vapors. The GasPoint catalytic and combustible sensors are calibrated to methane (with 50% methane calibration gas) at the factory prior to shipping.

**Catalytic Sensor Relative Sensitivity of Common Combustible Gases/Vapors**

| Gas/Vapor | Relative Sensitivity | Gas/Vapor | Relative Sensitivity |
|---|---|---|---|
| Methane | 100 | Carbon monoxide | 105 |
| Propane | 60 | Hydrogen | 100 |
| n-Butane | 60 | Ammonia | 125 |
| n-Pentane | 50 | Cyclohexane | 50 |
| n-Hexane | 40 | Ethylene | 85 |
| Acetylene | 80 | | |

**Note**: Each sensitivity has been rounded to the nearest 5%.

**Catalytic Bead Combustible Sensor**
The table shows the variation of the catalytic combustible sensor on exposure to a range of gases and vapors at the same %LEL concentration. The figures are expressed relative to the methane signal (=100).
The results are intended for guidance only. For a more accurate measurement calibrate using the gas or vapor under investigation.

**Special Note on the Combustible Sensor:**
Catalytic Poisons - Certain substances have a detrimental effect on all catalytic bead sensors. The GP-WD combustible sensor has a higher degree of poison resistance and will outperform other catalytic bead sensors in poisonous atmospheres. However, catalytic sensors should not be exposed for prolonged periods of time to lead or sulfur containing compounds, silicones, or phosphates. Action is cumulative and may result in an irreversible decrease in sensitivity. Certain other compounds, such as halogenated hydrocarbons and hydrogen sulfide, may temporarily inhibit the sensor performance, but in most cases it will recover after a period in clean air.

**Standard Model IR GasPoint Relative Sensitivity to Applicable Combustible Gases/Vapors**

| Gas/Vapor | Relative Sensitivity | Gas/Vapor | Relative Sensitivity |
|---|---|---|---|
| Acetone | 60 | n-Hexane | 325 |
| n-Butane | 450 | Methane | 100 |
| iso-Butane | 450 | n-Pentane | 390 |
| Butane-1 | 450 | iso-Pentane | 390 |
| cis-Butane-2 | 450 | Propane | 410 |
| trans-Butane-2 | 450 | Propanol | 230 |
| Ethane | 450 | Propylene | 310 |
| Ethanol | 330 | o-Xylene | 100 |
| Ethylene | 80 | m-Xylene | 100 |
| n-Heptane | 325 | p-Xylene | 100 |
| MEK | 365* | Methanol | 80* |
| IPA | 410* | Toluene | 25* |
| Ethyl Chloride | 120* | Mythyl Chloride | 100* |

* The relative sensitivity is just an estimate.
**NOTE**: This table is intended for guidance only.
Always calibrate using the gas or vapor under investigation.

**Infrared Combustible Sensor**
The standard model IR Combustible GasPoint is calibrated to methane. The table shows the variation of the IR (infrared) combustible sensor on exposure to applicable group combustible hydrocarbon gases and vapors at the same %LEL concentration. The figures are expressed relative to the methane signal (=100).
The results are intended for guidance only. For a more accurate measurement, calibrate using the gas or vapor under investigation.
**Note:** If the hydrocarbon desired is not listed, special models are available for other groups of hydrocarbons.
For IR sensors, use the specified gas to calibrate the system. IR sensors work very well in low or no Oxygen conditions. IR sensors monitors the molar concentration of the specific gases by a physical method. No chemical reaction takes places inside the sensor.
**Caution:** IR systems should always be calibrated as soon as you install the system to compensate for any change in pressure.

## *ORDER NUMBERS*

### Transmitters c/w Sensor Assemblies and Relays

| | |
|---|---|
| GP-WD | Transmitter c/w Combustible Sensor |
| GP-IR-WD | Transmitter c/w IR Combustible Sensor |
| GP-HD | Transmitter c/w Hydrogen Sulfide Sensor |
| GP-MD | Transmitter c/w Carbon Monoxide Sensor |
| GP-SD | Transmitter c/w Sulfur Dioxide Sensor |
| GP-ZD | Transmitter c/w Hydrogen Cyanide Sensor |
| GP-XD | Transmitter c/w Oxygen Sensor |
| GP-AD | Transmitter c/w Ammonia Sensor |
| GP-DD | Transmitter c/w Nitrogen Dioxide Sensor |
| GP-CD | Transmitter c/w Chlorine Sensor |
| GP-VD* | Transmitter c/w Chlorine Dioxide Sensor |
| GP-YD* | Transmitter c/w Hydrogen Sensor |
| GP-LD* | Transmitter c/w Hydrogen Chloride Sensor |
| Add Suffix "-SS" | For optional stainless steel Transmitter enclosure |

*Contact BW Technologies (page ii) for sensor availability
**Note:** Sensor Assembly enclosures are stainless steel (standard)

### Accessories and Spares

| | |
|---|---|
| GP-1 | Gas Transmitter only c/w LCDs and Relays (No Sensor) |
| GP-SEP | Sensor Separation Kit |
| GP-MBUS3 | MODBUS Communication Expansion Module |
| SS-RW02 | Combustible Sensor Assembly |
| IR-RW03 | IR Combustible Sensor Assembly |
| SS-RH02 | Hydrogen Sulfide Sensor Assembly |
| SS-RM02 | Carbon Monoxide Sensor Assembly |
| SS-RS02 | Sulfur Dioxide Sensor Assembly |
| SS-RA02 | Ammonia Sensor Assembly |
| SS-RZ02 | Hydrogen Cyanide Sensor Assembly |
| SS-RD02 | Nitrogen Dioxide Sensor Assembly |
| SS-RX02 | Oxygen Sensor Assembly |
| GP-CAL-3 | Non-conductive Remote Calibration Cup and Splash Guard |
| GP-SSCAL4 | Stainless Steel Remote Calibration Cup and Splash Guard |
| GP-SSPLASH4 | Stainless Steel Splash Guard |
| GPOINT-B | GasPoint Pushbutton protective boot |
| D1374/4 | Manual |

### Limited Warranty & Limitation of Liability

BW Technologies Ltd. (BW) warrants this product to be free from defects in material and workmanship under normal use and service for a period of two years, beginning on the date of shipment to the buyer.

This warranty extends only to the sale of new and unused products to the original buyer. BW's warranty obligation is limited, at BW's option, to refund of the purchase price, repair, or replacement of a defective product that is returned to a BW authorized service center within the warranty period. In no event shall BW's liability hereunder exceed the purchase price actually paid by the buyer for the Product.

This warranty does not include:

a) fuses, disposable batteries or the routine replacement of parts due to the normal wear and tear of the product arising from use;
b) any product which in BW's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation, handling or use;
c) any damage or defects attributable to repair of the product by any person other than an authorized dealer, or the installation of unapproved parts on the product; or

The obligations set forth in this warranty are conditional on:

a) proper storage, installation, calibration, use, maintenance and compliance with the product manual instructions and any other applicable recommendations of BW;
b) the buyer promptly notifying BW of any defect and, if required, promptly making the product available for correction. No goods shall be returned to BW until receipt by the buyer of shipping instructions from BW; and
c) the right of BW to require that the buyer provide proof of purchase such as the original invoice, bill of sale or packing slip to establish that the product is within the warranty period.

THE BUYER AGREES THAT THIS WARRANTY IS THE BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. BW SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, WHETHER ARISING FROM BREACH OF WARRANTY OR BASED ON CONTRACT, TORT, OR RELIANCE OR ANY OTHER THEORY.

Since some countries or states do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any provision of this warranty is held invalid or unenforceable by a court of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

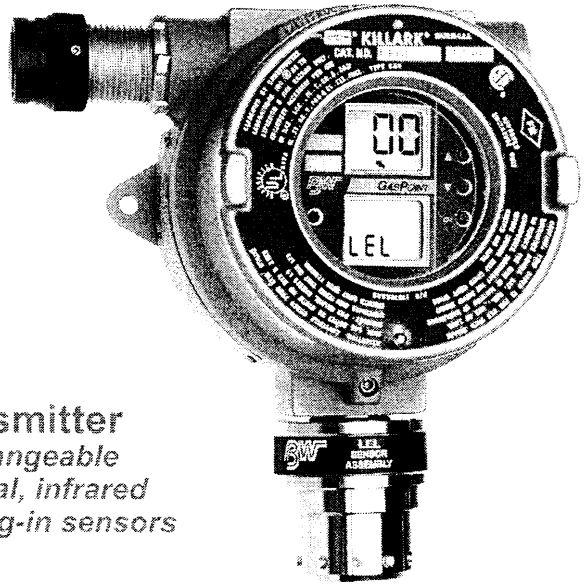
# GasPoint

## $H_2S$, CO, $NH_3$, HCN, $NO_2$, $SO_2$, $O_2$, $Cl_2$ Combustibles (Catalytic 0-100% LEL) or Combustibles (IR 0-100% LEL)

## *Gas Transmitter with Internal Alarm Relays*

"INNOVATORS IN GAS DETECTION"

BW Technologies




One Transmitter
*with interchangeable electrochemical, infrared and catalytic plug-in sensors*

ISO 9001

## Fixed Gas Monitoring Systems

### FEATURES:

The GasPoint transmitter provides a 4-20 mA output signal that can be connected to any control system (DCS, PLC, etc.). With advanced sensor technology and microcontroller based operation, the GasPoint provides continuous monitoring of hazardous gases.

- The GasPoint transmitter can accept any GasPoint sensor type: electrochemical, catalytic or IR (infrared). All plug-in sensor assemblies are field-interchangeable.
- Full function sensor integrity test (auto) continuously advises gas sensing ability and life ended
- Non-intrusive, one-person calibration with auto zero and auto span
- Equipped with three 5-amp relay contacts—two gas alarm relays (low/high) and fault alarm. Field-selectable normally energized/ de-energized and latching/non-latching alarm relay functions.
- Two backlit alphanumeric LCDs advise all environmental and gas hazard conditions as well as instrument and sensor status
- Remote toxic/oxygen sensors can be installed over 3,900 ft./ 1,100 m away; combustible sensors over 1,550 ft./475 m. Kit can be installed at any time.
- Alarm setpoints displayed on demand—simply press the external button
- Field programmable alarm levels
- Backlight (auto) in low light conditions and alarm
- Extensive fault diagnostics
- 2-way digital communication using MODBUS module

### Ordering Information

| | |
|---|---|
| GP-WD | Gas Transmitter w/ Combustible Catalytic Sensor |
| GP-IR-WD | Gas Transmitter w/ Combustible Infrared Sensor |
| GP-HD | Gas Transmitter w/ $H_2S$ Sensor |
| GP-MD | Gas Transmitter w/ CO Sensor |
| GP-AD | Gas Transmitter w/ $NH_3$ Sensor |
| GP-ZD | Gas Transmitter w/ HCN Sensor |
| GP-DD | Gas Transmitter w/ $NO_2$ Sensor |
| GP-SD | Gas Transmitter w/ $SO_2$ Sensor |
| GP-XD | Gas Transmitter w/ $O_2$ Sensor |
| GP-CD | Gas Transmitter w/ $Cl_2$ Sensor |

***Accessories and Spares***

| | |
|---|---|
| GP-POWER1 | 120-240 VAC Power Supply |
| GP-MBUS3 | 2-wire MODBUS Communication Expansion Module |
| GP-MBUS3-4 | 4-wire MODBUS Communication Expansion Module |
| GP-SEP | Sensor Separation Kit |
| GP-1 | Gas Transmitter |
| SS-RW02 | Combustible Catalytic Sensor Assembly |
| IR-RW03 | Combustible IR Sensor Assembly |
| GP-SSPB | Stainless Steel Process Baffle |
| GP-SSCAL4 | Stainless Steel GasPoint Splash Guard |
| GP-DUC-K1 | Duct Mount Adaptor |

***Replacement Sensor Assemblies***

| | | |
|---|---|---|
| SS-RH02.....$H_2S$ | SS-RM02.....CO | SS-RA02.....$NH_3$ |
| SS-RZ02.....HCN | SS-RD02.....$NO_2$ | SS-RS02.....$NO_2$ |
| SS-RS02.....$SO_2$ | SS-RX02.....$O_2$ | SS-RC02.....$Cl_2$ |


**www.gasmonitors.com**
Email: info@bwtnet.com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13.3

# GasPoint

***LEL, $H_2S$, CO, $NH_3$, HCN, $O_2$, $SO_2$, $Cl_2$ or $O_2$***

4-20 mA Gas Transmitter

Display advises:

- △ Gas type monitored
- △ Continuous (%LEL, %v/v or ppm) readout of gas concentration
- △ Alarm level and type encountered—LOW/HIGH or FAULT
- △ When sensor has failed its automatic daily self-test
- △ "Sensor Replacement" and "Sensor Expired" indications
- △ When to apply gas during calibration

### *Special Features*

Change gases monitored in the field at any time. The GasPoint Transmitter will recognize the sensor installed and test and reset itself to that sensor type.

No junction box connection required.

Daily sensor integrity test (auto) monitors sensor operation, length of time sensor has been in service and advises when sensor requires replacement.

GasPoint allows you to set or change calibration time and gas alarm setpoints in the field.

Select or modify the measuring range using a simple dipswitch.

The optional plug-in MODBUS expansion module provides an addressable communications interface (1-247).

*"INNOVATORS IN GAS DETECTION"*

BW Technologies


**For further information:**
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**www.gasmonitors.com**


BW1005-01-01-00-8.25x11-5006-3

## SPECIFICATIONS

**MONITOR:** 3-wire, 4-20 mA gas transmitter with advanced microcontroller-based circuitry
Power Input: 12 to 32 volts DC
Output Current: Normal Operation: Isolated linear 4-20 mA output
Calibration Mode: Steady 3 mA (auto reset to normal operation)
Fault Mode: 2 mA signal (and less)
Power Consumption: Toxic Versions: 40 mA at 24 VDC
Combustible Version: 100 mA at 24 VDC
Relays: 50 mA per relay at 24 VDC

**SENSORS:** Plug-in, smart sensors
Detection Type: Combustible gases: catalytic or IR; Toxic gases and Oxygen: electrochemical
Self-Test:: Automatic daily self-test of sensor integrity and sensor life
Relative Humidity: 5 to 95% RH non-condensing
Drift: Zero: <5% per year; Span: <10% per year

| Gas Monitoring Specifications | Detectable Accuracy | LCD Increment | Temperature Range | Units | Programmed Measuring Ranges |
|---|---|---|---|---|---|
| Combustibles - Catalytic | 1% | 1 | -40 to +90°C / -40 to +194°F | %LEL | 0-100 |
| Combustibles - Infrared | 1% | 1 | -40 to +70°C / -40 to +150°F | %LEL | 0-100 |
| $H_2S$ | 0.25 ppm | 1 | -40 to +50°C / -40 to +122°F | ppm | 0-20, 0-50, 0-100, 0-500 |
| CO | 1 ppm | 1 | -20 to +50°C / -4 to +122°F | ppm | 0-50, 0-100, 0-500, 0-1,000 |
| $NH_3$ | 1 ppm | 1 | -10 to +50°C / +14 to +122°F | ppm | 0-200, 0-50, 0-500, 0-1,000 |
| HCN | 0.1 ppm | 0.1 | -20 to +50°C / -4 to +122°F | ppm | 0-20.0, 0-50.0, 0-100 |
| $NO_2$ | 0.1 ppm | 0.1 | -20 to +50°C / -4 to +122°F | ppm | 0-50.0, 0-10.0, 0-20.0, 0-99.9 |
| $SO_2$ | 1 ppm | 1 | -20 to +50°C / -4 to +122°F | ppm | 0-100, 0-50, 0-20, 0-10 |
| $O_2$ | 0.1% | 0.1 | -20 to +50°C / -4 to +122°F | %v/v | 0-30.0% |
| $Cl_2$* | 0.1 ppm | 0.1 | -20 to +50°C / -4 to +122°F | ppm | 0-5.0, 0-10.0, 0-100.0 |

**Note: $Cl_2$ not rated for Class I, Div. 1*

**CALIBRATION:** Non-intrusive, via pushbutton
Auto zero and auto span

**DISPLAYS:** Two backlit liquid crystal displays
**LCD 1** 3-digit continuous readout of the gas present (ppm, % LEL or %v/v)
**LCD 2** Alphanumeric diagnostic status display

Alarm Setpoints: Two setpoints: user-selectable

**RELAY CONTACTS:** Three SPDT relays; 5 amps at 250 VAC
LOW/HIGH: Field selectable for normally energized/de-energized and latching/non-latching
FAULT: Normally energized and non-latching

**TRANSMISSION RANGES:** Relay contacts not considered. (For ranges with relays see manual.)

| Conductor Size | | Toxic /Oxygen Sensors | | Combustible Sensors | |
|---|---|---|---|---|---|
| 22 AWG | 0.64 mm | 6,712 ft. | 2,045 m | 3,356 ft | 1,022 m |
| 20 AWG | 0.75 mm | 10,953 ft. | 3,253 m | 5,336 ft. | 1,626 m |
| 18 AWG | 1.0 mm | 16,953 ft. | 5,167 m | 8,476 ft. | 2,583 m |

**CONTROLS:** Calibration: Non-intrusive via external pushbutton
Alarm Setpoints: Simple up/down pushbuttons with LCD readout of setpoints

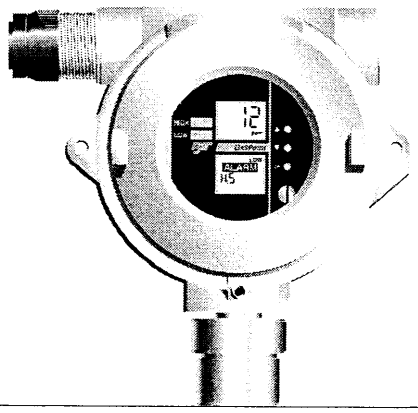
**PHYSICAL:** Size: 6.8 x 7 x 4.3 inches / 17 x 17.8 x 10.8 cm (approx.)
Weight: 4.85 lb. / 2.2 kg (approx.)
Transmitter: Nema 4, explosion-proof, anodized aluminum enclosure w/ mounting flanges
Sensor: Stainless steel enclosure

**WARRANTY:** Instrument: 2 years non-prorated; Sensor: 2 years full replacement warranty

*DUE TO ONGOING RESEARCH AND PRODUCT IMPROVEMENT, SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.*

**RATINGS AND CERTIFICATIONS:** **CSA** Class I, Div. 1, Groups B, C, D; Class 1 Zone 0, Group IIA, IIB, IIC
Explosion Proof: ANSI/ISA: UL 1203; CSA: C22.2 No 30
Combustible Performance Standards: ANSI/ISA: ISA-S12.13; CSA: C22.2 No 152

1. Large, backlit LCD readout of gas concentration
2. Alphanumeric LCD showing transmitter STATUS and diagnostics
3. Non-intrusive calibration via simple pushbutton
4. Interchangeable sensor types: LEL (catalytic or IR), toxic gas or oxygen with common transmitter assembly
5. Three relays: two gas alarm relays, one fault relay



**Locally distributed by:**

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13.3

# GasPoint

Gas Transmitter

## 4-20 mA Fixed Gas Gas Monitor

Installation and Operating Instructions

"INNOVATORS IN GAS DETECTION"

BW Technologies

## Limited Warranty & Limitation of Liability

BW Technologies LP (BW) warrants this product to be free from defects in material and workmanship under normal use and service for a period of two years, beginning on the date of shipment to the buyer. This warranty extends only to the sale of new and unused products to the original buyer. BW's warranty obligation is limited, at BW's option, to refund of the purchase price, repair, or replacement of a defective product that is returned to a BW authorized service center within the warranty period. In no event shall BW's liability hereunder exceed the purchase price actually paid by the buyer for the Product.

This warranty does not include:

a) fuses, disposable batteries or the routine replacement of parts due to the normal wear and tear of the product arising from use;
b) any product which in BW's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation, handling or use;
c) any damage or defects attributable to repair of the product by any person other than an authorized dealer, or the installation of unapproved parts on the product; or

The obligations set forth in this warranty are conditional on:

a) proper storage, installation, calibration, use, maintenance and compliance with the product manual instructions and any other applicable recommendations of BW;
b) the buyer promptly notifying BW of any defect and, if required, promptly making the product available for correction. No goods shall be returned to BW until receipt by the buyer of shipping instructions from BW; and
c) the right of BW to require that the buyer provide proof of purchase such as the original invoice, bill of sale or packing slip to establish that the product is within the warranty period.

THE BUYER AGREES THAT THIS WARRANTY IS THE BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. BW SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, WHETHER ARISING FROM BREACH OF WARRANTY OR BASED ON CONTRACT, TORT OR RELIANCE OR ANY OTHER THEORY.

Since some countries or states do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any provision of this warranty is held invalid or unenforceable by a court of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

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## *Safety Information – Read First*

**IMPORTANT**

Users of the GasPoint ("the transmitter") require a full understanding of the operating and maintenance instructions. Use the transmitter only as specified in this manual, otherwise the protection provided by the transmitter may be impaired. Read the following **Warnings** and **Cautions** before using the transmitter.

**⚠ Warnings**

- ⇒ **Do not paint the sensor assembly or the transmitter.**
- ⇒ **Calibrate the transmitter at start-up and BW recommends a calibration check on a regular schedule, once at least every 90 days. More frequent checks or inspections are encouraged to spot problems such as mud collections on the sensor head, accidental painting over the sensor head, etc.**
- ⇒ **Do not use the transmitter if it is damaged. Before you use the monitor, inspect the case. Look for cracks or missing metals or plastics. If the transmitter is damaged or something is missing, contact BW Technologies immediately.**
- ⇒ **Make sure the cover is properly fastened before you operate the transmitter.**
- ⇒ **Use only a sensor assembly specifically designed for your GasPoint model. Refer to Replacement Parts and Accessories.**
- ⇒ **Periodically test the sensor's response to gas by exposing the monitor to a targeted gas concentration that exceeds the high alarm setpoint. Manually verify that visual alarms are activated.**
- ⇒ **Opening the sensor will invalidate the calibration.**

**⚠ Cautions**

- ⇒ **Do not expose the monitor to electrical shock and/or severe continuous mechanical shock.**
- ⇒ **Do not attempt to disassemble, adjust, or service the monitor unless instructions for that procedure are contained in the manual and/or that part is listed as a replacement part.**
- ⇒ **Do not allow liquids to condense and/or use high power sprays on the instrument.**
- ⇒ **The warranty will be voided if customer personnel or third parties damage the monitor during repair attempts. Non-BW Technologies repair/service attempts void this warranty.**

**IMPORTANT**

The GasPoint is only to be used for the purposes specified in this manual. BW Technologies' authorized service representatives and parts must be employed in carrying out repairs to the unit in order to maintain the validity of the warranty. Modification of components, use of non-BW parts, or use of incomplete or used parts will also invalidate the warranty.

**CAUTION:** FOR SAFETY REASONS THIS EQUIPMENT MUST BE OPERATED AND SERVICED BY QUALIFIED PERSONNEL ONLY. READ AND UNDERSTAND INSTRUCTION MANUAL COMPLETELY BEFORE OPERATING OR SERVICING.

## *Contacting BW Technologies*

To contact BW Technologies, call:
USA: 1-888-749-8878
Canada: 1-800-663-4164
Europe: +44 (0) 1295 700300
Other countries: +1-403-248-9226

Address correspondence to:
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**Calgary, AB T2A 7X9**
**CANADA**

**ISO 9001**

Email us at: info@bwtnet.com
Visit BW Technologies' website at: www.gasmonitors.com

### *Manufacturer's Notes and Warnings*

1. Read the Safety Warnings and Cautions at the beginning of this manual.
2. The GasPoint is fully tested and calibrated in the factory. Installation of the GasPoint should be done by qualified personnel

# GasPoint

## Introduction

The GasPoint ("the transmitter") provides continuous monitoring of the atmosphere for hazardous gases in the workplace and is virtually maintenance-free. Its revolutionary design utilizes advanced microcontrollers and allows for enhanced diagnostics and fault analysis. Advanced design features make installation and operation simpler than ever, saving you time and money.

The transmitter provides a 4-20 mA output signal which can be connected to any control system (DCS, PLC, etc.). Designed with non-volatile memory, the transmitter has total memory retention.

The pushbutton, non-intrusive calibration can be easily performed by one person with no tools or magnet keys. Normally, only a periodic calibration check is needed to assure dependable performance. The backlight automatically activates in low light conditions and in an alarm condition.

The LCD is an intuitive user interface, indicating the following:

- When a toxic or combustible sensor has "failed" its self-test;
- Gas type monitored and concentration level (%LEL or ppm);
- Alarm level (field settable) and the type encountered (low, high, or fault);
- When to apply gas during calibration; and
- When a toxic or combustible sensor has "failed" its self-test.

The flexibility of the transmitter's modular design affords efficient installation. Wiring of the transmitter itself is straightforward. Field interchangeable plug-in sensor assemblies enable the user to change the gas monitored at any time. The transmitter recognizes the sensor installed and tests and resets itself to that sensor type.

The poison-resistant sensors have the fastest response times available. The transmitter is capable of responding to a momentary puff of gas that would otherwise remain undetected. The sensors have a proven history of reliable, long-term performance and are relatively unaffected by temperature or humidity variations. Gas enters the transmitter's sensor by convection and diffusion through a sintered stainless steel or wire-mesh screened opening.

The transmitter's explosion-proof design allows operation in areas where the combustible gas concentration may exceed the lower-explosive limit (LEL). Its rugged construction ensures a long life span in almost any environment.

The transmitter incorporates the best of both proven and new technologies that offer versatility in addition to reliable safety mechanisms.

**Table 1. Ratings and Certification**

| | |
|---|---|
| C SP® US | All gases, except $Cl_2$, $ClO_2$, and HCl<br>Approved by CSA (Canadian Standards Association) for use in both the USA and Canada<br>Class I, Div. 1, Groups B, C, D<br>Class II, Groups E, F, G (Toxic only)<br>Combustible Performance Standards: ANSI/ISA. ISA—S12.13<br>CSA: C22.2 No 152 |
| | GasPoint $Cl_2$, $ClO_2$, and HCl<br>Approved by CSA (Canadian Standards Association) for use in both the USA and Canada for ordinary locations |
| | Approved Non-Incendive for installations in Class I, Division 2, Groups B, C, D<br>Location's when both input power and relay outputs are connected to non-incendive sources not to exceed 32 Vdc (power input) and 24 Vdc (relay output)<br>CSA: C22.2 No.213, UL: 1604 |

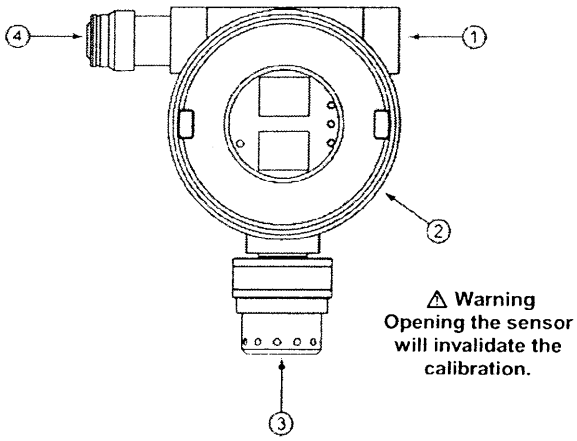


Figure 1. GasPoint Monitor

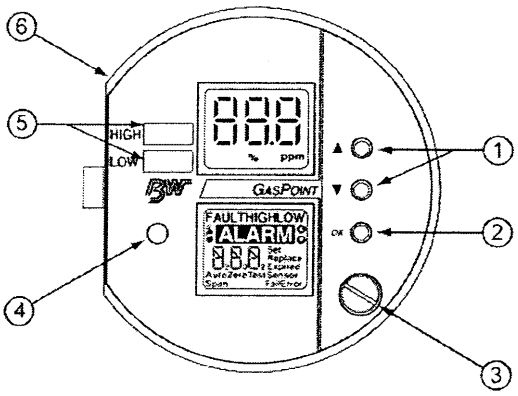


Figure 2. User Interface

Table 2. GasPoint Monitor

| Item | Description |
|---|---|
| 1 | Cable conduit access |
| 2 | Explosion-proof enclosure |
| 3 | Sensor |
| 4 | Calibration pushbutton |

Table 3. Control Bay

| Item | Description |
|---|---|
| 1 | Edit buttons |
| 2 | OK button |
| 3 | Faceplate security screw |
| 4 | Low light sensor |
| 5 | High/Low alarm settings |
| 6 | Slip Hinge |

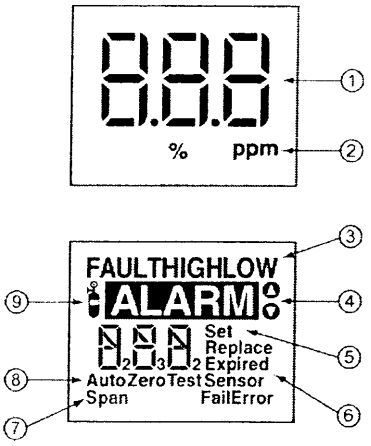


Figure 3. Liquid Crystal Display

Table 4. Liquid Crystal Display

| Item | Description |
|---|---|
| 1 | Numeric reading |
| 2 | Units of measure (ppm or %) |
| 3 | Alarm level/type |
| 4 | Increment/decrement prompt arrows |
| 5 | Set value arrow prompts |
| 6 | Sensor advice |
| 7 | Span advise icon |
| 8 | Automatic zero advise icon |
| 9 | Apply gas advise icon |



13.3

## *Installation*

### *Sensor Location*

Several factors should be considered when selecting locations to install sensors. The following general suggestions should be considered to assure the detection of the target gas. Select the most suitable location for each sensor.

**Air Currents:** If there are fans, wind, or other sources of air movement, gases may tend to rise or collect in certain areas of a facility. The local air currents should be assessed to aid in selecting the sensor location. Outdoor situation considerations, such as prevailing winds, should also be accounted for. Air convection can often be more important in determining gas concentrated areas than factors of vapor density.

**Vapor Density:** When there are no air currents in the area, sensor placement may be affected where the gas (vapor) to be monitored is lighter or heavier than air. For gases lighter than air, BW suggests placing the sensor approximately 12 in. (30 cm) above the level of a potential gas release, or close to the ceiling or roof in indoor installation. For gases heavier than air, BW suggests placing the sensor 12 in. (30 cm) below the release site, or near the floor or ground. Gases with a density equal to air or slightly greater than air tend to rise (particularly when air currents are present).

**Gas Emission Sources:** As a rule, at least one sensor should be located in close proximity to each point where a leak is likely to occur. This is particularly important when a liquid with a low volatility is being monitored.

**Environmental Factors:** Designed for rugged outdoor use, consider the following in selecting a location.

- Install sensors where they are protected from wind, dust, snow, water, vibration, and/or shock.
- Observe the operating temperature range of the sensor. Refer to Sensor Specifications.

### *Mounting the Enclosure*

Modular design simplifies the installation of the transmitter. The transmitter's main board is mounted to the inner control door, which is equipped with slip hinges. The transmitter's back enclosure contains the relays and power board and is equipped with a threaded 3/4 inch NPT conduit fitting outlet and pre-drilled mounting flanges. Power and signal lines connect to the plug-in terminal block on the power board. The transmitter may be disassembled, simplifying the installation.

⚠ **Caution: Qualified personnel should perform the installation according to applicable electrical codes, regulations, and safety standards. Ensure correct cabling and sealing fitting practices are implemented.**

Install the transmitter. The predrilled mounting flanges: I.D. 0.25 on 5.5 inch centers.

It is preferable to attach the transmitter to a wall or bracket, using bolts through the two mounting holes. These mountings, however, may be omitted if the electrical conduit is sufficiently rigid to support the weight of the transmitter.

***Note:*** *The sensor should never be installed pointed upwards.*

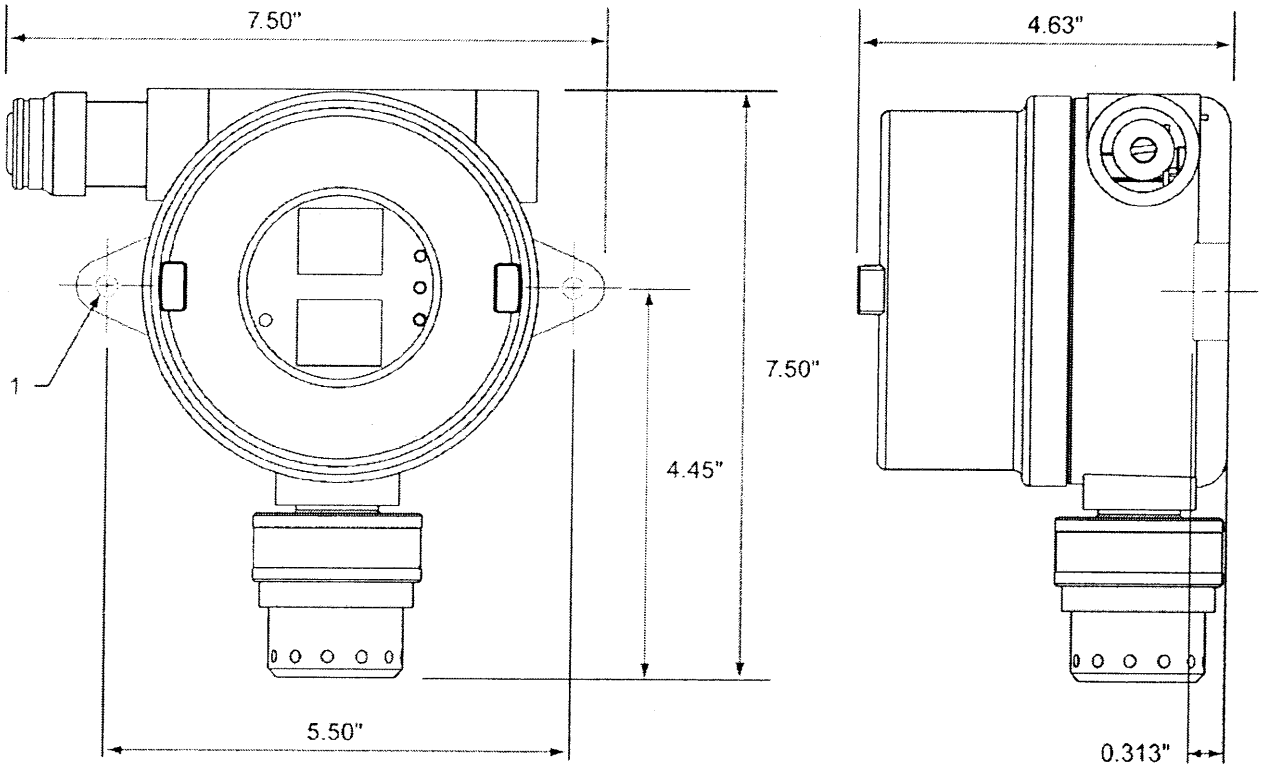


**Figure 4. Outline Drawing**



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### *System Design Specifications*

**Supply Voltage:** 12 to 32 volts

**Power Consumption:** Catalytic Combustible Sensors: 100 mA @ 24 Vdc
IR Combustible Sensors: 75 mA @ 24 Vdc
Toxic/Oxygen Sensors: 40 mA @ 24 Vdc
Relays: 50 mA per relay (150 mA total)

**Memory:** Non-volatile memory, a battery back-up is not necessary to retain values in the event of power outages.

**Loop Resistance:** 650 ohms maximum

**Cable:** 4-20 mA: 3 conductor, 14 to 24 AWG; Relays: 3 conductor, 14 to 24 AWG
Sensor Separation Kit: 4 conductor, 16 to 22 AWG

**Relays:** 5 amp at 24 Vdc or 115 Vac SPDT; low, high, and fault
Low/High Relays: Field selectable for normally energized/de-energized; latching/non-latching
Fault Relay: Energized; non-latching

**Sensor Separation Kit:** Transmission distances (see tables below)

### *Cable Installation*

**Transmission Range:** The distance the 4-20 mA signal can travel is dependent on several factors including the cable gauge. Maximum cable resistance is 650 ohms less the controller resistance.

The tables below assume a constant 24 volt power supply (at 20°C) copper wire and a controller resistance of 250 ohms. The signal range from the controller to the transmitter takes into account the return loop.

***Note:*** *The BW CR-4000 Controller has a resistance of only 120 ohms.*

**Table 5. Transmitter with Catalytic/IR Combustible Sensor**
(Maximum cable lengths between the controller and transmitter)

| Conductor Size | | Relays Not Used | | One Relay Connected | | Two Relays Connected | | Three Relays Connected | |
|---|---|---|---|---|---|---|---|---|---|
| Sq mm | AWG | feet | meters | feet | meters | feet | meters | feet | meters |
| 0.64 | 22 | 3,356 | 1,022 | 2,368 | 722 | 1,830 | 557 | 1,491 | 454 |
| 0.75 | 20 | 5,336 | 1,626 | 3,767 | 1,148 | 2,910 | 887 | 2,371 | 722 |
| 1.0 | 18 | 8,476 | 2,583 | 5,983 | 1,823 | 4,623 | 1,409 | 3,767 | 1,148 |
| 1.5 | 16 | 13,474 | 4,106 | 9,511 | 4,106 | 7,749 | 2,240 | 5,988 | 1,825 |
| $I_c$ Current Factor | | 0.12 | | 0.17 | | 0.23 | | 0.28 | |

**Table 6. Transmitter with Toxic/Oxygen Sensor**
(Maximum cable lengths between the controller and transmitter)

| Conductor Size | | Relays Not Used | | One Relay Connected | | Two Relays Connected | | Three Relays Connected | |
|---|---|---|---|---|---|---|---|---|---|
| Sq mm | AWG | feet | meters | feet | meters | feet | meters | feet | meters |
| 0.64 | 22 | 6,712 | 2,045 | 3,661 | 1,115 | 2,517 | 767 | 1,917 | 584 |
| 0.75 | 20 | 10,953 | 3,253 | 5,821 | 1,774 | 4,002 | 1,219 | 3,049 | 929 |
| 1.0 | 18 | 16,953 | 5,167 | 9,247 | 2,818 | 6,357 | 1,937 | 4,843 | 1,476 |
| 1.5 | 16 | 26,948 | 8,213 | 14,699 | 8,213 | 10,105 | 3,080 | 7,699 | 2,346 |
| $I_c$ Current Factor | | 0.06 | | 0.110 | | 0.160 | | 0.210 | |

For other operating parameters use the formula below to establish the transmission range.

Formula: Maximum distance = $\{\{(V_P - V_T)/I_c\}-R_C\}/(2xR_L)$

where:
$V_P$ = power supply voltage (minimum)
$V_T$ = transmitter supply voltage (minimum) 12 volt
$I_c$ = current through conductor (See Table 5 and 6 for factors)
$R_C$ = total controller resistance
$R_L$ = line resistance per 350 m (1,160 ft.)

### *4-20 mA Loop Installation*

**Cable Routing:** Separate cables are required for each transmitter. In classified areas the cable should be in conduit or it should be an approved hazardous location cable.

**Power Supply:** Ensure power supply meets the minimum requirements of all components of your system (i.e., alarms, relays, etc.). BW recommends that the power supply be regulated.

**⚠ Caution: Polarity must be observed. If the Return and +24 volt wires are reversed, the transmitter will not work. Do not apply electrical power to the transmitter until all connections are made, the sensor is in place, and the transmitter is complete.**

1. Remove the transmitter cover, open the inner hinged control door and remove, if desired.
2. Attach the conduit, if applicable, and pull cable(s) into the enclosure.
3. Connect the 3-pin power terminal block.

Return (R): 4-20 mA signal to the labeled terminal
Supply (V): (+) positive (12-32 volts) to the labeled terminal
Ground (G): Ground wire to the labeled terminal

***Note:*** *(If using shielded cable) To avoid radio frequency interference (RFI), the shield (including Mylar) must be grounded. Simply tying a bare drain wire to ground does not ground a shield. Keeping the shield as short as possible, tie the shield to the internal grounding screw. Tie any unused wires to ground.*

### *Relay Cable Installation*

The transmitter is equipped with three relays: low gas alarm, high gas alarm, and fault alarm. Select to connect the applicable relays required in each situation. Relay connections are labeled: NO (normally open), C (common), and NC (normally closed). Attach wires as required to the applicable terminals.

***Note:*** *The fault relay connections are reversed.*
*Set the alarm dip switches before applying power. Once power is applied, if desired, change the alarm setpoints.*

### *Connecting the Controller and Power Supply*

Ensure the transmitter's external cover is in place before applying power. Follow the procedures and recommendations in the control systems manual to complete the installation.

1. Ensure the transmitter is tied to the controller ground, to the earth ground, and to the negative terminal of the power supply.
2. Attach wires to the controller and power supply as shown in the wiring diagram. Refer to Figure 5.

### *Remote Sensor Separation Kit*

The transmitter sensor separation kit can be mounted at the following distances dependent of the cable size.

**Table 7. Distances for Sensor Separation Kit**

| Conductor Size | | Catalytic/IR Combustible Sensor | | Toxic/$O_2$ Sensor | |
|---|---|---|---|---|---|
| Sq mm | AWG | feet | meters | feet | meters |
| 0.64 | 22 | 619 | 188.5 | 1,548 | 472 |
| 0.75 | 20 | 985 | 300 | 2,463 | 750 |
| 1.0 | 18 | 1,564 | 476 | 3,912 | 1,174 |
| 1.5 | 16 | 2,487 | 758 | 6,218 | 1,895 |

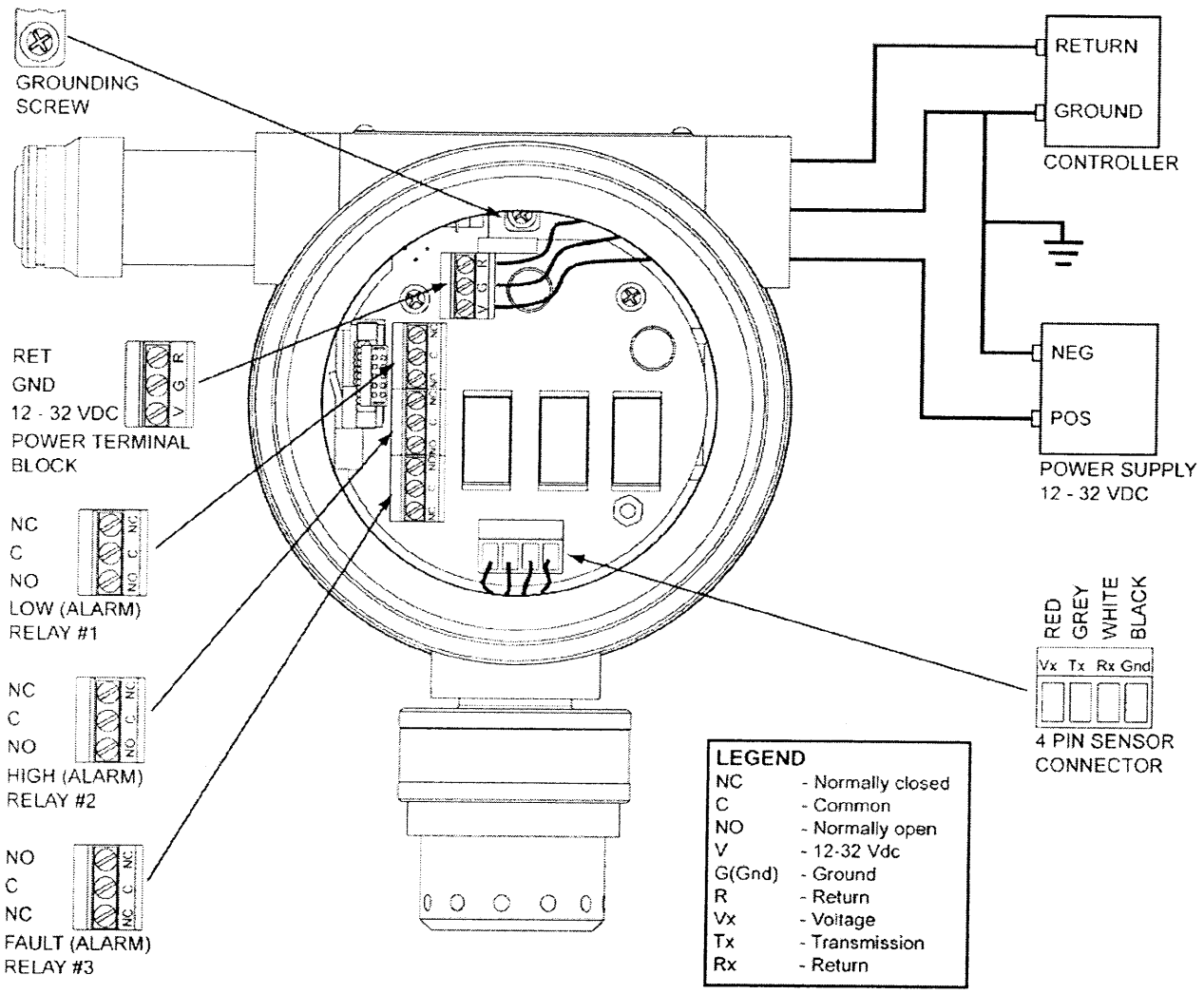
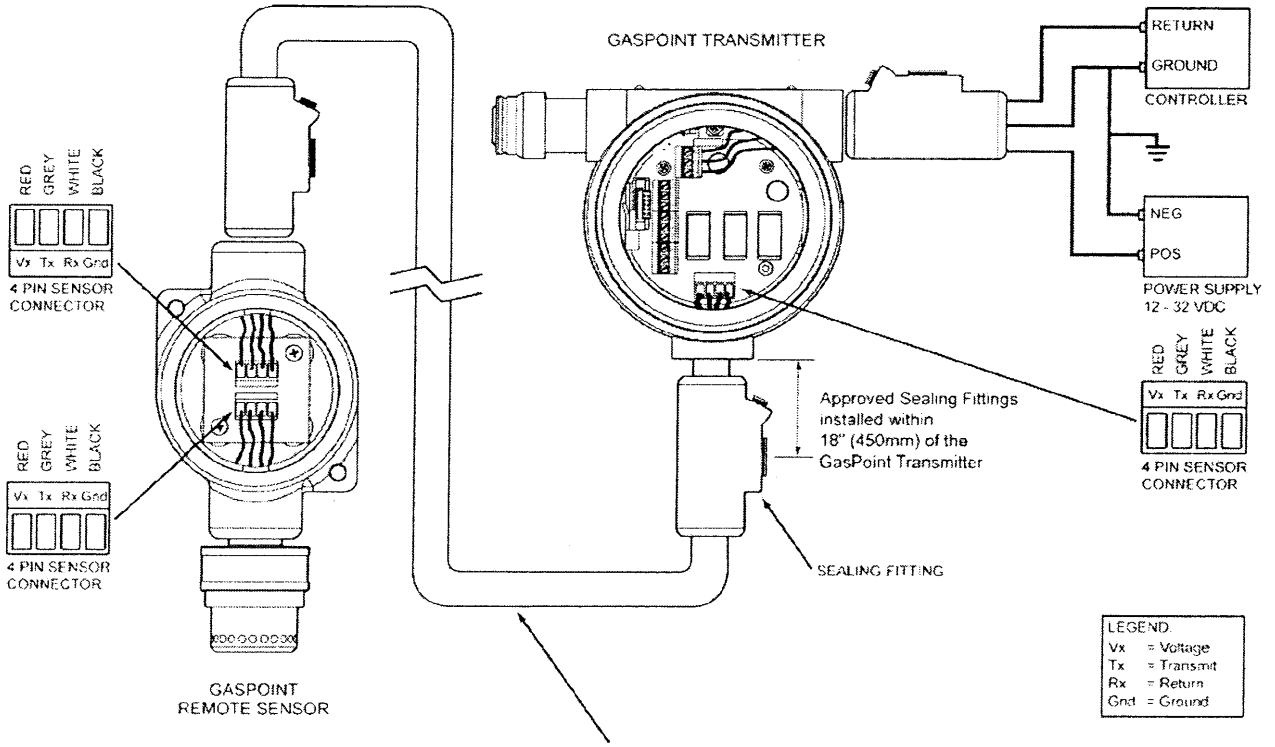



**Figure 5. System Wiring Diagram**

**Modbus Expansion Module Note:** For wiring of GasPoints equipped with the Modbus Communication Expansion Module, see the Modbus manual for additional wiring information.




**APPROVED NATIONAL ELECTRICAL CODE INSTALLATION**
**CONDUIT** or **APPROVED HAZARDOUS LOCATION CABLE** connecting the Remote Sensor and Transmitter must have Sealing Fittings at both ends within 18" (450mm) of each unit.
**HAZARDOUS LOCATION CABLE** and **SEALING FITTINGS** must be approved for Class 1, Div. 1 Gr. B,C,D Hazardous Locations.

**Figure 6. Sensor separation Kit Wiring Diagram**

### *Mounting the Sensor Separation Kit Enclosure*

1. The separation kit is equipped with predrilled flanges: I.D. 3065 (7.68 mm) on 4.35 in. (10.6 mm) centers.
2. Disconnect the wires from the transmitter terminal block and remove the sensor from the transmitter. Screw the sensor fully into the separation kit housing and install the wires, as shown on the diagram, to the adjacent terminal block in the separation kit.
3. Install cable as shown. Ensure correct cabling and sealing fitting practices are implemented.

### *Factory Settings*

The transmitter is calibrated and tested before shipping. Commonly used values are set at the factory. To change the factory default settings, refer to Changing the Alarm Setpoints.

The following settings are field selectable:

### *Dip Switch Overview*

1. **Calibration Time Delay:** To set span, select a time delay of 30 seconds or 6 minutes. For remote calibration use the 6 minute setting to allow time for the gas to reach the sensor. To save time and calibration gas, the transmitter begins the span procedure when it senses the calibration gas.

***Note:*** *The factory default is 30 seconds. See dip switch 3 (CAL TIME) to change to 6 minutes.*

2. **Measuring Range:** Select from up to four measuring ranges by setting Block 1 switch 4 and switch 5 to open or closed. Both switch 4 and 5 are factory set to open. Refer to Table 8.
3. **Low and/or High Relays:** Select non-latching or latching. Factory default is set to open (non-latching).
4. **Low and/or High Relays:** Select de-energized or energized. Factory default is set to open (de-energized).

### *Changing the Alarm and Calibration Gas Setpoints*

5. **Gas Alarms:** Gas alarm levels are set to Occupational Safety & Health Administration (OSHA) standards prior to shipping. The transmitter is equipped with two alarm levels, low and high. To set, select two, one, or no alarm levels and set selected levels to any value desired. To change the levels, refer to Changing the Alarm Setpoints. The factory defaults are listed in Table 8.
6. **Calibration Gas Concentration Level:** To facilitate the auto span, the calibration gas concentration expected is preset. It can be changed at any time for the toxic and combustible gas sensors. Set the standard generally used in your facility. Refer to Changing the Calibration Gas Concentration Level to change the value.

   The oxygen sensor span is set to 20.9% and cannot be adjusted (For $O_2$ calibrate in normal 20.9% ambient air, or if the atmosphere may be deficient or enriched, use pure air calibration gas.)

**Table 8. Factory Default Settings; Select Measuring Ranges**

| Gas Sensed | Units of Measure | Select Measuring Range | | | Range LO: 4<br>Range HI: 5 | Alarm Setpoints | | Calibration Gas |
|---|---|---|---|---|---|---|---|---|
| | | **Factory Default**<br>**4. Open**<br>**5. Open** | Or Select<br>4. Closed<br>5. Open | Or Select<br>4. Open<br>5. Closed | Or Select<br>4. Closed<br>5. Closed | **Factory Defaults**<br>(Field Settable) | | **Factory Default Value Level Expected*** |
| | | 1 | 2 | 3 | 4 | LOW | HIGH | |
| Hydrogen sulfide ($H_2S$) | ppm | **0 to 100** | 0 to 50 | 0 to 500 | 0 to 20 | 10 ppm | 15 ppm | 20 ppm |
| Carbon monoxide (CO) | ppm | **0 to 500** | 0 to 1000 | 0 to 100 | 0 to 50 | 35 ppm | 200 ppm | 200 ppm |
| Combustibles 0-100% LEL (Catalytic or IR) | %LEL | **0 to 100** | N/A | N/A | N/A | 10% | 20% | 50% LEL |
| Oxygen ($O_2$) | % by vol. | **0 to 30.0%** | N/A | N/A | N/A | 19.5% | 18.5% | 20.9% ambient/pure air |
| Sulfur dioxide ($SO_2$) | ppm | **0 to 100** | 0 to 50 | 0 to 20 | 0 to 10 | 2 ppm | 5 ppm | 20 ppm |
| Hydrogen cyanide (HCN) | ppm | **0 to 20.0** | N/A | N/A | N/A | 4.7 ppm | 10 ppm | 17 ppm |
| Chlorine ($Cl_2$) | ppm | **0 to 5.0** | 0 to 10.0 | 0 to 50.0 | 0 to 99.9 | 0.5 ppm | 1.0 ppm | 3.0 ppm |
| Chlorine dioxide ($ClO_2$) | ppm | **0 to 1.00** | 0 to 5.00 | N/A | N/A | 0.20 ppm | 0.30 ppm | 0.56 ppm |
| Hydrogen ($H_2$) | ppm | **0 to 100** | 0 to 200 | 0 to 800 | N/A | 30 ppm | 50 ppm | 100 ppm |
| Hydrogen chloride (HCl) | ppm | **0 to 10.0** | 0 to 20.0 | 0 to 99.9 | N/A | 0.2 ppm | 0.5 ppm | 6.6 ppm |
| Ammonia ($NH_3$) | ppm | **0 to 50** | 0 to 100 | 0 to 500 | 0 to 999 | 25 ppm | 50 ppm | 50 ppm |
| Nitrogen dioxide ($NO_2$) | ppm | **0 to 50.0** | 0 to 10.0 | 0 to 20 | 0 to 99.9 | 2 ppm | 5 ppm | 10 ppm |

* BW recommends that the calibration gas factory default values be changed if selecting higher measuring ranges than the factory default measuring range. Refer to Changing the Alarm Setpoints and Sensor Specifications.



13.3

### *Dip Switch Settings*

The dip switches are located on the upper control board. To access the dip switch banks, remove the top of the explosion-proof enclosure, loosen the control board access screw (located just below the buttons), and open the control door which is on slip hinges. The dip switches are clearly labeled.

**⚠ Caution: The transmitter must be powered down before removing the outer cover. If it is in a classified area, either remove the transmitter or declassify the area.**

***Note:*** *Any latched relay will be released upon one push of the external button.*

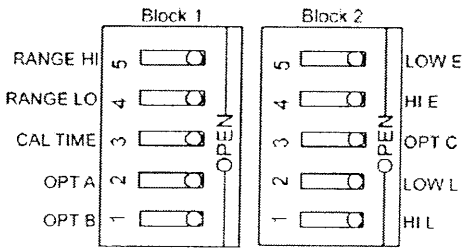



**Table 9. Dip Switches**

| Dip Switch | | Function |
|---|---|---|
| Block 1: Calibration and Measuring Ranges | | |
| 1 | OPT B | Not used |
| 2 | OPT A | Not used |
| 3 | CAL TIME | Calibration wait period<br>Open - 0.5 min.<br>Closed - 6 min. |
| 4 | RANGE LO | Set measuring range |
| 5 | RANGE HI | Set measuring range |
| Block 2: Gas Alarm Relay Settings | | |
| 1 | HI L<br>(High alarm) | Open - Non-latching relay<br>Closed - Latching relay |
| 2 | LOW L<br>(Low alarm) | Open - Non-latching relay<br>Closed - Latching relay |
| 3 | OPT C | Not used |
| 4 | HI E<br>(High alarm) | Open - De-energized relay<br>Closed - Energized relay |
| 5 | LOW E<br>(Low alarm) | Open - De-energized relay<br>Closed - Energized relay |



13.3

### *Connecting the Controller and Power Supply*

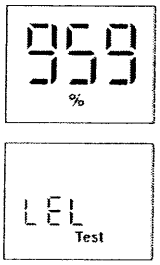
Ensure the transmitter's external cover is in place before applying power. Follow the procedures and recommendations in the control systems manual to complete installation.

***Note:*** *Ensure the transmitter is tied to the controller ground, to the earth ground, and to the negative terminal of the power supply.*

1. Attach wires to the controller and power supply as shown in Figure 5. When power is applied, the transmitter automatically activates.

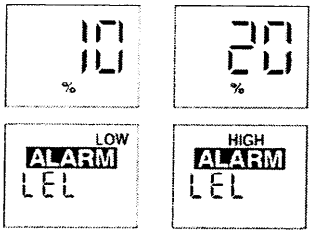
2. The LCD shows all the display elements, and the elements flash twice. Then each icon displays separately and stays lit until all icons are displayed. The LCD backlight then activates.

3. The word **Test** displays on the LCD. The transmitter then begins a 2-minute countdown from **999** to **000**.




During the countdown to normal operation the transmitter communicates with the sensor, determines the sensor type, tests the sensor integrity, tests all the circuitry, and allows the sensor to stabilize before normal operation begins. The transmitter also determines the sensor range. Once initialization is complete, the transmitter enters normal operational mode (in the system loop) providing a signal to the controller of the gas present.

4. After the countdown, the LCD displays the current low alarm and high alarm setpoints. Each alarm setpoint is displayed for 4 seconds. To review them, press and release the external pushbutton after normal operation begins.




5. Upon a successful self-test, the transmitter enters normal operation and displays the ambient gas present. The backlight remains activated for 5 seconds after normal operation begins. If the unit fails the self-test, refer to Fault Alarm Conditions and Advice.

### *Controller Calibration*

Follow the procedures and recommendations in the control system manual to calibrate the control system.

1. Calibrate the control system (see your control manuals). Set the controller as follows:
   - 4 mA = ZERO
   - 20 mA = FULL SCALE
2. Calibrate the transmitter with gas and then refer to Changing the Alarm Setpoints and Calibration Gas Setpoints

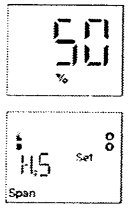
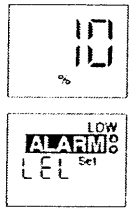
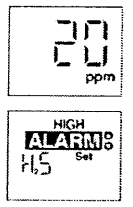
### *Changing the Alarm Setpoints*

The setpoint mode allows the user to change the calibration gas concentration level, the low alarm setpoint, and the high alarm setpoint. Refer to Factory Settings for factory default settings. To change the values:

1. Screw off the enclosure top. (Allows access to edit buttons.)
2. Press the OK button for 2 seconds to access setpoint mode and change factory default settings.

   The transmitter is equipped with two setpoints, low and high. If only one setpoint is required, set one level to zero to deactivate. Set the other setpoint as desired.

   To deactivate both alarm levels, set both setpoints to zero. If both low and high are set to the same value, the transmitter will trigger a high alarm condition if that setpoint is met or exceeded.

| Changing setpoint | LCD icons displayed | Display |
|---|---|---|
| ***Changing the Calibration Gas Concentration Level***<br>The LCD first displays the current calibration gas value. Press OK to accept the displayed value or proceed to change the value. The factory default value for $O_2$ is set for 20.9% and cannot be adjusted.<br>1. Press ▲ to increment the value or ▼ to decrement the value.<br>2. Press OK to accept the new displayed value and end set calibration gas level. | • Numeric display shows current calibration gas value expected<br>• **Set Span** icon flashes<br>• Set flash<br>• ▲▼ flash |  |
| ***Changing the Low Alarm Setpoint***<br>The next screen displays the current low alarm setpoint. Press OK to accept the current low alarm setpoint or proceed to change the value.<br>1. Press ▲ to increment the value or ▼ to decrement the value.<br>2. Press OK to accept the new displayed value and end set low alarm setpoint. | • Numeric display shows current low alarm setpoint<br>• **LOW ALARM set** icon flashes<br>• ▲▼ flash |  |
| ***Changing the High Alarm Setpoint***<br>The next screen displays the current high alarm setpoint. Press OK to accept the current high alarm setpoint or proceed to change the value.<br>1. Press ▲ to increment the value or ▼ to decrement the value.<br>2. Press OK to accept the new displayed value and end set high alarm setpoint. | • Numeric display shows current high alarm setpoint<br>• **HIGH ALARM set** icon flashes<br>• ▲▼ flash |  |

***Note:*** *Oxygen low and/or high gas alarm setpoints can be set to either enrichment and/or deficiency alarms as desired. If the alarm setpoint is set below 20.9% (deficiency alarm), an alarm is triggered if the concentration present is below 20.9%. If the alarm setpoint is set above 20.9% (enrichment alarm), an alarm is triggered if the concentration present exceeds 20.9%. You can choose to set both alarms above or below 20.9%, or one alarm above and one below 20.9%*

3. Test the transmitter using a gas cylinder other than the one used in the calibration steps. The gas concentration should not exceed the sensor's detection range. Confirm that the display shows the expected concentration.

## *Operation*

The transmitter provides continuous monitoring for the target gas. In the event of power failure, the transmitter will automatically reset itself back into the system loop after power is restored. The transmitter has non-volatile memory and will not be affected by a power disruption. All programmed information is protected with total memory retention.

***Note**: BW recommends the transmitter be calibrated before first time use.*

**LCD:** The LCD diplays the current ppm or % reading of the target gas present.

**View Alarm Setpoints:** To view the alarm setpoints at any time, press the external pushbutton (for one second) and release. The LCD displays the current low alarm setpoint and then the high alarm setpoint.

**Relays:**

- **Fault:** The fault relay is always energized under normal operations. The relay will de-energize only if the transmitter is addressing a fault condition or when power is released.
- **Low/High Gas Alarms:** The gas alarm relays connected are energized or de-energized (latching or non-latching) according to the transmitter dip switch settings you have selected.
- **Reset Latched Relay Alarm (Alarm Acknowledge):** If a gas alarm relay has been set to latching mode, acknowledge the alarm condition.

  Press the external pushbutton for one second until the display reads low alarm setpoint, then release the external button. The transmitter releases the latched alarm(s) and displays the current low and high alarm setpoints.

***Note:** If an alarm condition exists, the transmitter will not allow the user to reset a latched alarm or display the alarm setpoints.*

**Output:** The 4-20 mA loop output is normal (from 4 to 20 mA according to calibrated values) except in a fault condition.

**Backlight:** The backlight activates in low light conditions. When ambient light conditions return to normal, the backlight automatically deactivates.

### *Gas Alarm Conditions and Advice*

If the current gas concentration meets or exceeds either alarm setpoint, the transmitter gas alarm functions will activate.

***Note:*** *If both or either gas alarm is set to zero, then no gas alarm condition exists for that alarm level.*

The following alarm advice activates in any gas alarm condition (low or high):

- The backlight activates.
- The 4-20 mA loop output is normal (from 4 to 20 mA according to calibrated values).

When the alarm condition no longer exists, the transmitter exits alarm mode and enters normal operation.

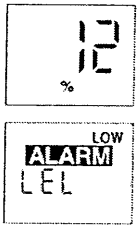
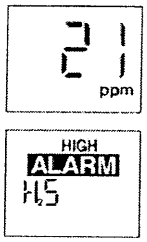
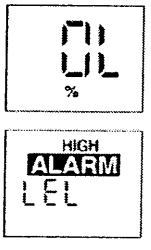
***Note:*** *If a relay is set to the latching position on either low or high gas alarm, the relay remains on until the alarm is reset (acknowledged). Press the external button to reset the relay.*

*If the alarms are disabled, then no alarm icons will be displayed.*

*An oxygen alarm level depends on which alarm setpoints have been set to low and high. The oxygen low and/or high gas alarm setpoints are user selectable for either enrichment and/or deficiency alarms as desired.*

**⚠ Caution: High off-scale readings may indicate an explosive concentration.**

**Table 10. Alarms**

| Alarm condition | Alarm relay | Alarm | Display |
|---|---|---|---|
| **LOW GAS ALARM**<br>The current gas concentration present meets or exceeds the low alarm the low alarm setpoint | Low alarm relay triggers field interface if the relay is connected and a low alarm setpoint is entered. | • Numeric display will show the gas currently presnet (ppm/%)<br>• **LOW** icon displays<br>• **ALARM** icon flashes |  |
| **HIGH GAS ALARM**<br>If the current gas concentration present meets or exceeds the high alarm setpoint | High alarm relay triggers a field interface if the relay is connected and a high alarm setpoint is entered. | • Numeric display will show the gas currently present (ppm/%)<br>• **HIGH** icon displays<br>• **ALARM** icon flashes |  |
| **OVER RANGE (over level or over range) GAS CONDITION**<br>If the gas concentration meets or exceeds the full measuring range | | • **OL** icon displays<br>• **HIGH** icon displays |  |



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### *Fault Alarm Conditions and Advice*

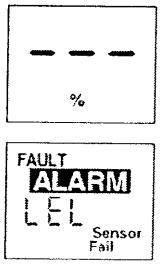
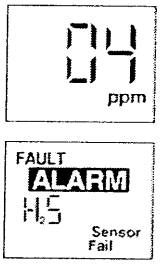
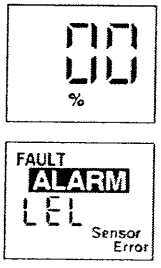
In the event of a fault condition, the fault alarm triggers activating any connected field interface. The transmitter advises which fault condition has occurred.

Under the fault alarm conditions:

- The non-latching fault relay is activated (de-energized) during a fault condition.
- The backlight activates.

When the problem is corrected, the transmitter automatically returns to normal operation.

**Table 11. Fault Conditions**

| Fault Condition | 4-20 mA Output | LCD Icons Displayed | Display |
|---|---|---|---|
| Sensor Self-Test Fail<br><br>(At start-up, the self-test has failed) | 2.00 mA | • Three (3) bars flash on the numeric display<br>• **FAULT** icon displays<br>• **ALARM** icon flashes<br>• **Sensor Fail** icon displays |  |
| Sensor Fault | 2.00 mA | • Numeric display will read the last value (ppm/%) present before sensor fault occurs<br>• **FAULT** icon displays<br>• **ALARM** flashes<br>• **Sensor Fail** displays |  |
| Sensor Drift | 2.00 mA | • Numeric display reads **00**<br>• **FAULT** icon displays<br>• **ALARM** icon flashes<br>• **Sensor Error** icon displays and flashes |  |



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## Calibration

### Guidelines

When calibrating the transmitter, adhere to the following guidelines.

- Calibration accuracy is never better than the calibration gas accuracy. BW Technologies recommends a premium-grade calibration gas. Gases with National Institute of Standards and Technology (NIST) traceable accuracy improves the validity of the calibration. Do not use a gas cylinder beyond its expiration date.
- Calibrate a new sensor before use. Allow the sensor to stabilize before starting calibration (approximately 5 minutes).
- Calibrate the transmitter on a regular schedule. (BW recommends once every 90 days (3 months), depending on use and sensor exposure to poisons and contaminants.)
- Calibrate the transmitter if the ambient gas display value varies at start-up.
- It is best to calibrate the sensor before changing the alarm setpoints.
- Calibrate only in a clean atmosphere, which is free of target gas.
- Use teflon or stainless steel hose on all electrochemical sensors.
- Tygon will poison a catalytic combustible sensor over time.

**⚠ Warning**

**Opening the sensor will invalidate the calibration**

**Table 12. Calibration Diagnostics Protection**

| *If calibration is incomplete, the transmitter automatically returns to normal operation and all prior (former) calibration data is retained. Common cause for the transmitter to refuse calibration or for an incomplete calibration include the following:* | |
|---|---|
| **Background interfering gas is present**<br>If interfering gas is present during auto zero, the transmitter refuses to auto zero and exits the calibration routine. | Combustible and Toxic sensors: wait for the transmitter to return to normal operation. Then apply pure air (zero gas) and repeat calibration. |
| **Calibration gas cylinder runs empty during calibration** | Wait for unit to return to normal operation. Replace the empty gas cylinder with a full cylinder and repeat calibration. |
| **Calibration gas concentration is too low or too high**<br>Calibration gas concentration is not within expected parameters—either the concentration of applied gas (ppm or %) is too high or too low.<br>The transmitter refuses to set span if the calibration gas is not within the expected parameters and exits the calibration routine. | Change the value to equal the calibration gas concentration being applied. |
| **Gas applied at the wrong time**<br>Gas is applied before requested to do so, or if gas is applied during auto zero, the transmitter refuses to proceed and exits the calibration routine. The prior (former) auto zero value will be retained. | Restart the calibration routine and apply gas only when the gas cylinder icon flashes. |

### Remote Calibration

The length of time depends on the length of hose the calibration gas must travel. If the wait period is longer than 30 seconds, the CAL TIME dip switch must be set to 6 minutes. To save gas and time, the transmitter begins to span when it senses calibration gas.
Apply the calibration gas for approximately 2 minutes plus the time estimated for the gas to reach the sensor.

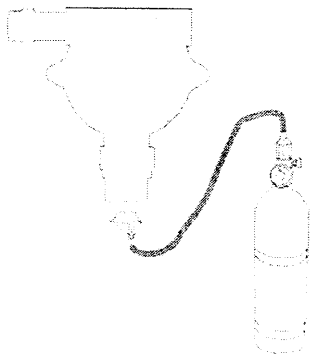
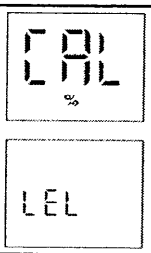
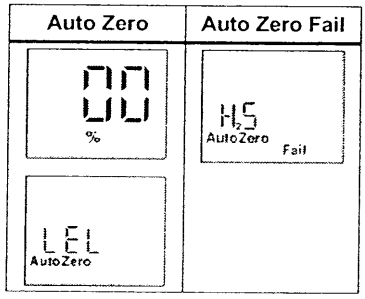
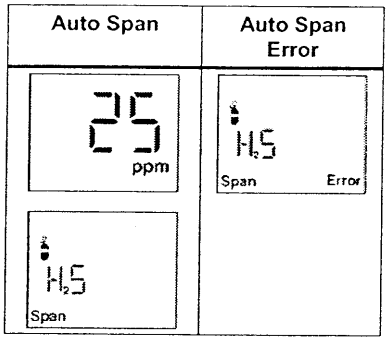


**Figure 7. Applying Gas to the Sensor**

### *Calibration Procedure*

The transmitter provides continuous monitoring for the target gas. In the event of power failure, the transmitter automatically resets itself back into the system loop after power is restored. The transmitter has non-volatile memory and will not be affected by a power disruption. All programmed information is protected with total memory retention.

For calibration gas concentrations and flowrates for each gas, refer to Table 16.

| Calibration steps | LCD icons displayed | Display |
|---|---|---|
| **START CALIBRATION**<br>1. Press and hold the external button down while the LCD displays the high and low alarm setpoints. Continue to hold the button until the LCD displays **CAL** and the CAL icon lights for 3 seconds. Then release the button.<br>***Note:*** *The 4-20 mA output will be 3mA throughout calibration. Calibrating the transmitter will not cause false alarms at the controller* | • First, the low and high alarm setpoints are displayed (8 seconds approximately)<br>• Next the **CAL** icon displays for 3 seconds<br>• Backlight is activated |  |
| **AUTO ZERO**<br>2. The transmitter then takes a zero level reading.<br>• Combustible and Toxic sensors: If target gas is present, apply zero gas (pure air or 100% nitrogen) to zero the sensor. Restart the calibration sequence.<br>• Oxygen sensor: Gas is not required. Auto zero sequence takes 30 to 60 seconds. | • Numeric display reads **00**<br>• **Auto zero** icon flashes |  |
| **AUTO SPAN**<br>3. Insert calibration cap. Refer to Figure 7 and apply gas to the sensor for approximately 2 minutes (5 minutes for ammonia). Refer to Table 16 for gas concentrations and flowrates.<br>4. When the countdown from **300** to **00** begins, span is complete. Disconnect the gas cylinder.<br>• If Span fails: check the calibration gas cylinder used and the concentration expected. Replace the cylinder and/or change the calibration gas expected, if required. Recalibrate<br>• Oxygen sensor: Use pure air calibration gas (20.9 % $O_2$) in case of deficient or enriched atmosphere. | • Numeric display shows calibration gas value expected<br>• flashes<br>• **Span** icon displays<br>• Gas type is constantly displayed<br>• After a successful calibration, the transmitter automatically returns to normal operation and displays the current reading (ppm or %) present. |  |
| **CALIBRATION FAIL OR ERROR**<br>**Auto zero Fail:** If the **Fail** icon displays, the LCD displays a countdown from **300** to **00**, before the transmitter begins normal operation.<br>**Auto Span Error:** If the **Error** icon displays, the LCD displays a countdown from **300** to **00**, before the transmitter enters normal operation.<br>***Note:****If either fail condition occurs, all previous information values are retained. Retry calibration* | **Auto Zero:** If the target or an interfering gas is present, the transmitter refuses to auto zero. The **Fail** icon displays. The **Fail** icon also displays if the external pushbutton is pressed during auto zero.<br>**Span:** If the calibration gas is not within expected values, the transmitter refuses to span. The **Error** icon displays. | |



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## *Maintenance*

To keep the transmitter in good operating condition, perform the following basic maintenance as required:

- Calibrate, test, and inspect the transmitter at regular intervals and after exposure to high concentrations.
- Keep an operations log of all maintenance, calibrations, and alarm events.
- Clean the exterior with a soft, damp cloth. Do not use solvents, soaps, or polishes.
- Do not immerse the transmitter in liquids.

### *Cleaning a Sensor*

The sensors are equipped with a stainless steel sintered or a hastelloy sintered flame arrestor screen (dependent on gas). Clean only with a dry brush being careful not to clog the screen. Replace the sensor if the screen is plugged.

### *Clearing a Sensor*

The sensor has a high degree of resistance to common vapors and gases. The sensor most likely clears itself if you remove the transmitter to a clean environment and wait 10 to 30 minutes. Do not expose a sensor to the fumes of inorganic solvents (such as paint fumes) or organic solvents.

### *Troubleshooting*

With enhanced diagnostics the transmitter provides extensive fault analysis and fault advice, refer to Fault Alarm Conditions and Advice. The troubleshooting chart deals with other factors and is to be used as a guide. Prior to reaching any conclusion that a problem may exist, check the following:

- All terminal blocks are fully seated on the boards.
- Power and signal connections are correct and complete.

**Table 13. Troubleshooting Tips**

| Problem | Possible Cause | Solution |
|---|---|---|
| No response to gas | • Sensor screen dirty | • Clean or replace sensor |
| Apparent false alarm | • Puff of gas | • Monitor is functioning |
| | • Not properly calibrated | • Recalibrate |
| | • Solvent fumes or interference from high levels of interfering gas | • Remove source |
| | • Radio frequency interference | • Check grounds and shielding are correct |
| No signal at controller | • Maximum distance reached | • Verify loop resistance, change wire AWG, or increase supply |
| | • Controller does not operate | • Troubleshoot controller |



13.3

### *Servicing the GasPoint*

**Disassembling:** Observe all safety and electrical codes and regulations before removing front cover. Unscrew the thumbscrew and open the service bay door.

**Assembling:** When reassembling the transmitter, ensure that it is electrically complete. Close the service bay door. Ensure the thumbscrew is aligned and tighten it down. Replace the outside glass cover. Reapply power and reinitialize the transmitter's power-up procedure, refer to Connecting the Controller and Power Supply. Change the alarm setpoints if desired.

**Important:** Calibrate the transmitter whenever a component is replaced.

### *Sensor Assembly Replacement*

To replace the entire sensor assembly, complete the following steps:

1. Power down the transmitter.
2. Disconnect the wires from the 4-pin plug-in terminal block at J5 on the power board and remove the old sensor.
3. Feed the new wires through the opening. Fully screw in the new sensor. Attach the wires to the plug-in terminal block. Ensure that all colored wires are correctly matched to the board labels from left to right. Refer to Figure 6.

**⚠ Caution: Check that all connections are correct. Incorrect wiring may damage the sensor and/or the power board.**

4. Refer to Table 8 to select a measuring range if required.

Refer to Replacement Parts and Accessories for part numbers.

**Table 14. Sensor Wiring Configuration**

| | Board Label | Wire Color | Description |
|---|---|---|---|
| 1 | Pwr 8 Vdc | Red | Power 8 Vdc (left) |
| 2 | TX | Grey | Transmission |
| 3 | RX | White | Signal |
| 4 | GND | Black | Ground (right) |

### *Other Component Replacement*

1. Power down the transmitter.
2. Unplug the sensor terminal block from the power board if required.
3. Replace the component, ensuring all wiring connections are complete and reassemble as shown in Figure 8. Refer to Installation
4. Ensure all field selectable options are set (measuring range, etc.).
5. Apply power and reinitialize power-up.
6. Set the alarm setpoints if required.

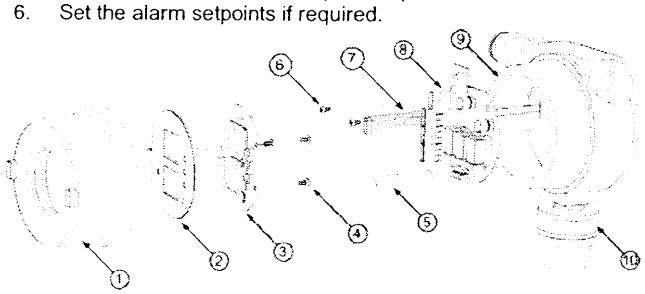

**Figure 8. Assembly Drawing**

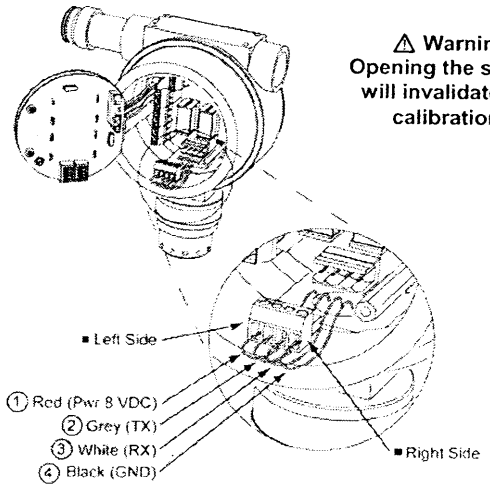


**Figure 9. Sensor Wiring Diagram**

**Table 15. GasPoint Replacement Parts**

| | Qty | Description Rating/TOL | Part # |
|---|---|---|---|
| 1 | 1 | External faceplate window cover | M1147 |
| 2 | 1 | Internal hinged door faceplate cover | M2345 |
| 3 | 1 | Transmitter main LCD board (PCB) | E2737/2 |
| 4 | 3 | #6-32 x ¼ inch machine Phillips screws | M0262 |
| 5 | 1 | Threaded stand-off – accepts thumbscrews | M2364 |
| 6 | 2 | #6-32 x ¼ inch machine Phillips screws | M0262 |
| 7 | 1 | Plug-in ribbon cable | E2800 |
| 8 | 1 | Power/relay board (PCB) | E2739/1 |
| 9 | 1 | Transmitter housing c/w external switch | M2346K |
| 10 | 1 | Sensor assembly | various |



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# *Specifications*

## *Sensor Specifications*

**Table 16. Operating and Calibration Specifications**

| Specifications | IR Combustibles %LEL | Catalytic Combustibles %LEL | Hydrogen sulfide $H_2S$ ppm | Carbon monoxide CO ppm | Sulfur dioxide $SO_2$ ppm | Ammonia $NH_3$ ppm | Hydrogen cyanide HCN ppm | Nitrogen dioxide $NO_2$ ppm | Oxygen $O_2$ % v/v |
|---|---|---|---|---|---|---|---|---|---|
| Repeatability % of signal | 1 | 1 | 1 | 1 | 1 | <10 | 0.5 | 2 | 0.1 |
| Temperature Range °C<br>°F | -40 to +50<br>-40 to +122 | -40 to +90<br>-40 to +194 | -40 to +50<br>-40 to +122 | -20 to +50<br>-4 to +122 | -20 to +50<br>-4 to +122 | -10 to +50<br>+14 to +122 | -20 to +50<br>-4 to +122 | -20 to +50<br>-4 to +122 | -20 to +50<br>-4 to +122 |
| Relative Humidity Range | 0 to 100% Non Condensing | 5 to 95% Non-condensing | | | | | | | |
| Long Term Drift Zero:<br>% of signal loss per month Span: | Nominal<br><1 | Nominal<br><1 | Nominal<br><2 | Nominal<br><2 | Nominal<br><2 | Nominal<br><2 | Nominal<br><2 | Nominal<br><2 | Nominal<br><1% |
| LCD Increments | 1% | 1% | 1 ppm | 1 ppm | 1 ppm | 1 ppm | 0.1 ppm | 0.1 ppm | 0.1% |
| Calibration[1]<br>Flow Rate (min). mls/minute<br>at a % or ppm reading of: | 250<br>50% LEL | 250<br>50% LEL | 250<br>20 ppm | 150<br>200 ppm | 250<br>20 ppm | 500<br>50 ppm | 250<br>15 ppm | 1,000<br>10 ppm | 250<br>20.9 %[2] |
| Sensor:<br>Replacement Part Numbers | IR-RW03 | SS-RW02 | SS-RH02 | SS-RM02 | SS-RS02 | SS-RA02 | SS-RZ02 | SS-RD02 | SS-RX02 |

1: It is recommended that the calibration gas concentration for toxic sensors be 50% of the selected measuring range. (Factory default values are shown.)

Auto span. Values expected by the transmitter for toxic gases can be changed at any time. Refer to Changing the Alarm Setpoints and Calibration Gas Setpoints section.

2: For oxygen use pure air calibration gas

***Note:*** *Performance data is based on conditions at 20°C, 50% RH, 1013 mBar.*

*Do not adjust the oxygen sensor span value.*

**Sensors:**

Toxic and Oxygen: Electrochemical
Combustible: Catalytic or Infrared (IR)
Position Sensitivity: None
Operation Pressure Range: 900 to 1100 mBar (atmospheric +/-10%)

**Calibration Notes:**

For maximum accuracy, calibrate with a mixture in the range most measurements are made. For most purposes a 2 minute exposure is satisfactory. ($NH_3$, $Cl_2$, $ClO_2$, and HCl need a 5 minute exposure.)

## *Relative Sensitivity of Combustible Gases/Vapors*

**Recommend:** For the most accurate measurements, calibrate using the gas or vapor under investigation. Where this is not possible see the applicable catalytic or infrared relative sensitivity table for combustible gases/vapors. The transmitter catalytic and combustible sensors are calibrated to methane (with 50% methane calibration gas) at the factory prior to shipping.

**Table 17. Catalytic Sensor Relative Sensitivity of Common Combustible Gases/Vapors**

| Gas/Vapor | Relative Sensitivity | Gas/Vapor | Relative Sensitivity |
|---|---|---|---|
| Methane | 100 | Carbon monoxide | 105 |
| Propane | 60 | Hydrogen | 100 |
| n-Butane | 60 | Ammonia | 125 |
| n-Pentane | 50 | Cyclohexane | 50 |
| n-Hexane | 40 | Ethylene | 85 |
| Acetylene | 80 | | |
| Each sensitivity has been rounded to the nearest 5% | | | |

**Table 18. Standard Model IR GasPoint Relative Sensitivity to Applicable Combustible Gases/Vapors**

| Gas/Vapor | Relative Sensitivity | Gas/Vapor | Relative Sensitivity |
|---|---|---|---|
| Acetone | 60 | n-Hexane | 325 |
| n-Butane | 450 | Methane | 100 |
| iso-Butane | 450 | n-Pentane | 390 |
| Butane-1 | 450 | iso-Pentane | 390 |
| cis-Butane-2 | 450 | Propane | 410 |
| trans-Butane-2 | 450 | Propanol | 230 |
| Ethane | 450 | Propylene | 310 |
| Ethanol | 330 | o-Xylene | 100 |
| Ethylene | 80 | m-Xylene | 100 |
| n-Heptane | 325 | p-Xylene | 100 |
| MEK | 365* | Methanol | 80* |
| IPA | 410* | Toulene | 25* |
| Ethyl chloride | 120* | Mythyl chloride | 100* |
| *The relative sensitivity is just an estimate.<br>This table is intended for guidance only.<br>Always calibrate using the gas or vapor under investigation. | | | |

**Catalytic Bead Combustible Sensor**
The table shows the variation of the catalytic combustible sensor on exposure to a range of gases and vapors at the same %LEL concentration. The figures are expressed relative to the methane signal (=100).
The results are intended for guidance only. For a more accurate measurement calibrate using the gas or vapor under investigation.

**Special Note on the Combustible Sensor**
Certain substances have a detrimental effect on all catalytic bead sensors. The GP-WD combustible sensor has a higher degree of poison resistance and will outperform other catalytic bead sensors in poisonous atmospheres. However, catalytic sensors should not be exposed for prolonged periods of time to lead or sulfur containing compounds, silicones, or phosphates. Damage is cumulative and may result in an irreversible decrease in sensitivity. Certain other compounds, such as halogenated hydrocarbons and hydrogen sulfide, may temporarily inhibit the sensor performance, but in most cases it will recover after a period in clean air.

**Infrared (IR) Combustible Sensor**
The standard model IR Combustible GasPoint is calibrated to methane. The table shows the variation of the IR combustible sensor on exposure to applicable group combustible hydrocarbon gases and vapors at the same %LEL concentration. The figures are expressed relative to the methane signal (=100).
The results are intended for guidance only. For a more accurate measurement, calibrate using the gas or vapor under investigation.

**⚠ Caution: IR systems should always be calibrated as soon as you install the system to compensate for any change in pressure.**

***Note:*** *If the hydrocarbon desired is not listed, special models are available for other groups of hydrocarbons.*

*For IR sensors, use the specified gas to calibrate the system. IR sensors work very well in low or no oxygen conditions. IR sensors monitors the molar concentration of the specific gases by a physical method. No chemical reaction takes places inside the sensor.*

## *Specifications*

| | |
|---|---|
| **Monitor:** | 3-wire, 4-20 mA gas transmitter with advanced micro-controller based circuitry |
| Power Input: | 12 to 32 volts dc |
| Output Current: | Normal Operation: Isolated linear 4-20 mA output<br>Calibration Mode: Steady 3 mA (automatic reset to normal operation)<br>Fault Mode: 2 mA signal (and less) |
| Current Consumption: | |
| | Toxic Versions: 40 mA at 24 Vdc<br>Catalytic Combustible Version: 100 mA at 24 Vdc<br>Infrared Combustible Version: 75 mA at 24 Vdc<br>Relays: 50 mA per relay at 24 Vdc |
| **Sensors:** | Plug-in, logic sensors |
| Self-Test: | Automatic self-test of sensor integrity upon power on |
| **Calibration:** | Non-intrusive, via pushbutton<br>Auto Zero and Auto Span |
| **Displays:** | Two backlit liquid crystal displays (LCD) |
| LCD 1: | 3 digit continuous readout of the gas present (ppm or %LEL) |
| LCD 2: | Alphanumeric diagnostic status display |
| **Alarm Setpoints:** | Two (2) setpoints - User selectable |
| **Relay Contacts:** | Three field retro-fittable SPDT relays; 5 amps @ 250 Vac |
| Low/High: | Field selectable for normally energized/de-energized and latching/non-latching |
| Fault: | Normally energized and non-latching |
| **Controls:** | |
| Calibration: | Non-intrusive via external pushbutton |
| Alarm Setpoints: | Simple up/down pushbuttons with LCD readout of setpoints |
| **Physical:** | |
| Size (w x l x h): | 6.8 x 7 x 4.3 in. (17 x 17.8 x 10.8 cm) including sensor |
| Weight: | 4.85 lb. (2.2 kg) approximately |
| Enclosure: | Explosion-proof, anodized aluminum enclosure c/w mounting flanges |
| Sensor: | Stainless steel enclosure |
| Wiring Port: | 3/4 inch n.p.t. |
| **Warranty:** | |
| Instrument: | 2 years non-prorated |
| Sensor: | 2 years warranty |
| **FCC Statement:** | This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules and ICES-003 Canadian EMI requirements. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. |
| **Approval:** | Approved by CSA to both U.S. and Canadian standards:<br>Class I, Group B, C, D<br>Approved by CSA to both U.S. and Canadian standards:<br>Class II, Group E, F, G for toxic gas transmitter only<br>Approved to Combustible Performance Standards ISA-S12.13 and C22.2 No. 152 |



13.3

## *Replacement Parts and Accessories*

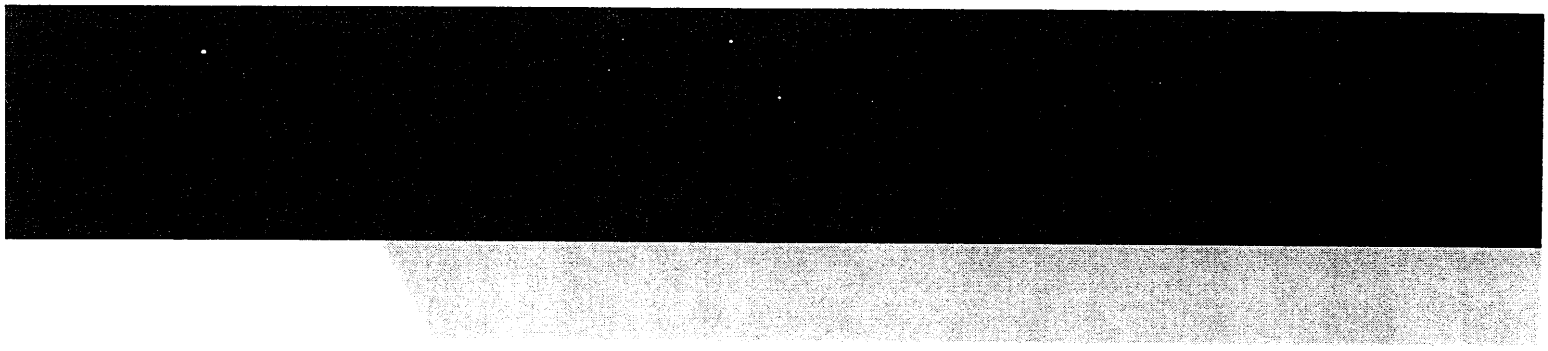
| Transmitters c/w Sensor Assemblies and Relays | | |
|---|---|---|
| **Model No.** | **Description** | **Qty** |
| GP-WD | Transmitter c/w combustible sensor | 1 |
| GP-IR-WD | Transmitter c/w IR combustible sensor | 1 |
| GP-HD | Transmitter c/w hydrogen sulfide sensor | 1 |
| GP-MD | Transmitter c/w carbon monoxide sensor | 1 |
| GP-SD | Transmitter c/w sulfur dioxide sensor | 1 |
| GP-ZD | Transmitter c/w hydrogen cyanide sensor | 1 |
| GP-XD | Transmitter c/w oxygen sensor | 1 |
| GP-AD | Transmitter c/w ammonia sensor | 1 |
| GP-DD | Transmitter c/w nitrogen dioxide sensor | 1 |
| GP-CD | Transmitter c/w chlorine sensor | 1 |
| GP-VD* | Transmitter c/w chlorine dioxide sensor | 1 |
| GP-YD* | Transmitter c/w hydrogen sensor | 1 |
| GP-LD* | Transmitter c/w hydrogen chloride sensor | 1 |

*Add Suffix "-SS" for optional stainless steel transmitter enclosure*
*Contact BW Technologies for sensor availability.
$Cl_2$ ,$ClO_2$ and HCl sensors are only certified for ordinary locations.
Sensor Assembly enclosures are stainless steel (standard)

### Accessories and Spares

| Model No. | Description | Qty |
|---|---|---|
| D2DT | Duck mounting kit | 1 |
| GP-DUC-K1 | Duct mount adapter | 1 |
| GP-1 | Gas transmitter only c/w LCDs and relays (no sensor) | 1 |
| GP-SEP | Sensor separation kit | 1 |
| GP-MBUS3 | MODBUS communication expansion module | 1 |
| GP-MBUS4 | MODBUS communication expansion module | 1 |
| IR-RW03 | IR combustible sensor assembly | 1 |
| SS-RA02 | Ammonia sensor assembly | 1 |
| SS-RC02 | Chlorine sensor assembly | 1 |
| SS-RD02 | Nitrogen dioxide sensor assembly | 1 |
| SS-RH02 | Hydrogen sulfide sensor assembly | 1 |
| SS-RL02 | Hydrogen chrloride sensor assembly | 1 |
| SS-RM02 | Carbon monoxide sensor assembly | 1 |
| SS-RS02 | Sulfur dioxide sensor assembly | 1 |
| SS-RW02 | Combustible sensor assembly | 1 |
| SS-RX02 | Oxygen sensor assembly | 1 |
| SS-RZ02 | Hydrogen cyanide sensor assembly | 1 |
| E0036 | Calibration plug | 1 |
| GP-CAL-3 | Non-conductive remote calibration cup and splash guard | 1 |
| GP-SSPLASH4 | Stainless Steel splash guard | 1 |
| GP-SSCAL4 | Stainless steel remote calibration cup and splash guard | 1 |
| GPOINT-B | GasPoint pushbutton protective boot | 1 |
| GP-FP-MPCB1 | PCB – main control board with LCDs and internal faceplate | 1 |
| GP-MPCB1 | PCB - main control board with LCD | 1 |
| GP-PPCB1 | PCB – power board with relays | 1 |
| GP-HART | Hart communication expansion module (2-wire system) | 1 |
| GP-2210 | Internal faceplate with hinge and label | 1 |
| M1147 | Enclosure with glass window | 1 |
| GP-POWER1 | Power supply 110/220 Vac – 24 Vdc | 1 |
| GP-SSPB | Stainless steel process baffle | 1 |
| GP-SSPB-2 | Stainless steel process baffle with NPT fitting | 1 |
| D1374 | User manual | 1 |

13.3



J1374/5 (English)
iERP: 122635
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BW Technologies by Honeywell

Corporate Headquarters
Calgary, Alberta

# Calibration Flow Rates

123179
GasPoint

The following information has changed in the user manual.

D1374/4 Page 26
D1374/5 Page 20

## Operating and Calibration Specifications

| Specifications | Hydrogen sulfide $H_2S$ ppm | Carbon monoxide CO ppm | Sulfur dioxide $SO_2$ ppm | Ammonia $NH_3$ ppm | Hydrogen cyanide HCN ppm | Nitrogen dioxide $NO_2$ ppm | Oxygen $O_2$ % v/v |
|---|---|---|---|---|---|---|---|
| **Calibration[1]:** | | | | | | | |
| Flow rate (min). ml/minute | **250–500** | **250–500** | **250–500** | **500–1000** | **250–500** | **500–1000** | **250–500** |
| at a % or ppm reading of: | 20 ppm | 200 ppm | 20 ppm | 50 ppm | 15 ppm | 10 ppm | 20.9%[2] |

1: It is recommended that the calibration gas concentration for toxic sensors be 50% of the selected mesuring range. (Factory default values are shown).

Auto span. Values expected by the transmitter for toxic gases can be changed at any time. Refer to Changing the Alarm Setpoints and Calibration Gas Setpoints in the user manual.

2: For oxygen use pure air calibration gas.

***Note:*** *Performance data is based on conditions at 20°C, 50% RH, 1013 mBar.*

*Do not adjust the oxygen sensor span value.*

# Chapter 14
# CONTROL EQUIPMENT

## MANUFACTURER/DISTRIBUTOR:

LUMEN
401,J-F KENNEDY
ST-JÉRÔME, QUE.
PH:450-436-3225 FAX:450-436-2537

**14.1 ENCLOSURE , MAIN PLC CABINET.**

**14.2 SCREW SCREEN AND MAIN PUMP CONSOLE.**

**14.3 TERMINAL BLOCS.**

**14.4 MOUNTING RAILS.**

**14.5 LEGEND PLATE.**

**14.6 FUSE AND SIDE JUMPER.**

**14.7 GROUNDING TERMINAL BLOC.**

**14.8 WIRING DUCT.**

**14.9 MINIATURE CIRCUIT BREAKER.**

**14.10 INDUSTRIAL RELAY , CONTACTOR.**

**14.11 CONTROL RELAY.**

**14.12 SLC 500 PROGRAMMABLE CONTROLLERS PARTS.**

**END OF CHAPTER 14**

# NEMA 12-13 ENCLOSURES — 5500 DDS

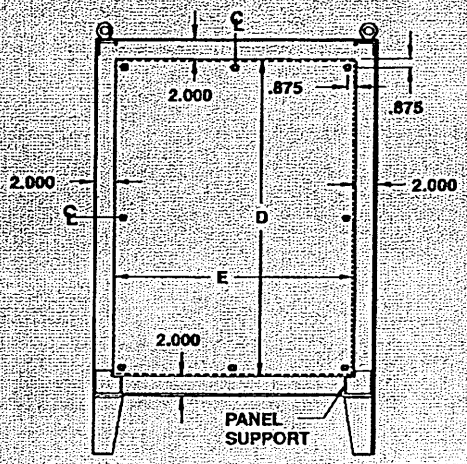
## Oil & dust tight double door enclosure

**Quick Features:**
- Poured gasket
- Seamless welding
- 3-point handle
- Drip shield
- Superior hinging
- 180° door opening
- Panel is included
- Floor stands included
- Powder coated

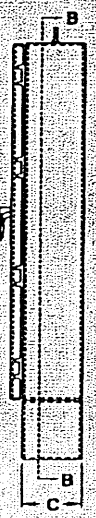
**The 5500 DDS** floor mounted double door, oil and dust tight enclosures are used indoors for protection against dirt, dust and oil. The box and cover are made from quality 12 GA steel with all seams continuously welded. The opening has a curled lip around all sides and there is no center post.

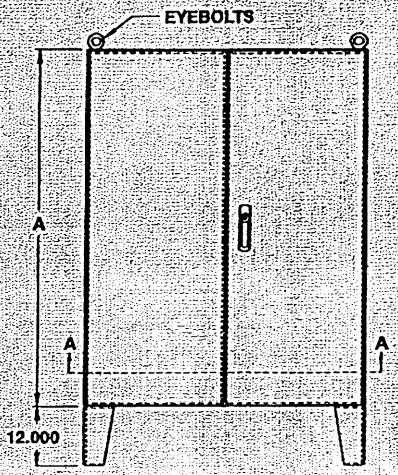
The left hand door is flanged and the 3-point automotive type locking handle is on the right hand door. The ball bearing pins of the concealed hinges can be easily pulled out to remove the door. Floor mounting stands are provided and body stiffeners are installed on larger models. **Each enclosure comes complete with a 11 GA inner panel** which mounts on welded M10 studs. Enclosures and panels are finished with heat fused polyester powder, electrostatically applied on a phosphatized base. Box is ANSI/ASA 61 gray, panel is white.

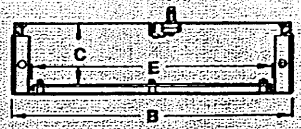
**CSA Certified / UL Listed**
**NEMA 12-13 / IP65**



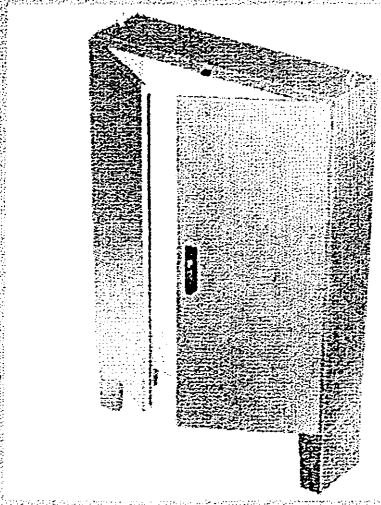
SECTION B-B



SECTION A-A



| CATALOG NUMBER | DIMENSIONS A | B | C | D | E | SHIP WGHT LBS. |
|---|---|---|---|---|---|---|
| 5500 DDS604808 | 60 | 48 | 8 | 56 | 44 | 422 |
| 5500 DDS604810 | 60 | 48 | 10 | 56 | 44 | 433 |
| 5500 DDS606010 | 60 | 60 | 10 | 56 | 56 | 520 |
| 5500 DDS726010 | 72 | 60 | 10 | 68 | 56 | 608 |
| 5500 DDS727210 | 72 | 72 | 10 | 68 | 68 | 716 |
| 5500 DDS604812 | 60 | 48 | 12 | 56 | 44 | 463 |
| 5500 DDS606012 | 60 | 60 | 12 | 56 | 56 | 530 |
| 5500 DDS726012 | 72 | 60 | 12 | 68 | 56 | 633 |
| 5500 DDS727212 | 72 | 72 | 12 | 68 | 68 | 751 |
| 5500 DDS604816 | 60 | 48 | 16 | 56 | 44 | 523 |
| 5500 DDS606016 | 60 | 60 | 16 | 56 | 56 | 650 |
| 5500 DDS726016 | 72 | 60 | 16 | 68 | 56 | 740 |
| 5500 DDS727216 | 72 | 72 | 16 | 68 | 68 | 841 |
| 5500 DDS604820 | 60 | 48 | 20 | 56 | 44 | 589 |

Visit www.eurobox.com for details

Call us toll free 1-800-363-2423

Data subject to change without notice.

## Suggested Accessories

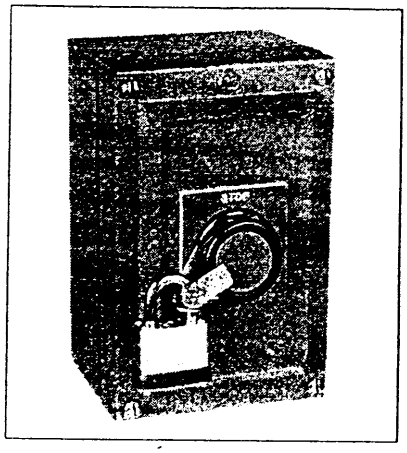
14.1

FOR RAW SEWER-EMERGENCY-STOP
+ SCREW SCREEN LOCAL CONTROL



# 30.5 mm Push Button Stations Hermetically Sealed for Division 2/Zone 2 Enclosures

## Custom Built Stations



### Description

The tables on pages 81 and 82 list the most commonly used push button stations. Stations not listed in the tables may be ordered as custom built stations.

### Cat. No.

The cat. no. used to identify custom built Bulletin 800R push button stations, which are built at the factory, will be cat. nos. listed for the enclosure only, except letter **W** will be substituted for the letter **Z** and with a station serial number.

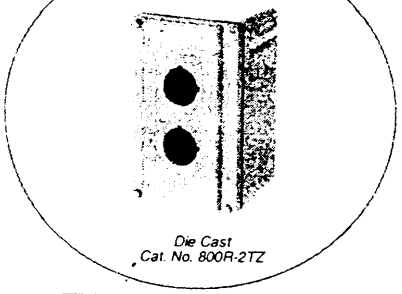
### Ordering Information

The following information is required when ordering custom built push button stations.

1. Cat. no. of enclosure.
2. Cat. no. of control units.
3. Legend plate cat. no. and/or marking for each unit.
4. Specify vertical or horizontal mounting.
5. Specify desired operator mounting sequence. Inclusion of a sketch is recommended. If no information is given, standard configuration will be used.

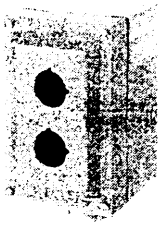
SCREW SCREEN CONTROL
C/W JOG+H/O/A+E-STOP+FOR/REV

Enclosures Only



*Die Cast*
*Cat. No. 800R-2TZ*

*Stainless Steel*
*Cat. No. 800R-2HZ4*



*Rosite Glass Polyester*
*Cat. No. 800R-2HZ4R*

*Fiberglass*
*Cat. No. 800H-2HZ4Y*

| Units ❶ | Die Cast (Type 4/13) Cat. No. | Stainless Steel (Type 4/4X/13) Cat. No. | Rosite Glass Polyester (Type 4/4X/13) Cat. No. | Fiberglass ❷ (Type 4/4X/12/13) Cat. No. |
|---|---|---|---|---|
| 1 | 800R-1TZ | 800R-1HZ4 | 800R-1HZ4R | 800H-1HZ4Y |
| 2 | 800R-2TZ | 800R-2HZ4 | 800R-2HZ4R | 800H-2HZ4Y |
| 3 | 800R-3TZ | 800R-3HZ4 | 800R-3HZ4R | 800H-3HZ4Y |
| 4 | 800R-4TZ | 800R-4HZ4 | 800R-4HZ4R | — |
| 5 | | 800R-5HZ4 | 800R-5HZ4R | — |
| 6 | 800R-6TZ | 800R-6HZ4 | 800R-6HZ4R | — |

❶ Number of units that can be mounted in enclosure.
❷ Extra deep. Accomodates two levels of stackable sealed switch contact blocks.

**Note:** Enclosure and conduit dimensions are detailed on page 84, except for the fiberglass enclosures which are found on page 78.

REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT. ANY ACTION INDICATED IS SUBJECT TO THESE REQUIREMENTS.

- [x] NO EXCEPTIONS TAKEN
- [ ] MAKE NOTED CORRECTIONS
- [ ] REVISE & RESUBMIT
- [ ] REJECTED

DATE 07/Nov/05 BY QC
EARTH TECH (CANADA) INC.

FIELD SCREW SCREEN LOCAL CONTROL BOX CLASS I DIV 2

E STOP
H-O-A
JOG



14.2

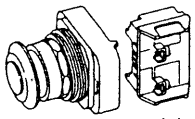
SCREW SCREEN

## 2-Position Twist Release Units, Non-Illuminated

3. RAW SEWER
3X SCREW-SCREEN

6 AP

**800H ___ – FRXT 1 A1**
*a b c d*



### a

| Finger-Safe Guards | |
|---|---|
| Code | Description |
| Blank | No Guards |
| C | Guards on Terminals |

### b

| Head Type ❶ | |
|---|---|
| Code | Description |
| FRXT | Twist-to-Release |
| FRXJT | Jumbo Head with Twist-to-Release ❷ |

### c

| Color Cap | |
|---|---|
| Code | Color |
| Blank | No Cap |
| 1 | Green |
| 2 | Black |
| 3 | Orange |
| 4 | Gray |
| 5 | White |
| 6 | Red |
| 7 | Blue |
| 9 | Yellow |

### d

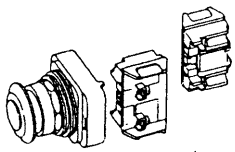
| Contact Block(s) | | | |
|---|---|---|---|
| Code | Operator Position Out | Operator Position In | Description |
| Blank | — | — | No Contacts on operator |
| **Standard** | | | |
| D1 | O | X | 1 N.O. |
| D2 | X | O | 1 N.C. |
| D4 | X | O | 1 N.C.L.B. |
| A1 | O<br>X | X<br>O | 1 N.O. - 1 N.C.L.B. |
| A5 | X<br>X | O<br>O | 2 N.C.L.B. |
| **Pen*TUFF* (Low Voltage)** | | | |
| D1V | O | X | 1 N.O. |
| D2V | X | O | 1 N.C. |
| D4V | X | O | 1 N.C.L.B. |
| AV | O<br>X | X<br>O | 1 N.O. - 1 N.C. |
| **Class I, Div. 2/Zone 2** | | | |
| **Logic Reed** | | | |
| D1R | O | X | 1 N.O. |
| D2R | X | O | 1 N.C. |
| AR | O<br>X | X<br>O | 1 N.O. - 1 N.C. |

### d (cont'd)

| Contact Block(s) | | | |
|---|---|---|---|
| Code | Operator Position Out | Operator Position In | Description |
| Blank | — | — | No Contacts on operator |
| **Class I, Div. 2/Zone 2** | | | |
| **Sealed Switch** | | | |
| D1P | O | X | 1 N.O. |
| D2P | X | O | 1 N.C. |
| AP | O<br>X | X<br>O | 1 N.O.<br>1 N.C. |
| **Stackable Sealed Switch** | | | |
| D1Y | O | X | 1 N.O. |
| D2Y | X | O | 1 N.C. |
| AY | O<br>X | X<br>O | 1 N.O. - 1 N.C. |
| Note: X=Closed/O=Open. | | | |

## 3-Position Push-Pull Units, Non-Illuminated

**800H ___ – FRX M 1 A7**
*a b c d e*



### a

| Finger-Safe Guards | |
|---|---|
| Code | Description |
| Blank | No Guards |
| C | Guards on Terminals |

### b

| Head Type | |
|---|---|
| Code | Description |
| FRX | Mushroom Head |
| FRXJ | Jumbo Mushroom Head ❷ |

### c

| Operator Function | | | |
|---|---|---|---|
| Code | Operator Position Out | Operator Position Center | Operator Position In |
| M | Momentary | Maintained | Maintained |
| N | Momentary | Maintained | Momentary |

### d

| Color Cap | |
|---|---|
| Code | Color |
| Blank | No Cap |
| 1 | Green |
| 2 | Black |
| 3 | Orange |
| 4 | Gray |
| 5 | White |
| 6 | Red |
| 7 | Blue |
| 9 | Yellow |

### e

| Contact Block(s) | | | | |
|---|---|---|---|---|
| Code | Operator Position | | | Description |
| Blank | — | — | — | No Contacts on operator |
| **Standard** | | | | |
| A | O<br>X | O<br>O | X<br>O | 1 N.O. - 1 N.C. |
| A1 | O<br>X | O<br>X | X<br>O | 1 N.O. - 1 N.C.L.B. |
| A7 | X<br>X | O<br>X | O<br>O | 1 N.C. - 1 N.C.L.B. |

### e (cont'd)

| Contact Block(s) | | | | |
|---|---|---|---|---|
| Code | Operator Position Out | Operator Position Ctr. | Operator Position In | Description |
| **Pen*TUFF* (Low Voltage)** | | | | |
| AV | O<br>X | O<br>O | X<br>O | 1 N.O. - 1 N.C. |
| **Class I, Div. 2/Zone 2** | | | | |
| **Logic Reed** | | | | |
| AR | O<br>X | O<br>O | X<br>O | 1 N.O. - 1 N.C. |
| **Sealed Switch** | | | | |
| AP | O<br>X | O<br>O | X<br>O | 1 N.O. - 1 N.C. |
| **Stackable Sealed Switch** | | | | |
| AY | O<br>X | O<br>O | X<br>O | 1 N.O. - 1 N.C. |
| Note: X=Closed/O=Open. | | | | |

❶ 2-position push-pull and push-pull/twist-to-release devices with N.C.L.B. contacts meet EN-418 and IEC 60947-5-5 standards for emergency stop applications.

❷ Not valid with color cap option **Blank** (no cap).

## Blank and Custom Legend Plates, Continued

### Speciality Legend Plates

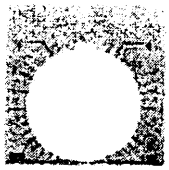
*Cat. No. 800T-X618*

*Cat. No. 800T-X647Y*

*Cat. No. 800T-X646*

| Type | Start/Stop Legend Plates | Emergency Stop Legend Plates | | |
|---|---|---|---|---|
| | Gray | Yellow | Yellow (Large Size) | Yellow IEC Ring |
| | Cat. No. | Cat. No. | Cat. No. | Cat. No. |
| Push-to-Stop / Pull-to-Start — Push-to-Stop / Twist or Pull Release | 800T-X618 | 800T-618Y | 800T-X647Y | — |
| Blank | — | — | 800T-X645Y | 800T-X646 |
| Custom | — | — | 800T-X645YE | — |
| Emergency Stop | — | — | — | 800T-X646EM |

### Potentiometer Legend Plates



*Cat. No. 800T-X609*

*Cat. No. 800T-X608*

| Type | Cat. No. |
|---|---|
| Potentiometer with Graduated Markings | 800T-X609 ❶ |
| Speed with Graduated Markings | 800T-X608 |

❶ For graduated markings with a custom text, order 800T-X609E and specify up to two lines of text, 14 characters per line.

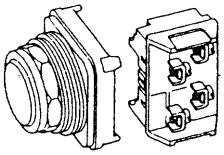
PLATE

## Momentary Contact Push Button Units, Non-Illuminated

9 AP

**800H** ____ **– AR** **1** ____ **A**

*a* *b* *c* *d* *e*



*a*

| Finger-Safe Guards | |
|---|---|
| Code | Description |
| Blank | No Guards |
| C | Guards on Terminals |

*b*

| Operator Type | |
|---|---|
| Code | Description |
| AR | Flush Head |
| BR | Extended Head |
| DR | Mushroom Head |
| DRX | Mushroom Head less Color Cap |
| R | Booted Head ❶ |
| GR | Bootless Guarded Head |

*c*

| Color Cap | |
|---|---|
| Code | Description |
| Blank | Used only when ordering Operator Type DRX |
| 1 | Green |
| 2 | Black |
| 3 | Orange ❷ |
| 4 | Gray ❷ |
| 5 | White ❷ |
| 6 | Red |
| 7 | Blue |
| 9 | Yellow |

*d*

| Special Mushroom Head | |
|---|---|
| Code | Description |
| Blank | No Special Head |
| J | Jumbo Mushroom Head — Plastic |

Note: Special Mushroom Head options only apply to Mushroom Head operator Type Code DR.

*e*

| Contact Block(s) | |
|---|---|
| Code | Description |
| Blank | No Contacts on operator |
| **Standard** | |
| D1 | 1 N.O. |
| D2 | 1 N.C. |
| D3 | 1 N.O.E.M. |
| D4 | 1 N.C.L.B. |
| D5 | 1 N.O. (Mini) |
| D6 | 1 N.C. (Mini) |
| A1 | 1 N.C.L.B. - 1 N.O. |
| A2 ❸ | 2 N.O. |
| A4 | 2 N.C. |
| A7 | 1 N.C.L.B. - 1 N.C. |
| A | 1 N.O. - 1 N.C. |
| B | 2 N.O. - 2 N.C. |
| H | 3 N.O. - 3 N.C. |
| C | 4 N.O. - 4 N.C. |
| **Pen*TUFF* (Low Voltage)** | |
| D1V | 1 N.O. |
| D2V | 1 N.C. |
| D3V | 1 N.O.E.M. |
| D4V | 1 N.C.L.B. |
| AV | 1 N.O. - 1 N.C. |
| BV | 2 N.O. - 2 N.C. |
| HV | 3 N.O. - 3 N.C. |
| CV | 4 N.O. - 4 N.C. |

*e (cont'd)*

| Contact Block(s) | |
|---|---|
| Code | Description |
| Blank | No Contacts on operator |
| **Time Delay** | |
| T | 1 N.O. Depress to close, release to initiate delayed opening |
| S | 1 N.C. Depress to open, release to initiate delayed closure |
| **Class I, Div. 2/Zone 2** | |
| **Logic Reed** | |
| D1R | 1 N.O. |
| D2R | 1 N.C. |
| A2R❸ | 2 N.O. |
| A4R❸ | 2 N.C. |
| AR | 1 N.O. - 1 N.C. |
| BR | 2 N.O. - 2 N.C. |
| HR | 3 N.O. - 3 N.C. |
| CR | 4 N.O. - 4 N.C. |
| **Sealed Switch** | |
| D1P | 1 N.O. |
| D2P | 1 N.C. |
| A2P | 2 N.O. |
| A4P | 2 N.C. |
| AP | 1 N.O. - 1 N.C. |
| BP | 2 N.O. - 2 N.C. |
| **Stackable Sealed Switch** | |
| D1Y | 1 N.O. |
| D2Y | 1 N.C. |
| A2Y | 2 N.O. |
| A4Y | 2 N.C. |
| AY | 1 N.O. - 1 N.C. |
| BY | 2 N.O. - 2 N.C. |
| HY | 3 N.O. - 3 N.C. |
| CY | 4 N.O. - 4 N.C. |

| Time Delay Contacts |
|---|
| Series C field installable kits can only be used with Series T or later operators. Adjustable range of 0.5...15 sec ±25% Maximum continuous current $I_{th}$ 5 A |

❶ Green and black operators are flush underneath boots; red operators are extended.
❷ Not available for booted operators.
❸ XA2 and XA2R contact blocks cannot be stacked upon, but they can stack on other contact blocks.

4

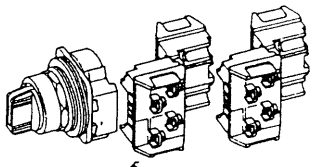
800 # HR2 B.P.
#-O-A 800 # JR 2 KB7 B-P



## 2- and 3-Position Selector Switch Units, Non-Illuminated

**800H** ___ **– HR** **A** **2** **D1** *(2-Position)*
*a b c d e*

**800H** ___ **– JR** ___ **2** **KC1** **H** *(3-Position)*
*a b c d $e_1$ $f_1$*


$f_1$

*a*

| Finger-Safe Guards | |
|---|---|
| Code | Description |
| Blank | No Guards |
| C | Guards on Terminals |

*b*

| Number of Positions | |
|---|---|
| Code | Description |
| HR | 2-Position |
| JR | 3-Position |

*c*

| Knob Insert Colors | |
|---|---|
| Code | Color |
| Blank | White |
| A | Red |
| B | Green |
| C | Blue |
| E | Yellow |
| F | Orange |
| X | Packet of Colored Inserts ❶ |

*d*

| Standard Knob Operators | |
|---|---|
| Code | Operator Function |
| 2 | Maintained |
| 4 | Spring Return from Left ❷ |
| 5 | Spring Return from Right |
| 91 ❸ | Spring Return from Both |

*e*

| Contact Block(s) (2-Position) | | | |
|---|---|---|---|
| Code | Description | | |
| | Contact Configuration | 2-Position | |
| Standard (Pen*TUFF*) | Standard (Pen*TUFF*) | ⊘ | ⊘ |
| Blank | No Contacts | — | — |
| D1 (D1V) | 1 N.O. 800T-XD1 or (XD1V) on white side | O | X |
| D2 (D2V) | 1 N.C. 800T-XD2 or (XD2V) on white side | X | O |

*e (cont'd)*

| Contact Block(s) (2-Position) | | | |
|---|---|---|---|
| Code | Description | | |
| | Contact Configuration | 2-Position | |
| Standard (Pen*TUFF*) | Standard (Pen*TUFF*) | ⊘ | ⊘ |
| A (AV) | 1 N.O. - 1 N.C. 1-800T-XA or (XAV) on white side | O | X |
| | | X | O |
| B (BV) | 2 N.O. - 2 N.C. 2-800T-XAs or (XAV)s — 1 on white side/ 1 on black side | O | X |
| | | X | O |
| | | O | X |
| | | X | O |
| H (HV) | 3 N.O. - 3 N.C. 3-800T-XAs or (XAV)s — 2 on white side/ 1 on black side | O | X |
| | | X | O |
| | | O | X |
| | | X | O |
| | | O | X |
| | | X | O |
| C (CV) | 4 N.O. - 4 N.C. 4-800T-XAs or (XAV)s — 2 on white side/ 2 on black side | O | X |
| | | X | O |
| | | O | X |
| | | X | O |
| | | O | X |
| | | X | O |

$e_1$

| Cam Option (3 Pos.) ❹ | |
|---|---|
| Code | Description |
| Blank | KB7 Cam (Std.) |
| KA1 | KA1 Cam |
| KA7 | KA7 Cam |
| KC1 | KC1 Cam |
| KC7 | KC7 Cam |
| KD7 | KD7 Cam |
| KE7 | KE7 Cam |
| KQ1 | KQ1 Cam |
| KR1 | KR1 Cam |
| KR7 | KR7 Cam |
| KT1 | KT1 Cam |
| KT7 | KT7 Cam |
| KU7 | KU7 Cam |

Note: Associated targets are shown in Table 1.

| Contact Blocks (3-Position) | |
|---|---|
| Code | Description |
| Standard (Pen*TUFF*) | Standard (Pen*TUFF*) |
| Blank | No contacts |
| A (AV) | 1 N.O. - 1 N.C. 1-800T-XA or (XAV) on white side |
| B (BV) | 2 N.O. - 2 N.C. 2 -800T-XAs or (XAV)s — 1 on white side/ 1 on black side |
| H (HV) | 3 N.O. - 3 N.C. 3-800T-XAs or (XAV)s — 2 on white side/ 1 on black side |
| C (CV) | 4 N.O. - 4 N.C. 4-800T-XAs or (XAV)s — 2 on white side/ 2 on black side |
| **Class I, Div. 2/Zone 2** | |
| **Logic Reed ❺** | |
| AR | 1 N.O. - 1 N.C. |
| BR | 2 N.O. - 2 N.C. |
| HR | 3 N.O. - 3 N.C. |
| CR | 4 N.O. - 4 N.C. |
| **Sealed Switch ❺** | |
| AP | 1 N.O. - 1 N.C. |
| BP | 2 N.O. - 2 N.C. |
| **Stackable Sealed Switch ❺** | |
| AY | 1 N.O. - 1 N.C. |
| BY | 2 N.O. - 2 N.C. |
| HY | 3 N.O. - 3 N.C. |
| CY | 4 N.O. - 4 N.C. |

Note: Associated targets are shown in Table 1.

Table 1. 3-Position Cam and Contact Block Functionality Table

| Contact Block Suffix Codes | Contact Block Side | Ckts | Cam Codes: KB7 (Std.) ⊘ ① ⊘ | KA1 ⊘ ① ⊘ | KA7 ⊘ ① ⊘ | KC1 ⊘ ① ⊘ | KC7 ⊘ ① ⊘ | KD7 ⊘ ① ⊘ | KE7 ⊘ ① ⊘ | KQ1 ⊘ ① ⊘ | KQ7 ⊘ ① ⊘ | KR1 ⊘ ① ⊘ | KR7 ⊘ ① ⊘ | KT1 ⊘ ① ⊘ | KT7 ⊘ ① ⊘ | KU7 ⊘ ① ⊘ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A_ B_ H C_ | White | A | X O O | X O O | O O X | X O O | O O X | X O O | O O X | X O O | O O X | X O O | O O X | X O O | O O X | X O O |
| | | B | O O X | O X O | O X O | O X O | O X O | O O X | O X O | O X O | O X O | O X O | O X O | O X O | O X O | O O X |
| | Black | A | X O O | X O O | O O X | X O O | O O X | X O O | O O X | X O O | O O X | X O O | O O X | X O O | O O X | X O O |
| | | B | O O X | O X O | O X O | O X O | O X O | O O X | O X O | O X O | O X O | O X O | O X O | O X O | O X O | O O X |
| | White | A | X O O | X O O | O O X | X O O | O O X | X O O | O O X | X O O | O O X | X O O | O O X | X O O | O O X | X O O |
| | | B | O O X | O X O | O X O | O X O | O X O | O O X | O X O | O X O | O X O | O X O | O X O | O X O | O X O | O O X |
| | Black | A | X O O | X O O | O O X | X O O | O O X | X O O | O O X | X O O | O O X | X O O | O O X | X O O | O O X | X O O |
| | | B | O O X | O X O | O X O | O X O | O X O | O O X | O X O | O X O | O X O | O X O | O X O | O X O | O X O | O O X |

Note: X=Closed/O=Open

❶ Packet of colored inserts, one of each color except orange.
❷ Target tables for 2-position devices are reversed from those shown.
❸ This option is only available with 3-position devices.
❹ If an overlapping cam is required, consult your local Allen-Bradley Sales Office.
❺ Contact block mounting same as listed for standard and Pen*TUFF* contact blocks.

# 30.5 mm Push Buttons

## Type 4/4X/13, Corrosion-Resistant/Watertight/Oiltight

### Modifications and Accessories, Continued

Standard Legend Plates

*Gray Legend Plate Type 4/4X*

*White Legend Plate Type 4/4X*

| Marking | Gray Type 4/4X Cat. No. | White Type 4/4X Cat. No. | Marking | Gray Type 4/4X Cat. No. | White Type 4/4X Cat. No. |
|---|---|---|---|---|---|
| AUTO-OFF-HAND | 800H-W154 | 800H-W554 | LOWER | 800H-W115 | 800H-W515 |
| AUTO-MAN-HAND | 800H-W059 | 800H-W459 | MAN-AUTO | 800H-W031 | 800H-W431 |
| CLOSE | 800H-W101 | 800H-W501 | MAN-OFF-AUTO | 800H-W062 | 800H-W462 |
| CYCLE START | 800H-W006 | 800H-W406 | MOTOR RUN | 800H-W008 | 800H-W408 |
| CYCLE STOP (Red) | 800H-W376 | — | MOTOR STOP (Red) | 800H-W375 | — |
| DECREASE | 800H-W002 | 800H-W402 | OFF | 800H-W116 | 800H-W516 |
| DOWN | 800H-W102 | 800H-W502 | OFF-COOLANT-ON | 800H-W052 | 800H-W452 |
| EMERG. STOP (Red) ❷ | 800H-W372 | — | OFF-LOC-REMOTE | 800H-W061 | — |
| EMERGENCY STOP (Red) ❷ | 800H-W373 | — | OFF-MAN-AUTO | 800H-W060 | 800H-W460 |
| FAST | 800H-W104 | 800H-W504 | OFF-ON | 800H-W133 | 800H-W533 |
| FEED START | 800H-W007 | — | ON | 800H-W117 | 800H-W517 |
| FEED STOP (Red) | 800H-W377 | — | OPEN | 800H-W118 | 800H-W518 |
| FOR.-REV. | 800H-W132 | 800H-W532 | OPEN-CLOSE | 800H-W134 | 800H-W534 |
| FOR.-OFF-REV. | 800H-W152 | 800H-W552 | OPEN-OFF-CLOSE | 800H-W153 | 800H-W553 |
| FORWARD | 800H-W105 | 800H-W505 | OUT | 800H-W119 | 800H-W519 |
| FOURTH SPEED | 800H-W010 | — | POWER ON | 800H-W001 | 800H-W401 |
| FULL SPEED | 800H-W106 | 800H-W506 | PULL-TO-START | 800H-W198 | — |
| HAND-AUTO | 800H-W131 | 800H-W531 | PUSH-TO-STOP (Red) | 800H-W378 | — |
| HAND-OFF-AUTO | 800H-W151 | 800H-W551 | RAISE | 800H-W120 | 800H-W520 |
| HIGH | 800H-W107 | 800H-W507 | RAISE-LOWER | 800H-W034 | — |
| HIGH-LOW | 800H-W030 | — | RAISE-OFF-LOWER | 800H-W156 | 800H-W556 |
| HIGH-LOW-OFF | 800H-W058 | — | RESET | 800H-W121 | 800H-W521 |
| HIGH-OFF-LOW | 800H-W155 | 800H-W555 | REVERSE | 800H-W122 | 800H-W522 |
| IN | 800H-W108 | 800H-W508 | RIGHT | 800H-W005 | 800H-W405 |
| INCH | 800H-W109 | 800H-W509 | RUN | 800H-W123 | 800H-W523 |
| INCREASE | 800H-W003 | — | RUN-INCH | 800H-W037 | — |
| JOG | 800H-W110 | 800H-W510 | RUN-JOG | 800H-W032 | — |
| JOG FOR. | 800H-W111 | 800H-W511 | SAFE-RUN | 800H-W033 | — |
| JOG REV. | 800H-W112 | 800H-W512 | SECOND SPEED | 800H-W124 | 800H-W524 |
| JOG RUN | 800H-W135 | 800H-W535 | SLOW | 800H-W125 | 800H-W525 |
| JOG-SAFE-RUN | 800H-W051 | — | SLOW-FAST | 800H-W136 | 800H-W536 |
| JOG-STOP-RUN | 800H-W057 | — | SLOW-OFF-FAST | 800H-W157 | 800H-W557 |
| LEFT | 800H-W004 | 800H-W404 | SPEED ❶ | 800H-W081 | 800H-W481 |
| LEFT-RIGHT | 800H-W036 | — | SPEED ❶ | 800H-W182 | — |
| LOC-OFF-REMOTE | 800H-W055 | 800H-W455 | START | 800H-W126 | 800H-W526 |
| LOW | 800H-W113 | 800H-W513 | START-JOG | 800H-W138 | 800H-W538 |
| LOW-HIGH | 800H-W035 | — | START-JOG-STOP | 800H-W158 | 800H-W558 |
| LOW-OFF-HIGH | 800H-W056 | — | START-RUN-STOP | 800H-W054 | — |
| LOW SPEED | 800H-W114 | 800H-W514 | START-STOP | 800H-W137 | 800H-W537 |

❶ Potentiometer type with graduated markings.

❷ These legend plates do not comply with E-Stop standards that specify a yellow background, such as IEC 60947-5-5 and NFPA 79.

LEGEND PLATE.

Bulletin 800R

# 30.5 mm Push Buttons Hermetically Sealed for Division 2

## Type 4/13 and 4/4X/13 for Hazardous Locations

### Specifications ❶

| | | |
|---|---|---|
| **Electrical Ratings** | | |
| Contact Ratings | | Refer to the Contact Ratings tables below. |
| Dielectric Strength | | 2200V for one minute, 1300V for one minute (Logic Reed) |
| Electrical Design Life Cycles | | 1,000,000 at maximum rated load, 200,000 at maximum rated load (Logic Reed) |
| **Mechanical Ratings** | | |
| Vibration | | 10,..2000 Hz 1.52mm displacement (peak-to-peak) Max./10 G Max. (except Logic Reed) |
| Shock | | 1/2 cycle sine wave for 11 milliseconds ≥ 25 G (contact fragility) and no damage at 1 00G |
| Degree of Protection | | Type 4/4X/13, 4/13; Watertight/Corrosion-Resistant IEC 529 IP66/65 |
| Mechanical Design Life Cycles | | |
| Push Buttons | (Momentary, Non-Illuminated) | 10,000,000 min. |
| | (Momentary, Illuminated) | 250,000 min. |
| | (Push-Pull/Twist-to-Release) | 250,000 min. |
| Selector Switches | (Non-Illuminated) | 1,000,000 min. |
| | (Illuminated) | 200,000 min. |
| All other devices | | 200,000 min. |
| Contact Operation | | Logic Reed and Sealed Switch Contact Blocks: Single break magnetic |
| Typical Operating Forces | | |
| Operators without contact blocks | | Flush, Extended, Standard Mushroom, Jumbo Plastic Mushroom: 2 lbs max<br>Maintained Selector Switch: 3.6 in.-lbs maximum |
| Spring Return Selector Switches | | 3.6 in.-lbs to stop<br>0.2 in.-lbs to return |
| Illuminated Push Buttons and Push-to-Test Pilot Lights | | 5 lbs maximum |
| 3-Position Push-Pull | | 8 lbs maximum push to in position or pull to center position (15 lbs maximum pull to out position) |
| Push-Pull and Push-Pull/Twist | | 9 lbs maximum push or pull<br>30 in.-oz. maximum twist, 6 in.-oz. minimum return |
| Contact Blocks | Logic Reed | 1 lb. maximum |
| | Sealed Switch | 3 lbs maximum at 0.205" plunger travel |
| | Stackable Sealed Switch | 1 lb. maximum |
| **Environment** | | |
| Temperature Range | Operating | –40...+131°F (–40...+55°C) |
| | Storage | –40...+185°F (–40...+85°C) |
| **Note:** Operating temperatures below freezing are based on the absence of moisture and liquids. Contact your local Allen-Bradley sales office for use in lower temperature applications. | | |
| Humidity | | 50% at +104°F (+40°C) |

❶ Performance Data — See publication A113, page Important-2.

#### Control Stations

Bulletin 800R control stations are designed for Division 2 hazardous locations. They consist of Bulletin 800H (Type 4/4X/13) or Bulletin 800T (Type 4/13) operators with sealed contact blocks. Bulletin 800R units are available as factory assembled stations or as components for field assembly.

#### Hazardous Locations

Since the contacts are enclosed in a hermetically sealed chamber, the contact block is suitable for use in **Class I and II, Division 2/Zone 2 Groups A, B, C, D, F and G hazardous locations and is listed by Underwriters Laboratories** for this class of service. Complete stations as shown on page 119 can be used for **Class I and II Division 2** applications. The individual components shown in the 800T and 800H sections are also suitable for **Class I and II Division 2/Zone 2** locations providing they are suitably mounted by the customer in an enclosure as required for the application and by applicable codes and laws.

**Class I Zone 2** protection method Ex nW IIc Temp. Code T3/T6, Demko 97.Y.122018 U applies to operators and contacts.

Per National Electrical Code: **Zone 2**. In Class I, Zone 2 locations, all wiring methods permitted for Class I, Division 2, Class I, Division 1 or Division 2, and Class I, Zone 0 or Zone 1 locations, including requirements for sealing, shall be permitted.

**Note:** Allen-Bradley Logic Reed contact blocks are also **listed by Underwriters Laboratories** for the **Division 2/Zone 2 hazardous locations** listed above.

> ⚠ **CAUTION:**
> The complete stations and individual components listed herein **are not suitable for use in Class I and II Division 1 hazardous locations**. For Class I and II Division 1 hazardous locations, order Bulletin 800H Type 7 & 9 stations and units.

#### Sealed Switch Contact Ratings

Maximum continuous current $I_{th}$ 5 A. Bulletin 800T and 800H units have control circuit ratings with sealed switch contact blocks as follows.

| Max. Opertnl. Volts Ue | Utilization Category IEC | NEMA | Rated Operational Currents Volts Ue | Make | Break |
|---|---|---|---|---|---|
| AC 600 | AC-15 | B600 | 120...600<br>0...120 | 3600 VA<br>30 A | 360 VA<br>3 A |
| DC 300 | DC-13 | P300 | 24...300<br>0...24 | 138 VA<br>5.0 A | |

#### Stackable Sealed Switch Contact Ratings

Maximum continuous current $I_{th}$ 2.5 A. Bulletin 800T and 800H units have control circuit ratings with sealed switch contact blocks as follows.

| Max. Opertnl. Volts Ue | Utilization Category IEC | NEMA | Rated Operational Currents Volts Ue | Make | Break |
|---|---|---|---|---|---|
| AC 300 | AC-15 | C300 | 120...300<br>0...120 | 1800 VA<br>15 A | 180 VA<br>1.5 A |
| DC 150 | DC-13 | Q150 | 24...150<br>0...24 | 69 VA<br>2.5 A | |

#### Logic Reed Contact Ratings

Maximum DC: 30V, 0.06 A Maximum AC: 150V, 0.15 A
Should only be used with resistive loads.

#### Approvals

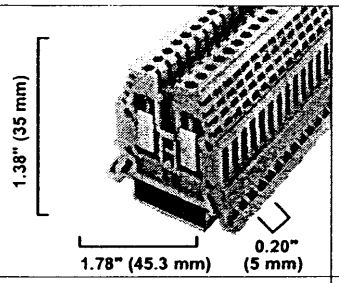
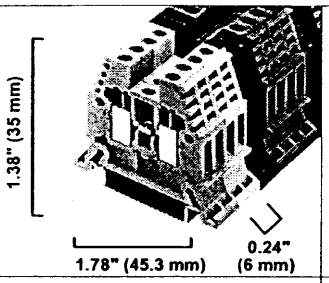
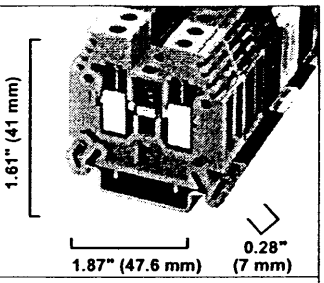
UL Listed — File: E10314
Guide: NOIV
CSA Certified: LR11924
IEC Compliance Demko 97.Y.122018 U

FOR ALL CONTROL PANEL 17275

Bulletin 1492

# IEC Terminal Blocks

## Standard Feed-Through Blocks

| | 1492-W3 | | | | 1492-W4 | | | | 1492-W6 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dimensions are not intended to be used for manufacturing purposes. **Note:** Height dimension is measured from top of rail to top of terminal block. |   | | | |   | | | |   | | | |
| **Specifications** | *Single-circuit terminal block.* | | | | *Single-circuit terminal block.* | | | | *Single-circuit terminal block.* | | | |
| Approvals | cULus | EEx e II | CSA | IEC | cULus | EEx e II | CSA | IEC | cULus | EEx e II | CSA | IEC |
| Voltage Rating | 600V AC/DC | 550V | 600V AC/DC | 800V AC/DC | 600V AC/DC | 550V | 600V AC/DC | 800V AC/DC | 600V AC/DC | 550V | 600V AC/DC | 800V AC/DC |
| Maximum Current | 20 A | 24 A | 20 A | 24 A | 30 A | 32 A | 30 A | 32 A | 40 A | 41 A | 40 A | 41 A |
| Wire Range (Rated Cross Section) | #30-#14 AWG | 2.5 mm² | #22-#14 AWG | 0.5-2.5 mm² | #22-#10 AWG | 4.0 mm² | #22-#10 AWG | 0.5-4 mm² | #22-#10 AWG | 6.0 mm² | #22-#10 AWG | 0.5-6 mm² |
| Wire Strip Length | 0.39" (10 mm) | | | | 0.35" (9 mm) | | | | 0.47" (12 mm) | | | |
| Recommended Tightening Torque | 5.0...5.6 lb-in. (0.6 Nm) | | | | 5.0...5.6 lb-in. (0.6 Nm) | | | | 5.6...6.8 lb-in. (0.7 Nm) | | | |
| Density | 61 pcs./ft (200/m) | | | | 50 pcs./ft (166/m) | | | | 43 pcs./ft (142/m) | | | |
| Insulation Temperature Range | –40...+195°F (–40...+90°C) | | | | –40...+195°F (–40...+90°C) | | | | –40...+195°F (–40...+90°C) | | | |
| **Terminal Blocks** | **Cat. No.** | | | **Pcs./ Pkg.** | **Cat. No.** | | | **Pcs./ Pkg.** | **Cat. No.** | | | **Pcs./ Pkg.** |
| Color: Gray | 1492-W3 | | | 50 | 1492-W4 | | | 50 | 1492-W6 | | | 50 |
| Red | 1492-W3-RE | | | 50 | 1492-W4-RE | | | 50 | 1492-W6-RE | | | 50 |
| Blue | 1492-W3-B | | | 50 | 1492-W4-B | | | 50 | 1492-W6-B | | | 50 |
| Black | 1492-W3-BL | | | 50 | 1492-W4-BL | | | 50 | 1492-W6-BL | | | 50 |
| Green | 1492-W3-G | | | 50 | 1492-W4-G | | | 50 | 1492-W6-G | | | 50 |
| Yellow | 1492-W3-Y | | | 50 | 1492-W4-Y | | | 50 | 1492-W6-Y | | | 50 |
| Orange | 1492-W3-OR | | | 50 | 1492-W4-OR | | | 50 | 1492-W6-OR | | | 50 |
| White | 1492-W3-W | | | 50 | 1492-W4-W | | | 50 | 1492-W6-W | | | 50 |
| Brown | 1492-W3-BR | | | 50 | 1492-W4-BR | | | 50 | 1492-W5-BR | | | 50 |
| **Accessories** (page 185) | **Cat. No.** | | | **Pcs./ Pkg.** | **Cat. No.** | | | **Pcs./ Pkg.** | **Cat. No.** | | | **Pcs./ Pkg.** |
| Mounting Rails: 1 m Symmetrical DIN (Steel) | 199-DR1 | | | 10 | 199-DR1 | | | 10 | 199-DR1 | | | 10 |
| 1 m Symmetrical DIN (Aluminum) | 1492-DR5 | | | 10 | 1492-DR5 | | | 10 | 1492-DR5 | | | 10 |
| 1 m Hi-Rise Sym. DIN (Aluminum) | 1492-DR6 | | | 2 | 1492-DR6 | | | 2 | 1492-DR6 | | | 2 |
| 1 m Angled Hi-Rise Sym. DIN (Steel) | 1492-DR7 | | | 2 | 1492-DR7 | | | 2 | 1492-DR7 | | | 2 |
| End Barrier | 1492-EB3 | | | 50 | 1492-EB3 | | | 50 | 1492-EB10 | | | 50 |
| End Anchors: DIN Rail — Normal Duty | 1492-EA35 | | | 50 | 1492-EA35 | | | 50 | 1492-EA35 | | | 50 |
| DIN Rail — Heavy Duty | 1492-EAH35 | | | 10 | 1492-EAH35 | | | 10 | 1492-EAH35 | | | 10 |
| Jumpers: Insulated Side Jumper | 1492-SJ5-10 (10-pole) | | | 10 | 1492-N42 (2-pole)<br>1492-SJ6-10 (10-pole) | | | 50<br>10 | — | | | — |
| Center Jumper — 50-pole | 1492-CJ5-50 | | | 5 | 1492-CJ6-50 | | | 5 | — | | | — |
| Center Jumper — 40-pole | — | | | — | — | | | — | 1492-CJ7-40 | | | 5 |
| Center Jumper — 10-pole | 1492-CJ5-10 | | | 10 | 1492-CJ6-10 | | | 10 | 1492-CJ7-10 | | | 10 |
| Center Jumper — 3-pole | 1492-CJ5-3 | | | 10 | 1492-CJ6-3 | | | 10 | 1492-CJ7-3 | | | 10 |
| Center Jumper — 2-pole | 1492-CJ5-2 | | | 10 | 1492-CJ6-2 | | | 10 | 1492-CJ7-2 | | | 10 |
| Center Jumper Link | 1492-CJL5 | | | 10 | 1492-CJL6 | | | 10 | 1492-CJL7 | | | 10 |
| Center Jumper Cover – White ❶ | 1492-CJCW5 | | | 20 | 1492-CJCW6 | | | 20 | 1492-CJCW6 | | | 20 |
| Other Accessories: Partition Plate | 1492-PP3 | | | 50 | 1492-PP3 | | | 50 | 1492-PP10 | | | 50 |
| Separation Plate | 1492-SP3 | | | 50 | 1492-SP3 | | | 50 | — | | | — |
| Test Plug | — | | | — | 1492-TP28 | | | 10 | 1492-TP28 | | | 10 |
| Test Plug Adapter | 1492-TA285 | | | 10 | 1492-TA40 | | | 10 | 1492-TA40 | | | 10 |
| Electrical Warning Plate (4-pole) | 1492-EWP5-4 | | | 10 | 1492-EWP7-4 | | | 10 | 1492-EWP7-4 | | | 10 |
| Group Marking Carrier | 1492-GM35 | | | 10 | 1492-GM35 | | | 10 | 1492-GM35 | | | 10 |
| Marking Systems: Snap-in Marker Cards | 1492-SM5X9<br>1492-SM5X12 | | | 5 | 1492-SM6X9<br>1492-SM6X12 | | | 5 | 1492-SM6X12 | | | 5 |
| Individual Marker Tabs (single char.) | 1492-MP5 ❷ | | | 5 | 1492-MP5 ❷ | | | 5 | 1492-MP ❷ | | | 5 |

❶ May only be used as a marking surface. Cannot be installed over a center jumper.

❷ Cat. no. is not complete. See page 186.

REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT. ANY ACTION INDICATED IS SUBJECT TO THESE REQUIREMENTS

☑ NO EXCEPTIONS TAKEN

☐ MAKE NOTED CORRECTIONS

☐ REVISE & RESUBMIT

☐ REJECTED

DATE July 21/05 BY DC

EARTH TECH (CANADA) INC.

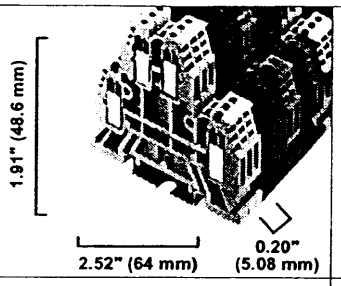
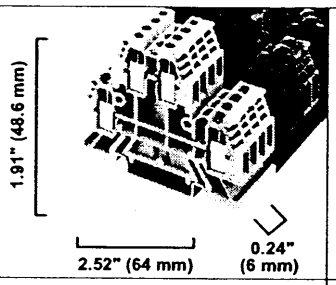
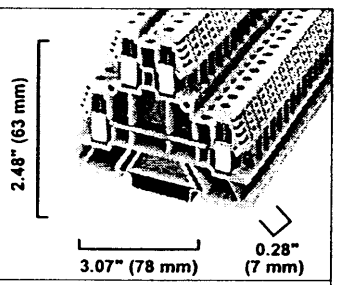
JOB: WASTE WATER TREATMENT PLANT IQUALUIT, CONTRACTOR PRE-APPROVAL; SIFEC-KUDLIK per: C.FAUTEUX, T,P. G.FAUTEUX, P,ENG. P.A. PELLETIER, P,ENG

(1)

14.3

USED FOR ANALOG
TOP POWER
BOT SIG



| | 1492-WD3 | | | | 1492-WD4 | | | | 1492-WD6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dimensions are not intended to be used for manufacturing purposes.<br>**Note:** Height dimension is measured from top of rail to top of terminal block. |  | | | |  | | | |  | | |
| **Specifications** | *Two-circuit terminal block.* | | | | *Two-circuit terminal block.* | | | | *Two-circuit terminal block.* | | |
| Approvals | cULus | EEx e II | CSA | IEC | cULus | EEx e II | CSA | IEC | cULus | CSA | IEC |
| Voltage Rating | 300V AC/DC | 420V | 300V AC/DC | 500V AC/DC | 300V AC/DC | 420V | 300V AC/DC | 500V AC/DC | 300V AC/DC | 300V AC/DC | 500V AC/DC |
| Maximum Current | 15 A | 24 A | 15 A | 24 A | 20 A | 24 A | 20 A | 32 A | 50 A | 55 A | 41 A |
| Wire Range (Rated Cross Section) | #30... #14 AWG | 2.5 mm² | #22... #14 AWG | 0.5... 2.5 mm² | #22... #12 AWG | 4 mm² | #22... #12 AWG | 0.5... 4 mm² | #18... #8 AWG | #18... #8 AWG | 0.5... 6 mm² |
| Wire Strip Length | 0.39" (10 mm) | | | | 0.39" (10 mm) | | | | 0.35" (9 mm) | | |
| Recommended Tightening Torque | 5.0...5.6 lb-in. (0.6 Nm) | | | | 5.0...5.6 lb-in. (0.6 Nm) | | | | 6.2 lb-in. (0.7 Nm) | | |
| Density | 60 pcs./ft (197/m) | | | | 50 pcs./ft (166/m) | | | | 43 pcs./ft (142/m) | | |
| Insulation Temperature Range | –40...+195°F (–40...+90°C) | | | | –40...+195°F (–40...+90°C) | | | | –40...+195°F (–40...+90°C) | | |

| **Terminal Blocks** | **Cat. No.** | **Pcs./ Pkg.** | **Cat. No.** | **Pcs./ Pkg.** | **Cat. No.** | **Pcs./Pkg.** |
|---|---|---|---|---|---|---|
| Color: Gray | 1492-WD3 | 50 | 1492-WD4 | 50 | 1492-WD6 | 20 |
| Red | 1492-WD3-RE | 50 | 1492-WD4-RE | 50 | — | — |
| Blue | 1492-WD3-B | 50 | 1492-WD4-B | 50 | — | — |
| Black | 1492-WD3-BL | 50 | 1492-WD4-BL | 50 | — | — |
| Green | 1492-WD3-G | 50 | 1492-WD4-G | 50 | — | — |
| Yellow | 1492-WD3-Y | 50 | 1492-WD4-Y | 50 | — | — |
| Orange | 1492-WD3-OR | 50 | 1492-WD4-OR | 50 | — | — |
| Brown | 1492-WD3-BR | 50 | 1492-WD4-BR | 50 | — | — |
| White | 1492-WD3-W | 50 | 1492-WD4-BR | 50 | — | — |

| **Accessories** (page 185) | **Cat. No.** | **Pcs./ Pkg.** | **Cat. No.** | **Pcs./ Pkg.** | **Cat. No.** | **Pcs./Pkg.** |
|---|---|---|---|---|---|---|
| Mounting Rails:<br>1 m Symmetrical DIN (Steel) | 199-DR1 | 10 | 199-DR1 | 10 | 199-DR1 | 10 |
| 1 m Symmetrical DIN (Aluminum) | 1492-DR5 | 10 | 1492-DR5 | 10 | 1492-DR5 | 10 |
| 1 m Hi-Rise Sym. DIN (Aluminum) | 1492-DR6 | 2 | 1492-DR6 | 2 | 1492-DR6 | 2 |
| 1 m Angled Hi-Rise Sym. DIN (Steel) | 1492-DR7 | 2 | 1492-DR7 | 2 | 1492-DR7 | 2 |
| End Barrier | 1492-EBD3 | 50 | 1492-EBD3 | 50 | 1492-EBD6 | 50 |
| End Anchor:<br>DIN Rail - Normal Duty | 1492-EA35 | 50 | 1492-EA35 | 50 | 1492-EA35 | 50 |
| DIN Rail — Heavy Duty | 1492-EAH35 | 10 | 1492-EAH35 | 10 | 1492-EAH35 | 10 |
| Jumpers:<br>Insulated Side Jumper | 1492-SJ5-10 (10-pole) | 10 | 1492-N42 (2-pole)<br>1492-SJ6-10 (10-pole) | 50<br>10 | — | — |
| Center Jumper — 50-pole | 1492-CJD5-50 | 5 | 1492-CJD6-50 | 5 | — | — |
| Center Jumper — 40-pole | — | — | — | — | 1492-CJ7-40 | 5 |
| Center Jumper — 10-pole | 1492-CJD5-10 | 10 | 1492-CJD6-10 | 10 | 1492-CJ7-10 | 10 |
| Center Jumper — 3-pole | 1492-CJD5-3 | 10 | 1492-CJD6-3 | 10 | 1492-CJ7-3 | 10 |
| Center Jumper — 2-pole | 1492-CJD5-2 | 10 | 1492-CJD6-2 | 10 | 1492-CJ7-2 | 10 |
| Center Jumper Link | 1492-CJL5 | 10 | 1492-CJDL6 | 10 | 1492-CJL7 | 10 |
| Other Accessories:<br>Partition Plate | 1492-PPD3 | 50 | 1492-PPD3 | 50 | 1492-PPD6 | 50 |
| Separation Plate | 1492-SPD3 | 50 | 1492-SPD3 | 50 | — | — |
| Test Plug | — | — | 1492-TP28 | 10 | 1492-TP28 | 10 |
| Test Plug Adapter | 1492-TA285 | 10 | 1492-TA40 | 10 | 1492-TA40 | 10 |
| Electrical Warning Plate (4-pole) | 1492-EWP5-4 | 10 | 1492-EWP6-4 | 10 | 1492-EWP7-4 | 10 |
| Group Marking Carrier | 1492-GM35 | 10 | 1492-GM35 | 10 | 1492-GM35 | 5 |
| Marking Systems:<br>Snap-in Marker Card | 1492-SM5X9 | 5 | 1492-SM6X9 | 5 | 1492-SM6X12 | 5 |
| Individual Marker Tabs (single char.) | 1492-MP5 ❶ | 10 | 1492-MP ❶ | 10 | 1492-MP ❶ | 10 |

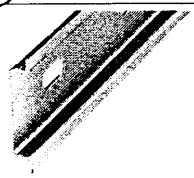
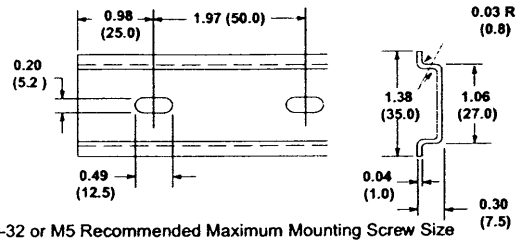
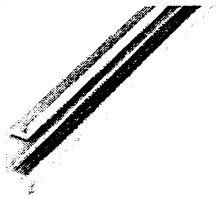
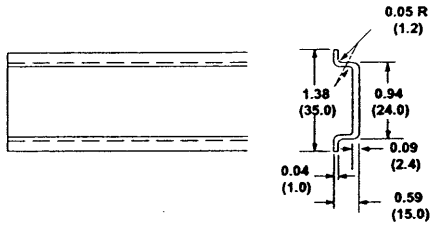
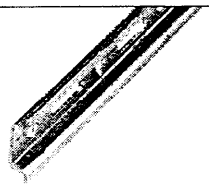
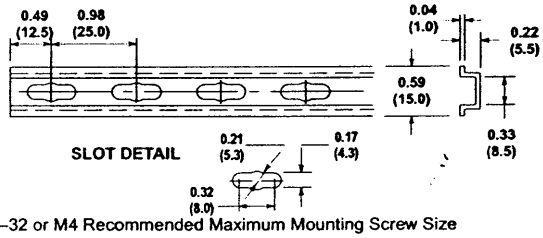
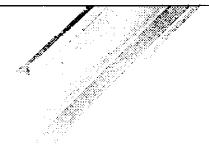
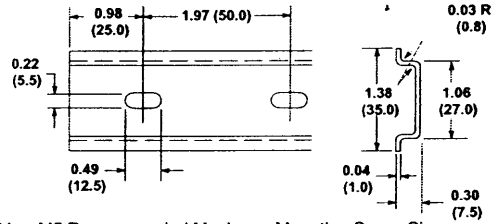
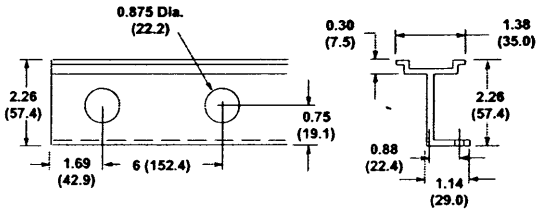
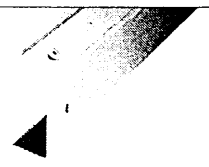
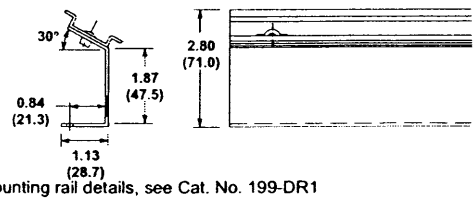
❶ Cat. no. is not complete. See page 186.



(2)

14.3

## DIN Mounting Rails

| Item | Description | Pcs./Pkg. | Dimensions ❶ |
|---|---|---|---|
| 199-DR1  | Symmetrical Rail<br>35 mm x 7.5 mm<br>3.28' (1 m) long<br>Zinc-Plated, Yellow Chromated Steel<br>EN50022<br>**DIN #3** | 10 |  |
| 199-DR2 | Same as 199-DR1, but length = 2 m | 100 | #10–32 or M5 Recommended Maximum Mounting Screw Size |
| 199-DR4  | Heavy Duty Symmetrical Rail<br>35 mm x 15 mm<br>3.28' (1 m) long<br>Zinc-Plated, Yellow Chromated Steel<br>EN50022<br>**DIN #3** | 5 |  |
| 1492-DR3  | Mini 15 mm x 5.5 mm Rail 3.28' (1 m) long<br>Zinc-Plated, Yellow Chromated Steel<br>EN50045<br>**DIN #2** | 5 |  <br>#8–32 or M4 Recommended Maximum Mounting Screw Size |
| 1492-DR5  | Symmetrical Rail<br>35 mm x 7.5 mm<br>3.28' (1 m) long<br>Copper-Free Aluminum EN50022<br>For 1492 Terminal Blocks Only<br>**DIN #3** | 10 |  <br>#12–24 or M5 Recommended Maximum Mounting Screw Size |
| 1492-DR6 ❷ | Symmetrical Rail<br>35 mm x 7.5 mm<br>2.26" (57.4 mm) high<br>3.28' (1 m) long<br>Copper-Free Aluminum<br>For 1492 Terminal Blocks Only<br>**DIN #3** | 2 |  <br>Wire insulator plug for wire access through rail — use Heyco UB875 |
| 1492-DR7 ❷  | Symmetrical Rail<br>35 mm x 7.5 mm<br>2.80" (71.0 mm) high<br>3.28' (1 m) long<br>Angled 30°<br>Zinc-Plated, Chromated Steel<br>**DIN #3** | 2 |  <br>For mounting rail details, see Cat. No. 199-DR1 |

❶ Dimensions shown in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

❷ 0.218" (5.5 mm) x 0.50" (12.7 mm) slotted mounting holes every 3" (76.2 mm) starting 1.69" (42.9 mm) from end.

MAIN FLC CABINET

VERTICAL BLOC

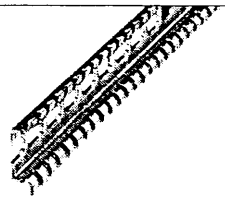
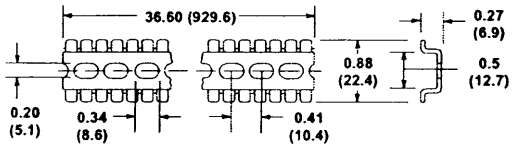
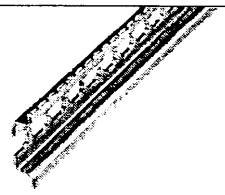
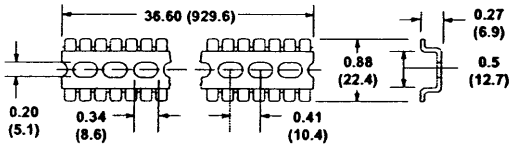
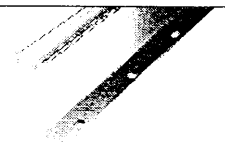
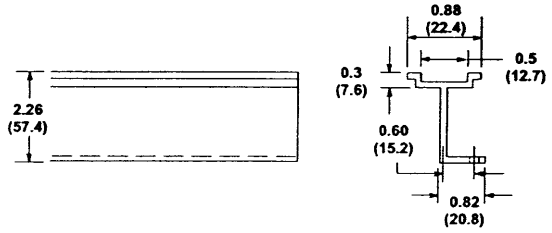
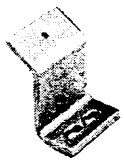
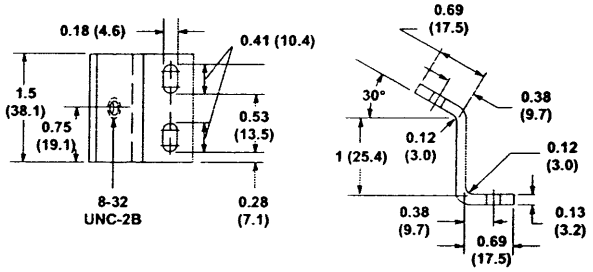
(1)

# Accessories

## Mounting Rails, Continued

### Allen-Bradley Mounting Rails

#### NEMA/EEMAC Mounting Rails

| Item | Description | Pcs./Pkg. | Dimensions ❶ |
|---|---|---|---|
| 1492-N1  | Breakaway Mounting Rail 3' (0.91 m) long Scored every 0.203" (5.2 mm) so it will break off to the desired length | 20 |   #8–32 or M4 Recommended Mounting Screw Size |
| 1492-N22  | Rigid Mounting Rail 3' (0.91 m) long | 20 |   #8–32 or M4 Recommended Mounting Screw Size |
| 1492-N44 ❷  | 2.26" (57.4 mm) High Rise Mounting Rail 3' (0.91 m) long Aluminum | 2 |   |
| 1492-N25  | Mounting Rail Standoff Brackets Used with 1492-N22 Rigid Mounting Rail | 2 |   |

❶ Dimensions shown in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.
❷ 0.19" (4.8 mm) x 0.4" (10.2 mm) slotted mounting holes every 3" (76.2 mm) starting 1.5" (38.1 mm) from end.

(2)

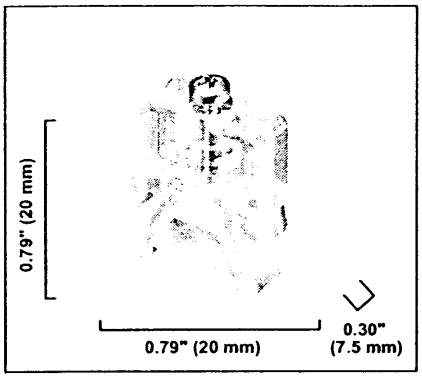
14.4

# Accessories

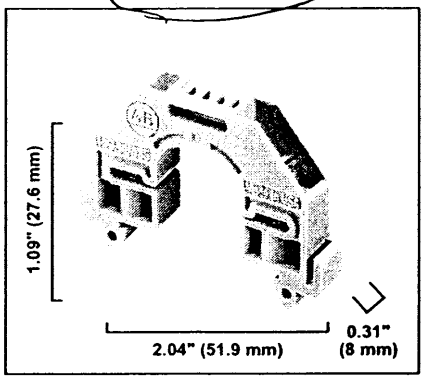
## End Anchors

### EC

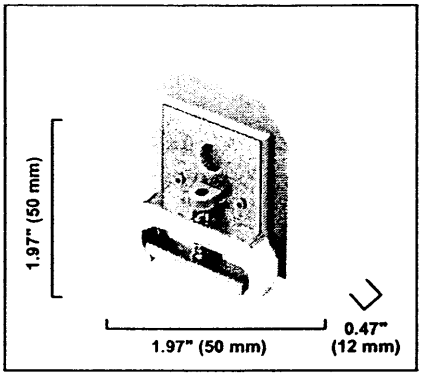
**1492-EA15**




**1492-EA35**

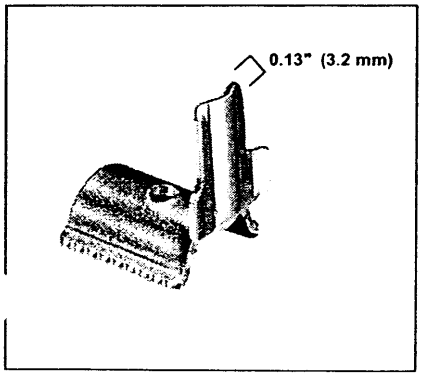



**1492-EAH35**

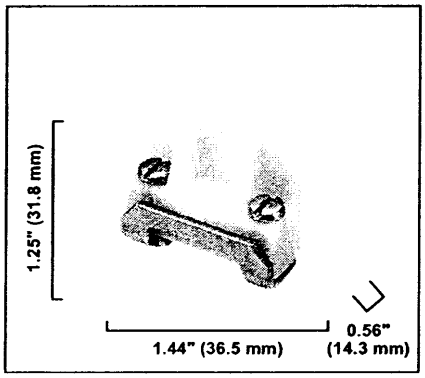



### NEMA/EEMAC

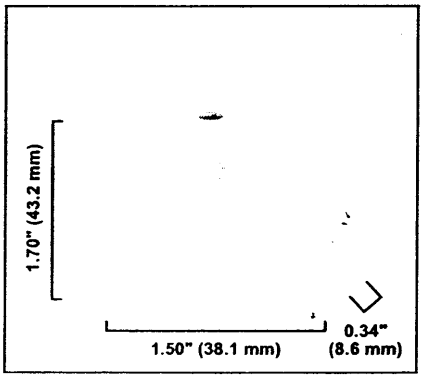
**1492-N2**



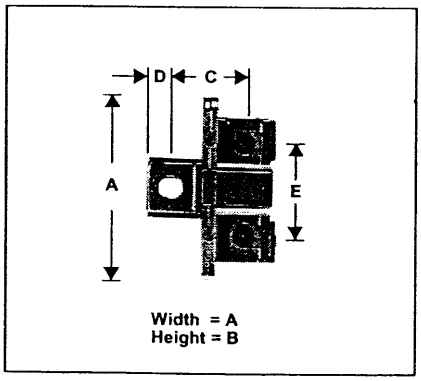

**1492-N23**



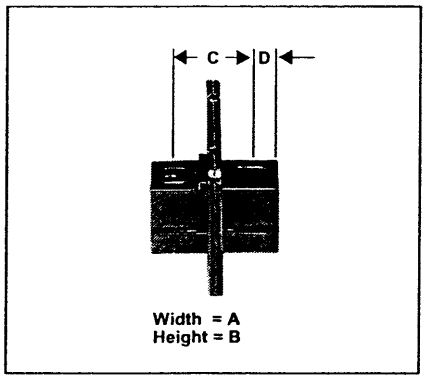

**1492-N47**




**1492-15A, 1492-25A**



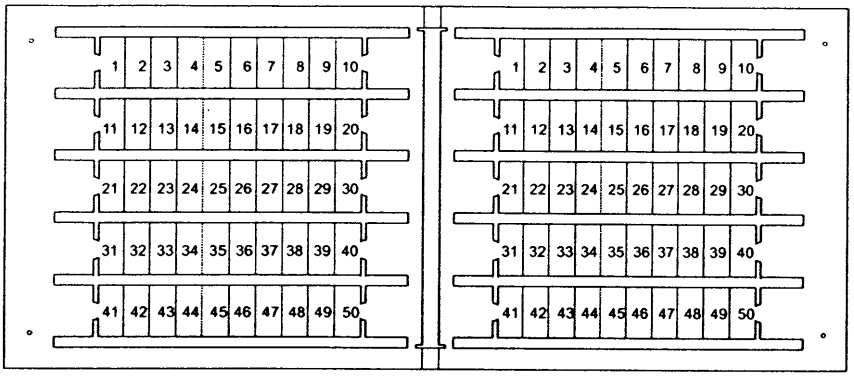

**1492-15E, 1492-25E**




| Cat. No. | A | B | C | D | E |
|---|---|---|---|---|---|
| 1492-15A | 1.5" (38.1 mm) | 1.03" (26.2 mm) | 0.594" (15.1 mm) | 0.234" (5.9 mm) | 0.75" (19.1 mm) |
| 1492-15E | 1.5" (38.1 mm) | 1.03" (26.2 mm) | 0.594" (15.1 mm) | 0.234" (5.9 mm) | — |
| 1492-25A | 1.88" (47.8 mm) | 1.19" (30.2 mm) | 0.688" (17.5 mm) | 0.203" (5.2 mm) | 0.97" (24.6 mm) |
| 1492-25E | 1.88" (47.8 mm) | 1.19" (30.2 mm) | 0.688" (17.5 mm) | 0.234" (5.9 mm) | — |

## Standard Pre-Printed Marker Cards, 50 Numbers in Series (Minimum Order of 1 Card)

**HORIZONTAL**
(Shown approx. 50% of actual size.)




## Catalog Number Explanation

**1492 – SM 6X9 H 1–50**

**Bulletin Number**

| Marker Type | |
|---|---|
| SM | Snap-in Marker |

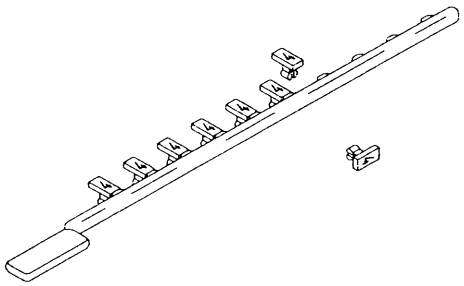
| Orientation | |
|---|---|
| **Code** | **Direction** |
| H | Horizontal |
| V | Vertical |

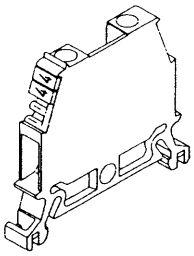
| Marker Code | | |
|---|---|---|
| **Code** | **Width (mm)** | **Height (mm)** |
| 5X5 | 5 | 5 |
| 5X9 | 5 | 9 |
| 5X12 | 5 | 12 |
| 6X9 | 6 | 9 |
| 6X12 | 6 | 12 |
| 8X9 | 8 | 9 |
| 8X12 | 8 | 12 |
| N81 | 6 | 10 |
| N83 | 10 | 10 |

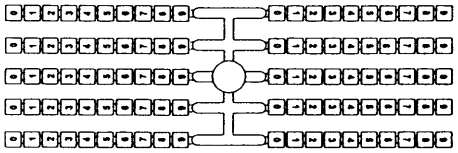
| Printing | |
|---|---|
| **Code** | **Numbers Printed** |
| 1–50 | Printed "1–50" |
| 51–100 | Printed "51–100" |
| 101–150 | Printed "101–150" |
| . . . | . . . |
| 351–400 | Printed "351–400" |
| 401–450 | Printed "401–450" |
| 451–500 | Printed "451–500" |

## 6 mm Single Digit Pre-Printed Marker Tabs

**Note:** 10 labels per piece. For use with any 1492-W product that is compatible with 1492-SM5X9 and 1492-SM5X12 Marker Cards, refer to page 207. Also for use with 1492-W10 terminal blocks.







| Numbers | | |
|---|---|---|
| Printing | Cat. No. | Pcs./Pkg. |
| 0 | 1492-MP-0 | 10 |
| 1 | 1492-MP-1 | 10 |
| 2 | 1492-MP-2 | 10 |
| 3 | 1492-MP-3 | 10 |
| 4 | 1492-MP-4 | 10 |
| 5 | 1492-MP-5 | 10 |
| 6 | 1492-MP-6 | 10 |
| 7 | 1492-MP-7 | 10 |
| 8 | 1492-MP-8 | 10 |
| 9 | 1492-MP-9 | 10 |

| Number Series | | |
|---|---|---|
| Printing | Cat. No. | Pcs./Pkg. |
| 0...9 | 1492-MP | 10 |

| Blank | | |
|---|---|---|
| Printing | Cat. No. | Pcs./Pkg. |
| Blank | 1492-MP-BLANK | 10 |

| Letters | | |
|---|---|---|
| Printing | Cat. No. | Pcs./Pkg. |
| A | 1492-MP-A | 10 |
| B | 1492-MP-B | 10 |
| C | 1492-MP-C | 10 |
| D | 1492-MP-D | 10 |
| E | 1492-MP-E | 10 |
| F | 1492-MP-F | 10 |
| G | 1492-MP-G | 10 |
| H | 1492-MP-H | 10 |
| I | 1492-MP-I | 10 |
| J | 1492-MP-J | 10 |
| K | 1492-MP-K | 10 |
| L | 1492-MP-L | 10 |
| M | 1492-MP-M | 10 |
| N | 1492-MP-N | 10 |
| P | 1492-MP-P | 10 |
| Q | 1492-MP-Q | 10 |
| R | 1492-MP-R | 10 |
| S | 1492-MP-S | 10 |

| Letters (continued) | | |
|---|---|---|
| Printing | Cat. No. | Pcs./Pkg. |
| T | 1492-MP-T | 10 |
| U | 1492-MP-U | 10 |
| V | 1492-MP-V | 10 |
| W | 1492-MP-W | 10 |
| X | 1492-MP-X | 10 |
| Y | 1492-MP-Y | 10 |
| Z | 1492-MP-Z | 10 |

| Special Symbols | | |
|---|---|---|
| Printing | Cat. No. | Pcs./Pkg. |
| + | 1492-MP-POS | 10 |
| ⏚ | 1492-MP-GND | 10 |
| – | 1492-MP-NEG | 5 |
| ~ | 1492-MP-AC | 10 |
| = | 1492-MP-DC | 10 |

## 5 mm Single Digit Pre-Printed Marker Tabs

**Note:** 100 labels per card. For use with any 1492-W product that is compatible with 1492-SM5X9 and 1492-SM5X12 Marker Cards, refer to page 0-207.

| Numbers | | |
|---|---|---|
| Printing | Cat. No. | Pcs./Pkg. |
| 0 | 1492-MP5-0 | 5 |
| 1 | 1492-MP5-1 | 5 |
| 2 | 1492-MP5-2 | 5 |
| 3 | 1492-MP5-3 | 5 |
| 4 | 1492-MP5-4 | 5 |
| 5 | 1492-MP5-5 | 5 |
| 6 | 1492-MP5-6 | 5 |
| 7 | 1492-MP5-7 | 5 |
| 8 | 1492-MP5-8 | 5 |
| 9 | 1492-MP5-9 | 5 |

| Number Series | | |
|---|---|---|
| Printing | Cat. No. | Pcs./Pkg. |
| 0...9 | 1492-MP5-10 | 5 |
| A...Z | 1492-MP5-AZ | 5 |

| Blank | | |
|---|---|---|
| Printing | Cat. No. | Pcs./Pkg. |
| Blank | 1492-MP5-BLANK | 5 |

| Letters | | |
|---|---|---|
| Printing | Cat. No. | Pcs./Pkg. |
| A | 1492-MP5-A | 5 |
| B | 1492-MP5-B | 5 |
| C | 1492-MP5-C | 5 |
| D | 1492-MP5-D | 5 |
| E | 1492-MP5-E | 5 |
| F | 1492-MP5-F | 5 |
| G | 1492-MP5-G | 5 |
| H | 1492-MP5-H | 5 |
| I | 1492-MP5-I | 5 |
| J | 1492-MP5-J | 5 |
| K | 1492-MP5-K | 5 |
| L | 1492-MP5-L | 5 |
| M | 1492-MP5-M | 5 |
| N | 1492-MP5-N | 5 |
| P | 1492-MP5-P | 5 |
| Q | 1492-MP5-Q | 5 |
| R | 1492-MP5-R | 5 |
| S | 1492-MP5-S | 5 |

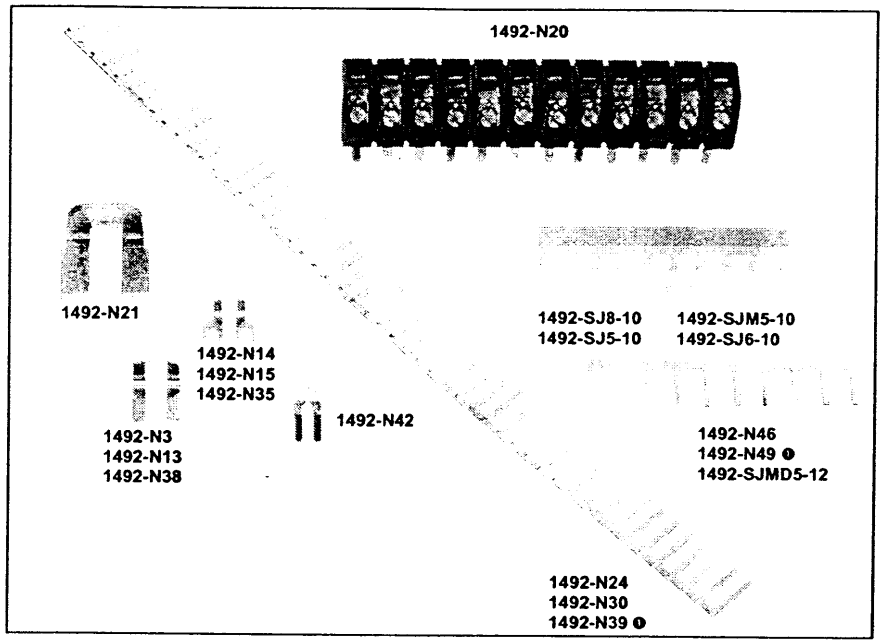
| Letters (continued) | | |
|---|---|---|
| Printing | Cat. No. | Pcs./Pkg. |
| T | 1492-MP5-T | 5 |
| U | 1492-MP5-U | 5 |
| V | 1492-MP5-V | 5 |
| W | 1492-MP5-W | 5 |
| X | 1492-MP5-X | 5 |
| Y | 1492-MP5-Y | 5 |
| Z | 1492-MP5-Z | 5 |

| Special Symbols | | |
|---|---|---|
| Printing | Cat. No. | Pcs./Pkg. |
| + | 1492-MP5-POS | 5 |
| ⏚ | 1492-MP5-GND | 5 |
| – | 1492-MP5-NEG | 5 |
| ~ | 1492-MP5-AC | 5 |
| = | 1492-MP5-DC | 5 |

# Accessories

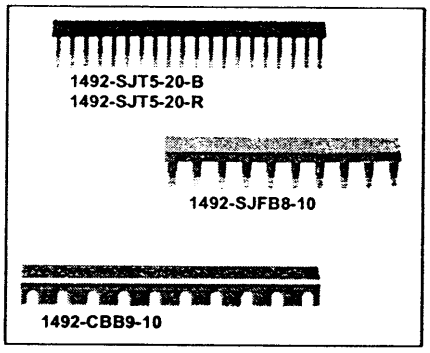
## Jumpers/Fanning Strips/Fuse Holder

### Side Jumpers/Fanning Strip/Installation Accessories

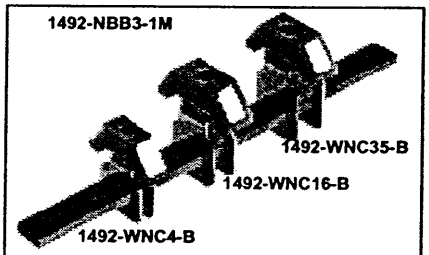



❶ The 1492-SJS Insulating Sleeve reduces exposure to live parts on the 1492-N39 and 1492-N49. The 1492-SJS used with the 1492-N39 and 1492-H1 or 1492-HM1 provides IEC 947 IP2X finger protection.

### Side Jumpers

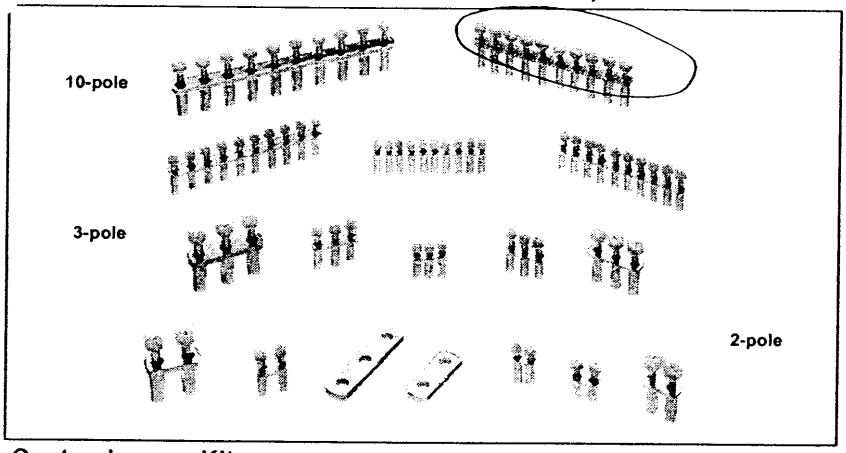



### Neutral Disconnect Busbar and Busbar Terminals

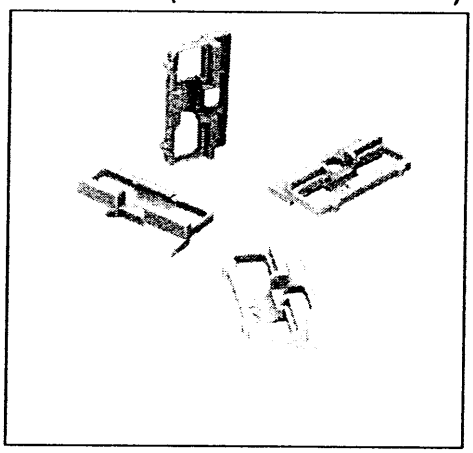



*Note: All terminals shown with Cat. No. 1492-SM6X9 markers installed*

### Center Jumper Bars – IEC (Cat. No. 1492-CJ...)



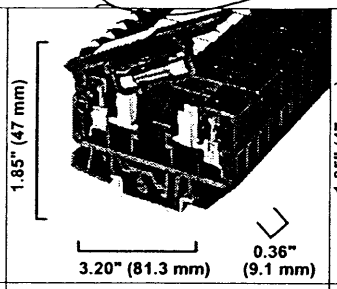
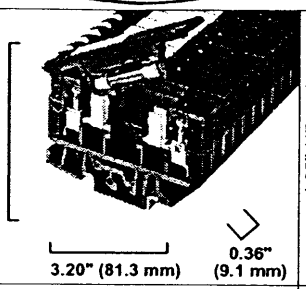
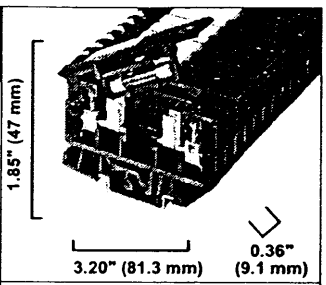

### Fuse Holder (Cat. No. 1492-IFMFH1)

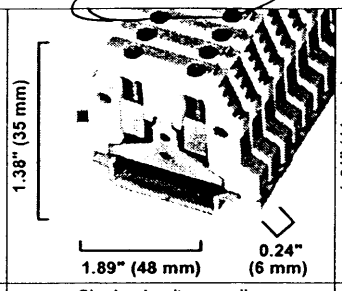
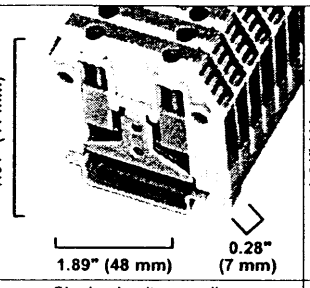
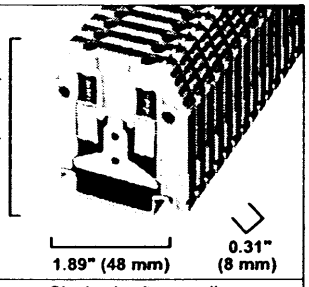


### Center Jumper Kits

| Cat. No. | Description | Used with Cat. Nos. | Pcs./Pkg. | Cat. No. | Description | Pcs./ Pkg. |
|---|---|---|---|---|---|---|
| 1492-CJ5SF | Capped Screw/Ferrule | 1492-W3, -W3TW | 850 | 1492-CJ5B | Busbar | 10 |
| 1492-CJT5SF | Capped Screw/Ferrule | 1492-WTS3, WTF3 | 1500 | | | |
| 1492-CJD5SF | Capped Screw/Ferrule | 1492-WD3, -WR3 | 1000 | | | |
| 1492-CJ6SF | Capped Screw/Ferrule | 1492-W4 | 700 | 1492-CJ6B | Busbar | 10 |
| 1492-CJ7SF | Capped Screw/Ferrule | 1492-W6, -WD6 | 700 | 1492-CJ7B | Busbar | 10 |
| 1492-CJ8SF | Capped Screw/Ferrule | 1492-W10 | 325 | 1492-CJ8B | Busbar | 10 |
| 1492-CJD6SF | Capped Screw/Ferrule | 1492-WD4, -WM4, -WD4P, -WDG4P | 1000 | 1492-CJD6B | Busbar | 10 |

POWER ANALOG

| | 1492-H4 | | | 1492-H5 | | | 1492-H6 | | |
|---|---|---|---|---|---|---|---|---|---|
| Dimensions are not intended to be used for manufacturing purposes.<br>**Note:** Height dimension is measured from top of rail to top of terminal block. |  | | |  | | |  | | |
| **Specifications** | *Single circuit fusible terminal block with neon blown fuse indicator.* | | | *Single circuit fusible terminal block with LED blown fuse indicator.* | | | *Single circuit fusible terminal block without a blown fuse indicator.* | | |
| Approvals | | CSA | IEC | | CSA | IEC | | CSA | IEC |
| Voltage Rating | 300V AC/DC | 300V AC/DC | 500V AC/DC | 300V AC/DC | 300V AC/DC | 500V AC/DC | 300V AC/DC | 300V AC/DC | 500V AC/DC |
| Maximum Current | 12 A | 12 A | 12 A | 12 A | 12 A | 12 A | 12 A | 12 A | 12 A |
| Wire Range (Rated Cross Section) | #30... #12 AWG | #30... #12 AWG | 0.05... 4 mm² | #30... #12 AWG | #30... #12 AWG | 0.05... 4 mm² | #30... #12 AWG | #30... #12 AWG | 0.05... 4 mm² |
| Indicator Type | Neon | | | LED | | | Non-Indicating | | |
| Leakage Current | 2 mA @ 300V | | | 2 mA @ 24V | | | — | | |
| Working Voltage | 100...300V AC | | | 10...57V AC/DC | | | Per Fuse Rating | | |
| Fuse Size (Not Supplied) | 1/4" x 1-1/4" | | | 1/4" x 1-1/4" | | | 1/4" x 1-1/4" | | |
| Wire Strip Length | 0.38" (9.7 mm) | | | 0.38" (9.7 mm) | | | 0.38" (9.7 mm) | | |
| Recommended Tightening Torque | 3...7 lb-in. (0.3...0.8 Nm) | | | 3...7 lb-in. (0.3...0.8 Nm) | | | 3...7 lb-in. (0.3...0.8 Nm) | | |
| Density | 33 pcs./ft (109/m) | | | 33 pcs./ft (109/m) | | | 33 pcs./ft (109/m) | | |
| Insulation Temperature Range | –40...+221°F (–40...+105°C) | | | –40...+221°F (–40...+105°C) | | | –40...+221°F (–40...+105°C) | | |
| **Terminal Blocks** | **Cat. No.** | | **Pcs./ Pkg.** | **Cat. No.** | | **Pcs./ Pkg.** | **Cat. No.** | | **Pcs./ Pkg.** |
| Terminal Block | 1492-H4 | | 25 | 1492-H5 | | 25 | 1492-H6 | | 25 |
| **Accessories** (page 185) | **Cat. No.** | | **Pcs./ Pkg.** | **Cat. No.** | | **Pcs./ Pkg.** | **Cat. No.** | | **Pcs./ Pkg.** |
| Mounting Rails:<br>3' Scored A-B Rail | 1492-N1 | | 20 | 1492-N1 | | 20 | 1492-N1 | | 20 |
| 3' Rigid A-B Rail | 1492-N22 | | 20 | 1492-N22 | | 20 | 1492-N22 | | 20 |
| 3' High Rise A-B Rail | 1492-N44 | | 2 | 1492-N44 | | 2 | 1492-N44 | | 2 |
| Standoff Brackets (Use Every 12") | 1492-N25 | | 2 | 1492-N25 | | 2 | 1492-N25 | | 2 |
| 1 m Symmetrical DIN | 199-DR1 | | 10 | 199-DR1 | | 10 | 199-DR1 | | 10 |
| 1 m Symmetrical DIN (Alumin.) | 1492-DR5 | | 10 | 1492-DR5 | | 10 | 1492-DR5 | | 10 |
| 1 m Hi-Rise Symmetrical DIN | 1492-DR6 | | 2 | 1492-DR6 | | 2 | 1492-DR6 | | 2 |
| 1 m Angled Hi-Rise Sym. DIN | 1492-DR7 | | 2 | 1492-DR7 | | 2 | 1492-DR7 | | 2 |
| End Barrier | 1492-N37 | | 50 | 1492-N37 | | 50 | 1492-N37 | | 50 |
| End Anchors:<br>A-B Rail — Heavy Duty | 1492-N23 | | 10 | 1492-N23 | | 10 | 1492-N23 | | 10 |
| A-B Rail — Normal Duty | 1492-N47 | | 50 | 1492-N47 | | 50 | 1492-N47 | | 50 |
| DIN Rail — Normal Duty | 1492-EA35 | | 50 | 1492-EA35 | | 50 | 1492-EA35 | | 50 |
| DIN Rail — Heavy Duty | 1492-EAH35 | | 50 | 1492-EAH35 | | 50 | 1492-EAH35 | | 50 |
| Side Jumpers:<br>10-pole Uninsulated | 1492-N49 | | 10 | 1492-N49 | | 10 | 1492-N49 | | 10 |
| Side Jumper Insulating Sleeve | 1492-SJS | | 10 | 1492-SJS | | 10 | 1492-SJS | | 10 |
| Marking Systems | 1492-SM8X12 | | 5 | 1492-SM8X12 | | 5 | 1492-SM8X12 | | 5 |

| Dimensions are not intended to be used for manufacturing purposes.<br>**Note:** Height dimension is measured from top of rail to top of terminal block.<br>GREEN + YELLOW | 1492-WG4<br>  <br> | | | | 1492-WG6<br>  <br> | | | | 1492-WG10S<br>  <br> | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Specifications** | *Single-circuit grounding terminal block.* | | | | *Single-circuit grounding terminal block.* | | | | *Single-circuit grounding terminal block.* | | |
| Approvals | | EEx e II | CSA | IEC | | EEx e II | CSA | IEC | | CSA | IEC |
| Voltage Rating | — | — | — | — | — | — | — | — | — | — | — |
| Maximum Current | Grounding | | | | Grounding | | | | Grounding | | |
| Wire Range (Rated Cross Section) | #22... #12 AWG | 4 mm² | #22... #12 AWG | 4 mm² | #22... #10 AWG | 6 mm² | #22... #10 AWG | 6 mm² | #22... #8 AWG | #22... #8 AWG | 10 mm² |
| Wire Strip Length | 0.43" (11 mm) | | | | 0.47" (12 mm) | | | | 0.43" (11 mm) | | |
| Recommended Tightening Torque | 5.6...6.8 lb-in. (0.7 Nm) | | | | 5.6...6.8 lb-in. (0.7 Nm) | | | | 7.1 lb-in. (0.8 Nm) | | |
| Density | 50 pcs./ft (166/m) | | | | 43 pcs./ft (142/m) | | | | 38 pcs./ft (125/m) | | |
| Insulation Temperature Range | –40...+195°F (–40...+90°C) | | | | –40...+195°F (–40...+90°C) | | | | –40...+195°F (–40...+90°C) | | |
| **Terminal Blocks** | **Cat. No.** | | | **Pcs./ Pkg.** | **Cat. No.** | | | **Pcs./ Pkg.** | **Cat. No.** | | **Pcs./ Pkg.** |
| Terminal Block: | 1492-WG4 | | | 50 | 1492-WG6 | | | 50 | 1492-WG10S | | 10 |
| **Accessories** (page 185) | **Cat. No.** | | | **Pcs./ Pkg.** | **Cat. No.** | | | **Pcs./ Pkg.** | **Cat. No.** | | **Pcs./ Pkg.** |
| Mounting Rails:<br>1 m Symmetrical DIN (Steel) | 199-DR1 | | | 10 | 199-DR1 | | | 10 | 199-DR1 | | 10 |
| 1 m Symmetrical DIN (Aluminum) | 1492-DR5 | | | 10 | 1492-DR5 | | | 10 | 1492-DR5 | | 10 |
| 1 m Hi-Rise Sym. DIN (Aluminum) | 1492-DR6 | | | 2 | 1492-DR6 | | | 2 | 1492-DR6 | | 2 |
| 1 m Angled Hi-Rise Sym. DIN (Steel) | 1492-DR7 | | | 2 | 1492-DR7 | | | 2 | 1492-DR7 | | 2 |
| End Barrier | 1492-EB3-Y | | | 50 | 1492-EB10-Y | | | 50 | 1492-EB10-Y | | 50 |
| End Anchors<br>DIN Rail — Normal Duty | 1492-EA35 | | | 50 | 1492-EA35 | | | 50 | 1492-EA35 | | — |
| DIN Rail — Heavy Duty | 1492-EAH35 | | | 10 | 1492-EAH35 | | | 10 | 1492-EAH35 | | — |
| Other Accessories:<br>Group Marking Carrier | 1492-GM35 | | | 10 | 1492-GM35 | | | 10 | 1492-GM35 | | 10 |
| Marking Systems:<br>Snap-in Marker Card | 1492-SM6X12 | | | 5 | 1492-SM6X12 | | | 5 | 1492-SM8X12 | | 5 |
| Individual Marker Tabs (single char.) | 1492-MP ❶ | | | 10 | 1492-MP ❶ | | | 10 | — | | — |

❶ Cat. no. is not complete. See page 186.



JOB: WASTE WATER TREATMENT PLANT IQUALUIT,
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK per: C.FAUTEUX, T,P.
G.FAUTEUX, P,ENG.
P.A. PELLETIER, P,ENG

(1)

14.7

# Taylor® Wiring Duct

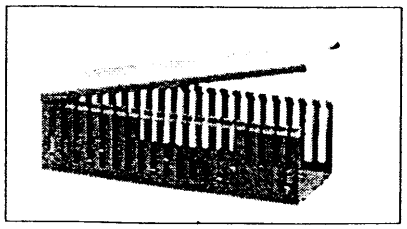
## Wiring Duct and Accessories

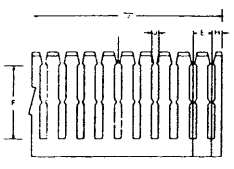
### Narrow Slot Flush Profile Duct – Vinyl

| Cat. No. Vinyl Duct | Cover Cat. No. | Nom. Size W | Nom. Size H | Dimensions (in.) A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T.5 X .5HD+ | T.5C+ | .5 | .5 | .68 | .72 | .68 | .78 | .39 | .38 | on ctr. | .20 | .158 |
| T.5 X 1HD+ | | .5 | 1 | .68 | 1.1 | .68 | 1.16 | .39 | .68 | on ctr. | .20 | .158 |
| T.75 X .75HD+ | T.75C+ | .75 | .75 | .79 | .75 | .79 | .81 | .39 | .375 | on ctr. | .20 | .158 |
| T.75 X 1.5HD+ | | .75 | 1.5 | .79 | 1.49 | .79 | 1.60 | .39 | 1.03 | on ctr. | .20 | .158 |
| T1 X 1 HD+ | | 1 | 1 | .98 | 1.13 | .98 | 1.2 | .39 | .70 | on ctr. | .20 | .158 |
| T1 X 1.5HD+ | | 1 | 1.5 | .98 | 1.52 | .98 | 1.6 | .39 | 1.07 | on ctr. | .20 | .158 |
| T1 X 2HD+ | T1C+ | 1 | 2.25 | .98 | 2.0 | .98 | 2.1 | .39 | 1.25 | on ctr. | .20 | .158 |
| T1 X 3HD+ | | 1 | 3 | .98 | 3.0 | .98 | 3.1 | .39 | 2.50 | on ctr. | .20 | .158 |
| T1 X 4HD+ | | 1 | 4 | .98 | 3.85 | .98 | 3.9 | .39 | 3.26 | on ctr. | .20 | .158 |
| T1.5 X 1HD+ | | 1.5 | 1 | 1.57 | 1.13 | 1.57 | 1.2 | .39 | .70 | on ctr. | .20 | .158 |
| T1.5 X 1.5HD+ | | 1.5 | 1.5 | 1.57 | 1.52 | 1.57 | 1.6 | .39 | 1.07 | on ctr. | .20 | .158 |
| T1.5 X 2HD+ | T1.5C+ | 1.5 | 2.25 | 1.57 | 2.0 | 1.57 | 2.1 | .39 | 1.25 | on ctr. | .20 | .158 |
| T1.5 X 3HD+ | | 1.5 | 3 | 1.57 | 3.0 | 1.57 | 3.1 | .39 | 2.50 | on ctr. | .20 | .158 |
| T1.5 X 4HD+ | | 1.5 | 4 | 1.57 | 3.85 | 1.57 | 3.9 | .39 | 3.26 | on ctr. | .20 | .158 |
| T2 X 1HD+ | | 2 | 1 | 1.97 | 1.13 | 1.97 | 1.2 | .39 | .70 | .5 | .20 | .158 |
| T2 X 1.5HD+ | | 2 | 1.5 | 1.97 | 1.52 | 1.97 | 1.6 | .39 | 1.07 | .5 | .20 | .158 |
| T2 X 2HD+ | | 2 | 2.25 | 1.97 | 2.0 | 1.97 | 2.1 | .39 | 1.25 | .5 | .20 | .158 |
| T2 X 3HD+ | T2C+ | 2 | 3 | 1.97 | 3.0 | 1.97 | 3.1 | .39 | 2.50 | .5 | .20 | .158 |
| T2 X 4HD+ | | 2 | 4 | 1.97 | 3.85 | 1.97 | 3.9 | .39 | 3.26 | .5 | .20 | .158 |
| T2 X 5HD+ | | 2 | 5 | 1.97 | 5.04 | 1.97 | 5.10 | .39 | 4.38 | .5 | .20 | .158 |
| T2.25 X 1.5HD+ | | 2.25 | 1.5 | 2.36 | 1.52 | 2.36 | 1.6 | .39 | 1.07 | .5 | .20 | .158 |
| T2.25 X 2HD+ | T2.25C+ | 2.25 | 2.25 | 2.36 | 2.0 | 2.36 | 2.1 | .39 | 1.25 | .5 | .20 | .158 |
| T2.25 X 3HD+ | | 2.25 | 3 | 2.36 | 3.0 | 2.36 | 3.1 | .39 | 2.50 | .5 | .20 | .158 |
| T2.25 X 4HD+ | | 2.25 | 4 | 2.36 | 3.85 | 2.36 | 3.9 | .39 | 3.26 | .5 | .20 | .158 |
| T3 X 1HD+ | | 3 | 1 | 2.95 | 1.13 | 2.95 | 1.2 | .39 | .70 | 1 | .20 | .158 |
| T3 X 2HD+ | | 3 | 2.25 | 2.95 | 2.0 | 2.95 | 2.1 | .39 | 1.25 | 1 | .20 | .158 |
| T3 X 3HD+ | T3C+ | 3 | 3 | 2.95 | 3.0 | 2.95 | 3.1 | .39 | 2.50 | 1 | .20 | .158 |
| T3 X 4HD+ | | 3 | 4 | 2.95 | 3.85 | 2.95 | 3.9 | .39 | 3.26 | 1 | .20 | .158 |
| T3 X 5HD+ | | 3 | 5 | 2.95 | 5.04 | 2.95 | 5.1 | .39 | 4.38 | 1 | .20 | .158 |
| T3.15 X 2HD+ | | 3.15 | 2.25 | 3.15 | 2.0 | 3.15 | 2.1 | .39 | 1.25 | 1 | .20 | .158 |
| T3.15 X 3HD+ | T3.15C+ | 3.15 | 3 | 3.15 | 3.0 | 3.15 | 3.1 | .39 | 2.50 | 1 | .20 | .158 |
| T3.15 X 4HD+ | | 3.15 | 4 | 3.15 | 3.85 | 3.15 | 3.9 | .39 | 3.26 | 1 | .20 | .158 |
| T4 X 2HD+ | | 4 | 2.25 | 3.94 | 2.0 | 3.94 | 2.1 | .39 | 1.25 | 1.5 | .20 | .158 |
| T4 X 3HD+ | T4C+ | 4 | 3 | 3.94 | 3.0 | 3.94 | 3.1 | .39 | 2.50 | 1.5 | .20 | .158 |
| T4 X 4HD+ | | 4 | 4 | 3.94 | 3.85 | 3.94 | 3.9 | .39 | 3.26 | 1.5 | .20 | .158 |
| T4 X 5HD+ | | | 5 | 3.94 | 5.04 | 3.94 | 5.10 | .39 | 4.38 | 1.5 | .20 | .158 |
| T6 X 4HD+ | T6C+ | 6 | 4 | 5.91 | 3.85 | 5.91 | 3.9 | .39 | 3.26 | 2.5 | .20 | .158 |

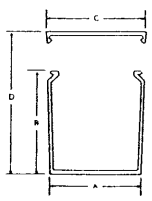
*+ Catalogue number must be completed by adding suffix G for Grey, W for White, B for Blue.*
*Example: T2 x 2HD is a 2" x 2" gray duct.*
*Standard lengths are 6 feet*
*To order adhesive-backed duct, add suffix **A** to catalogue number.*
*Example: T2 x 2HDGA is a 2" x 2" gray duct with adhesive backing.*
*Shelf life for adhesive is 1 year.*

*Vinyl duct is UL Recognized ᵁᴸ,*
*CSA Certified and meets the JIC requirements.*
*Noryl® duct available upon request (oyster white only).*
*Contact Customer Service for details.*

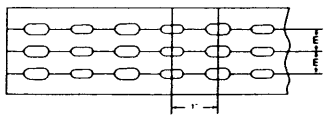




*Typical Side View*



*Overall Height Cover Installed*



*Bottom Mounting Holes, ½ x 7/16 (in.)*

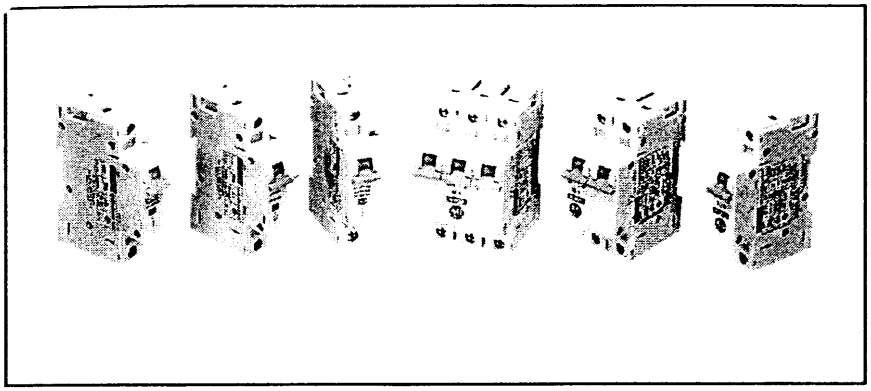
14.8

JOB: WASTE WATER TREATMENT PLANT IQUALUIT, CONTRACTOR PRE-APPROVAL; SIFEC-KUDLIK per: C.FAUTEUX, T,P. G.FAUTEUX, P,ENG. P.A. PELLETIER, P,ENG

JOB; WASTE WATER TREATMENT PLANT AT IQUALUIT, NUNAVUT CONTRACTOR PRE-APPROVAL; SIFEC-KUDLIK, PER; C.FAUTEUX, T.P. G.FAUTEUX, P.ENG.

REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT. ANY ACTION INDICATED IS SUBJECT TO THESE REQUIREMENTS.
☑ NO EXCEPTION TAKEN
☐ MAKE NOTED CORRECTIONS
☐ REVISE & RESUBMIT
☐ REJECTED
DATE Jan 21/14 BY DC
EARTH TECH (CANADA) INC.

492-CB



## Description

Bulletin 1492 Energy Limiting Miniature Circuit Breakers are thermal magnetic type **supplementary** overcurrent protective devices. Bulletin 1492-CB Miniature Circuit Breakers are available in 1-, 2-, and 3-pole units rated from 0.5...50 A. AC units are rated 65V DC as standard. 2- and 3- pole devices are connected internally and at the handle for simultaneous operation.
Wire termination is achieved by a clamping style, self-lifting box lug on all Bulletin 1492-CB units. Both line and load side termination points will accept #16...6 AWG (1.5...16 mm²) copper wires.

## Features

- Energy Limiting Design — protects downstream components better than conventional breakers during short circuits
- Field-mountable options for selective applications
- True IP2X Finger-Safe design (top and sides)
- International approvals — CE Marked, meets UL, CSA, and IEC (VDE) standards for worldwide acceptance
- Ratings to 480V AC and 10,000 A Interrupt Capacity (refer to page 1-109)
- AC and DC voltage ratings — in one convenient device
- A positively trip-free mechanism (breaker operation cannot be defeated by holding the handle in the ON position)
- 3 trip curves: F, G, and H
- Time delay (H characteristic) for high inrush currents during inductive start-ups such as transformers and power supplies
- Superior shock and vibration resistance capabilities — helps to prevent nuisance tripping
- Mounts on DIN Rail or optional through door brackets
- On standard AC/DC versions (F, G, H) line and load connections may be reversed

## Trip Curves

1492-CB Trip Curves are available in publication 1492-2.5.

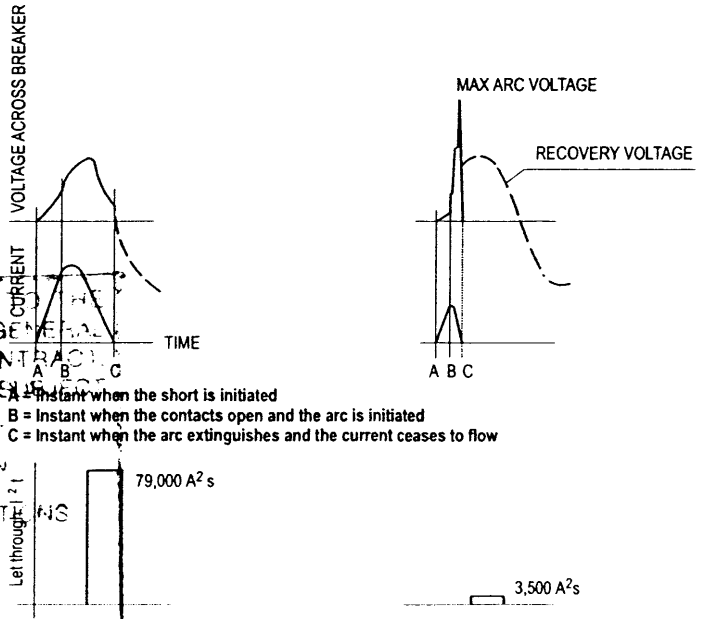
## The Benefits of Limiting Let-Through-Energy

### 1492-CB vs. Conventional Breakers

The 1492-CB line features the unique ability to achieve short circuit interruptions far more effectively than conventional breakers.
In *conventional circuit breakers*, short circuit interruption time required is approximately one or two half cycles of an AC sine wave. When the contacts open, the resulting arc continues to burn until the current level passes through zero. The arc may re-ignite because of the insufficient width of the contact gap. The current that flows until the arc is extinguished produces a heating effect proportional to the $I^2t$ value *(let-through-energy)* of the fault current. The 1492-CB Energy Limiting Miniature Circuit Breaker is designed to substantially reduce the amount of *let-through-current* and the resulting *let-through-energy* that can damage protected components. The 1492-CB has the ability to interrupt short circuit current within the first half cycle of the fault.

### Short Circuit Interruption Diagrams

**Short Circuit Interruption 10 kA — 120 Volts AC**
Instant of initiation: 15° after voltage zero




REVIEWED ACCORDING TO THE
REQUIREMENTS OF THE GENERAL
CONDITIONS OF THE CONTRACT.
ANY ACTION INDICATED IS SUBJECT
TO THESE REQUIREMENTS.
[X] NO EXCEPTIONS TAKEN
[ ] MAKE NOTED CORRECTIONS
[ ] REVISE & RESUBMIT
[ ] REJECTED
DATE July 21/05 BY DC
EARTH TECH (CANADA) INC.

JOB; WASTE WATER TREATMENT
PLANT AT IQUALUIT, NUNAVUT
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK, PER; C.FAUTEUX, T.P.
G.FAUTEUX, P.ENG.
P.A.PELLETIER,P.ENG.

## 1492-CB, Continued

### The Benefits of Limiting Let-Through-Energy (Continued)

Limiting let-through-energy will protect against the harmful effects of overcurrent and is focused primarily on avoiding the following:

- Excessive Heat
- Mechanical Damage

Both of these factors are proportional to the square of the current. Thermal energy is proportional to the square of the RMS value and magnetic forces are proportional to the square of the peak value. The most effective way to provide protection is to substantially limit *let-through-energy*. This provides the following advantages:

- Far less damage at the location of the short circuit.
- Fast electric separation of a faulty unit from the system, especially power supplies connected in parallel that are switched off when the voltage of the power bus drops below a certain level.
- Far less wear on the miniature circuit breaker itself. This means more safe interruptions.
- Better protection of all components in the short circuit path.
- Far wider range of selective action when used with an upstream protective device. (No nuisance shut downs from feeder line interruptions, causing a blackout in all connected branches.)

### Applications

Bulletin 1492-CB Energy Limiting Miniature Circuit Breakers have a wide range of trip characteristics for a wide range of applications.

- F trip characteristic (3...5 x *In*) ❶ for low fault tolerant loads, such as PLC outputs, solid state control equipment, and also for selective action with an upstream fault device
- G trip characteristic (6...10 x *In*) ❶ for standard duty loads, such as relay coils, control circuitry, and test equipment
- H trip characteristic (12...20 x *In*) ❶ for high inrush loads, such as power supplies, heaters, and transformer primaries

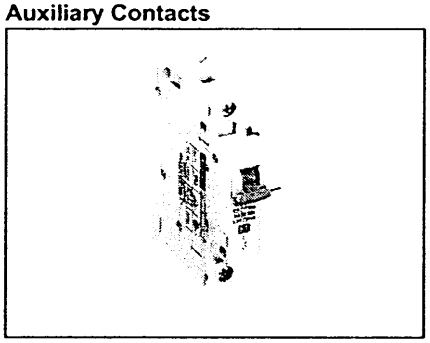
A type F has a fault level inrush current interruption approximately half that of type G. The type H has a fault level interruption approximately twice that of type G.

## Accessories

### Accessory Notes

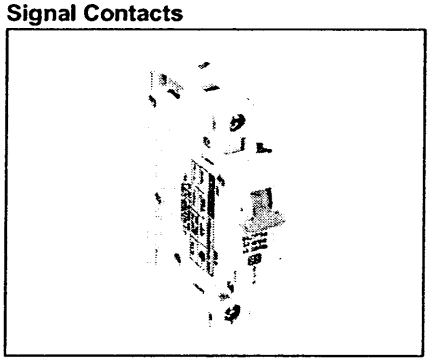
**Note:** Maximum of two accessories per device.

### Auxiliary Contacts



Refer to Specifications on page 1-108 for ratings. Each auxiliary contact module contains one (1) contact, either Normally Open or Normally Closed. Actuation of the contact is determined by the handle position of the adjacent poles.

### Signal Contacts

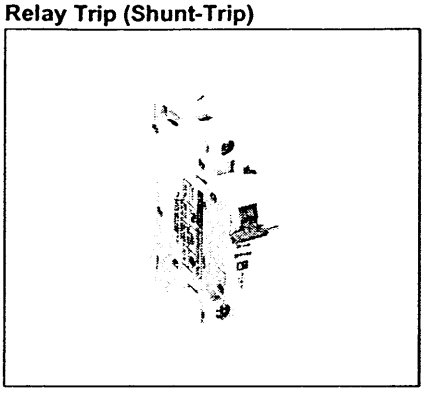


Refer to Specifications on page 1-108 for ratings. Each contact module contains one contact that will be linked internally with the adjacent poles, but not through the handle. Contacts are actuated by a fault condition on the protected poles, not by the manual operation of them.

**Note:** The difference between an auxiliary contact and a signal contact is the protected poles adjacent to the signal contact may be manually shut off without affecting the status of the signal contact, whereas the auxiliary contact is activated either by manual (possibly to service a panel) or automatic operation (fault) of the protected poles. Manual operation of the protected poles does not alter the contact state of the signal contact (which may be connected to an alarm circuit for fault indication only).

❶ *In* = rated current. The time/current trip characteristic k1...k2 x *In* is defined such that inrush current k1 x *In* has a time delay that exceeds 10 ms, and k2 x *In* has a time delay that is less than 10 ms.

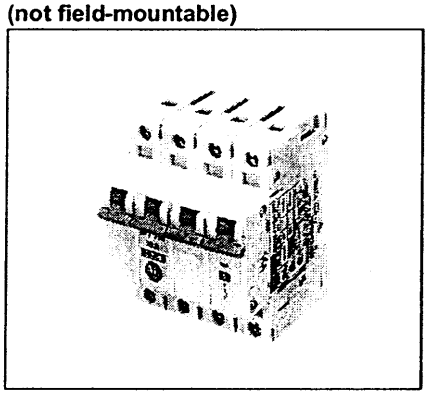
### Relay Trip (Shunt-Trip)



Refer to the table below for ratings. The Relay trip module can be used to trip the adjacent current carrying poles from a remote location by applying a voltage (pick-up voltage) to the Relay trip terminals. Contacts operate between 8 and 16 milliseconds after the pick-up voltage has been applied.

| Type | Pick-Up Voltage Range | Impedance |
|---|---|---|
| A1 | 5...15 V AC/DC | 1.1 Ω |
| A2 | 10...24V AC/DC | 4.7 Ω |
| A3 | 20...48V AC/DC | 16 Ω |
| A4 | 40...110V AC/DC | 63 Ω |
| A5 | 90...240V AC/DC | 395 Ω |

### Switched Neutral Module (not field-mountable)



Refer to Specifications on page 1-108 for ratings. This module is used to open the neutral line of the circuit as a result of the condition of the protected poles. It is used as a safety measure (required by some standards) for the protection of networks with a grounded neutral system. The switched neutral pole opens after and closes before the adjacent protected pole (i.e., early make, late break). Automatic actuation is a result of the adjacent pole trip mechanism and manual actuation is by the linked handles.



(2)

14.9

**'492-CB, Continued**

## How to Order 1492-CB

The following information must be known to select the proper miniature circuit breaker:

- What is the full load amperage that will be available in the system?
- Is it a 1-, 2-, or 3-phase system?
- What are the start-up or inrush properties of the load?
- Will the system require additional shaping options (e.g., auxiliary contacts, signal contacts)?

After defining these few parameters, the selection can be done by following the chart below. All options are field-mountable except the neutral switch, which comes installed from the factory.

## Selection Information

You can order a basic 1-, 2-, or 3-pole miniature circuit breaker from the following tables and add an accessory module to meet your specific application requirements.

**1492 – CB 3 G 200 – N ❶ ❹**

**Bulletin Number**

| Energy Limiting Miniature Circuit Breaker | |
|---|---|
| CB | Screw Terminal |

| Switched Neutral Module | |
|---|---|
| N ❶ | 277V 65 A |

| Number of Poles | | Rated Voltage ❷ By Trip Characteristic | |
|---|---|---|---|
| | | F, G, H | DF, DG, DH |
| 1 | 1 pole | 277V AC 65V DC | 120V DC |
| 2 | 2 poles | 480V AC 65V DC | 240V DC |
| 3 | 3 poles | 480V AC 65V DC | 360V DC |

| Trip Characteristic | |
|---|---|
| Code | Magnetic Trip Range |
| F | 3...5 x *In* |
| G | 6...10 x *In* |
| H | 12...20 x *In* |
| DF ❸❹ | 4.5...8 x *In* |
| DG ❸❹ | 9...16 x *In* |
| DH ❸❹ | 18...32 x *In* |

*In* = Rated Current

**UL1077, CSA C22.2 #235** — In North America, miniature circuit breakers are recognized as supplementary protectors and are intended for use as overcurrent protection within an appliance or other electrical equipment where branch circuit protection is already provided or not required. Internationally, these products are rated to IEC standards as miniature circuit breakers or circuit breakers for equipment.

FEW + BOILER CP

| Trip Char. | Current Rating Code (Standard Trip Characteristic is Type G) | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | 005 | 010 | 015 | 020 | 030 | 040 | 050 | 060 | 070 | 100 | 120 | 150 ❸ | 160 ❸ | 200 ❸ | 250 ❸ | 300 ❸ | 320 ❸ | 400 ❸ | 500 ❸ |
| G | 005 | 010 | 015 | 020 | 030 | 040 | 050 | 060 | 070 | 100 | 120 | 150 | 160 | 200 | 250 | 300 | 320 | 400 | 500 |
| H | 005 | 010 | 015 | 020 | 030 | 040 | 050 | 060 | 070 | 100 | 120 | 150 | 160 | 200 | 250 | 300 | 320 | 400 | 500 |
| DF ❸❹ | 005 | 010 | 015 | 020 | 030 | 040 | 050 | 060 | 070 | 100 | 120 | 150 | 160 | 200 | 250 | 300 | 320 | 400 | — |
| DG ❸❹ | 005 | 010 | 015 | 020 | 030 | 040 | 050 | 060 | 070 | 100 | 120 | 150 | 160 | 200 | 250 | 300 | 320 | 400 | — |
| DH ❸❹ | — | — | — | — | — | — | — | 060 | 070 | 100 | 120 | 150 | 160 | 200 | 250 | 300 | 320 | 400 | — |
| Amp Rating | 0.5 | 1 | 1.5 | 2 | 3 | 4 | 5 | 6 | 7 | 10 | 12 | 15 | 16 | 20 | 25 | 30 | 32 | 40 | 50 |

MAIN PLC CABINET

❶ This alphanumeric character is for the optional neutral module.
❷ Rated volts are UL Recognized.
❸ Minimum order of 10 breakers required.
**Attention:** Do not use these DC versions in AC networks. Polarity markings must be observed with the DC versions.

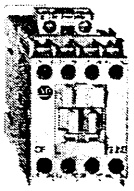
POWER RELAY

17275

**Bulletin 700-CF**

# Industrial Relays

## Overview/Product Selection



### Bulletin 700-CF

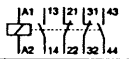
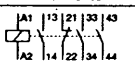
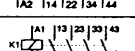
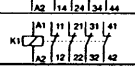
- IEC Industrial Relays (Finger Safe Design
- Positively-Guided/Mechanically-Linked Contacts per IEC 947-5-1 Annex L on Main and Auxiliary Contacts
- Solid-State and Pneumatic Timing Modules
- 4...12 Poles
- 12...600V Coils

REVIEWED ACCORDING TO
REQUIREMENTS OF THE
CONDITIONS OF THE
ANY ACTION INDICATED IS
TO THESE REQUIREMENTS
☑ NO EXCEPTIONS TAKEN
☐ MAKE
☐ REVISE &
☐ REJECTED
DATE July 21/05 DC
BY

### Table Of Contents


Product Selection .....186
Accessories.....188
Specifications .....193
Approximate Dimensions .....196


### ~ 4-Pole AC Coil Voltage

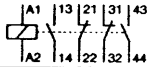
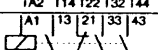
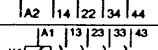
| AC-12 $I_{th}$ [A] | | AC-15 $I_{th}$ [A] | | | | | | | Connection Diagrams | Contacts N.O. | Contacts N.C. | Standard Contacts Cat. No. ❶ | Gold Bifurcated Contacts Cat. No. ❶ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40°C | 60°C | 24/48V | 120V | 240V | 400V | 500V | 600V | 690V | | | | | |
| 25 | 20 | 16 | 14 | 10 | 5 | 2.5 | 1.8 | 1 |  | 2 | 2 | 700-CF220⊗ | 700-CFB220⊗ |
| | | | | | | | | |  | 3 | 1 | 700-CF310⊗ | 700-CFB310⊗ |
| | | | | | | | | |  | 4 | 0 | 700-CF400⊗ | 700-CFB400⊗ |
| | | | | | | | | |  | 0 | 4 | 700-CF040⊗ | 700-CFB040⊗ |

**⊗ Voltage Suffix Code**

The Cat. No. as listed is incomplete. Select a Voltage Suffix Code from the table below to complete the Cat. No. Example: **Cat. No. 700-CF220⊗** becomes **Cat. No. 700-CF220F**

| Voltage | 12 | 24 | 32 | 36 | 42 | 48 | 100 | 100-110 | 110 | 120 | 127 | 200 | 200-220 | 208 | 208-240 | 220-230 | 230 | 230-240 | 240 | 277 | 347 | 380 | 380-400 | 400 | 400-415 | 440 | 480 | 500 | 550 | 600 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 Hz | R | K | V | W | X | Y | KP | — | D | P | S | KG | — | — | — | F | — | VA | T | — | — | — | N | — | G | B | — | M | C | — |
| 60 Hz | Q | J | — | V | — | X | — | KP | — | D | — | — | KG | H | L | — | — | — | A | T | I | E | — | — | — | N | B | — | — | C |
| 50/60 Hz | — | KJ | — | — | — | KY | KP | — | KD | L | — | KG | — | — | — | — | KF | — | KA | — | — | — | — | KN | — | KB | — | — | — | — |

### 4-Pole DC Coil Voltages

| AC-12 $I_{th}$ [A] | | AC-15 $I_{th}$ [A] | | | | | | | Connection Diagrams | Contacts N.O. | Contacts N.C. | Standard Contacts Cat. No.❶ | Gold Bifurcated Contacts Cat. No.❶ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40°C | 60°C | 24/48V | 120V | 240V | 400V | 500V | 600V | 690V | | | | | |
| 25 | 20 | 16 | 14 | 10 | 5 | 2.5 | 1.8 | 1 |  | 2 | 2 | 700-CF220⊗ | 700-CFB220⊗ |
| | | | | | | | | |  | 3 | 1 | 700-CF310⊗ | 700-CFB310⊗ |
| | | | | | | | | |  | 4 | 0 | 700-CF400⊗ | 700-CFB400⊗ |

**⊗ Voltage Suffix Code ❷**

The Cat. No. as listed is incomplete. Select a Voltage Suffix Code from the table below to complete the Cat. No. Example: **Cat. No. 700-CF220Z⊗** becomes **Cat. No. 700-CF220ZJ for 24V DC**

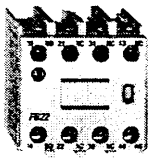
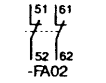
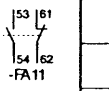
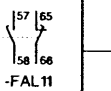
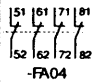
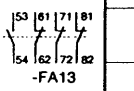
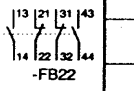
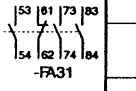
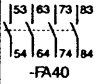
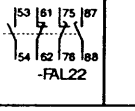
| Voltage | 9 | 12 | 24 | 36 | 48 | 60 | 64 | 72 | 80 | 110 | 115 | 125 | 220 | 230 | 250 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Standard | ZR | ZQ | ZJ | ZW | ZY | ZZ | ZB | ZG | ZE | ZD | ZP | ZS | ZA | ZF | ZT |
| With diode suppressor | | | DJ | | | | | | | | | | | | |

❶ All Cat. Nos. are factory-stocked.
❷ When ordering DJ coil with built-in surge suppression, the DJ is not polarity sensitive. Drop out time: 14...20 ms.

(1)

Power Relay

## Auxiliary Contacts

| | Description | N.O. | N.C. | Connection Diagrams | For Use With | Cat. No. ❺ |
|---|---|---|---|---|---|---|
|  | **Auxiliary Contact Blocks for Front Mounting ❶❷**<br>• 2- and 4-pole<br>• Quick and easy mounting without tools<br>• Mutual positive guidance to the main contactor poles (except for L types)<br>• Models with equal function with several terminal numbering choices<br>L = Late break/Early make | 0 | 2 |  -FA02 | 700-CF | 100-FA02 |
| | | 1 | 1 |  -FA11 | 700-CF | 100-FA11 |
| | | 2 | 0 | -FA20 | 700-CF | 100-FA20 |
| | | 1L | 1L |  -FAL11 | 700-CF | 100-FAL11 |
| | | 0 | 4 |  -FA04 | 700-CF | 100-FA04 |
| | | 1 | 3 |  -FA13 | 700-CF | 100-FA13 |
| | | 2 | 2 | -FA22 | 700-CF | 100-FA22 |
| | | 3 | 1 |  -FB22 | 700-CF | 100-FA31 |
| | | 4 | 0 |  -FA31 | 700-CF | 100-FA40 |
| | | 1+1L | 1+1L |  -FA40 | 700-CF | 100-FAL22 |
| | | | |  -FAL22 | | |

| | Description | N.O. | N.C. | Connection Diagrams | For Use With | Cat. No. ❺ |
|---|---|---|---|---|---|---|
| | **Auxiliary Contact Blocks for Side Mounting without Sequence Terminal Designations ❷❸**<br>• 1- and 2-pole<br>• Two-way numbering for right or left mounting on the contactor<br>• Quick and easy mounting without tools<br>• Mutual positive guidance and to the main relay poles (except for L types)<br>L = Late break/Early make | 0 | 1 | -SA01 | 700-CF | 100-SA01 |
| | | 1 | 0 | -SA10 | 700-CF | 100-SA10 |
| | | 0 | 2 | -SA02 | 700-CF | 100-SA02 |
| | | 1 | 1 | -SA11 | 700-CF | 100-SA11 |
| | | 2 | 0 | -SA20 | 700-CF | 100-SA20 |
| | | L1 | L1 | -SAL11 | 700-CF | 100-SAL11 |

❶ Control Relay and Auxiliary Contact

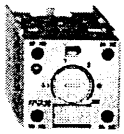
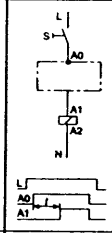
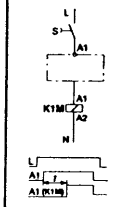
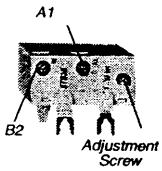
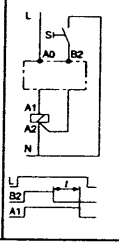
| 700CF (AC and DC coils), vertical mounting, 60°C | | | | | |
|---|---|---|---|---|---|
| Cat. No. 700... ❺ | Max. N.O. Side Aux. | Max. N.C. Side Aux. | Max. N.O. Front + Side Aux. | Max. N.C. Front + Side Aux. | Max. N.O. + N.C. Front + Side Aux. |
| CF400 | 2 | 4 | 6 | 6 | 6 |
| CF310 | 2 | 4 | 6 | 6 | 6 |
| CF220 | 2 | 4 | 6 | 6 | 6 |
| CF040 ❹ | 2 | 2 | 4 | 4 | 4 |

| 700CF (AC and DC coils), vertical mounting, 40°C | | | | | |
|---|---|---|---|---|---|
| Cat. No. 700... ❺ | Max. N.O. Side Aux. | Max. N.C. Side Aux. | Max. N.O. Front + Side Aux. | Max. N.C. Front + Side Aux. | Max. N.O. + N.C. Front + Side Aux. |
| CF400 | 2 | 4 | 6 | 7 | 7 |
| CF310 | 2 | 4 | 6 | 7 | 7 |
| CF220 | 2 | 4 | 6 | 7 | 7 |
| CF040 ❹ | 2 | 3 | 4 | 5 | 5 |

❷ Up to 8 auxiliary contacts may be mounted (a maximum of 4 N.C. contacts on the front of the contactor and a maximum of 2 N.O. contacts on each side).
❸ Maximum No. of Contacts: Refer to the following tables
❹ AC coils only.
❺ All Cat. Nos. are factory stocked.

(2)

## Control Modules

| | Description | | Connection Diagrams | Reset Time | Repeat Accuracy | For Use With | Cat. No. ❷ |
|---|---|---|---|---|---|---|---|
|  *Cat. No. 100-FPTA30 Mount on front of 700-CF Relay* | **Pneumatic Timing Module — ON Delay (1 N.O. + 1 N.C.)** Timed contact operates after the time delay. Relay contact operates instantaneously. • Continuous adjustment range | **ON-Delay** 0.3...30 s Range 1.8...180 s Range | | 25...90 ms for AC Coils 47...85 ms for DC coils | +/-10% | 700-CF AC Coils DC Coils ❶ | 100-FPTA30 100-FPTA180 |
| | **Pneumatic Timing Module — OFF Delay (1 N.O + 1 N.C.)** Timed contact will remain in operation until the end of the time delay. Relay contact operates instantaneously. • Continuous adjustment range | **OFF-Delay** 0.3...30 s Range 1.8...180 s Range | | | | 700-CF All | 100-FPTB30 100-FPTB180 |
| *Cat. No. 100-ETA30* | **Solid-state Timing Module** Changes all contacts on Bulletin 100-C contactors and Bulletin 700-CF control relays into timed contacts. **100-ETA** The contactor is switched on after the end of the delay time. | **ON-Delay** 0.1...3 s Range 1...30 s Range 10...180 s Range |  | 100 ms min. 100 ms max. | +/-1% | 700-CF 110...240V 50/60 Hz 110...250VDC | 100-ETA3 100-ETA30 100-ETA180 |
| | | ON-Delay 0.1...3 s 1...30 s 10...180 s Range |  | | | 700-CF with DC coils 24V DC and 48V DC | 100-ETAZJ3 100-ETAZJ30 100-ETAZJ180 |
|  *Cat. No. 100-ETB30* | **100-ETB** After interruption of the control signal, the contactor is switched off after the end of the set delay time. • Continuous adjustment range | **OFF-Delay** 0.3...3 s 1...30 s 10...180 s Range |  | | | 700-CF 110...240V AC coils, 50/ 60 Hz | 100-ETB3 100-ETB30 100-ETB180 |
| | | | | | | 700-CF 24V AC coils | 100-ETBKJ3 100-ETBKJ30 100-ETBKJ180 |

❶ Cannot be used with side-mounted auxiliary contacts.
❷ All Cat. Nos. are factory stocked.

JOB; WASTE WATER TREATMENT
PLANT AT IQUALUIT, NUNAVUT
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK, PER; C.FAUTEUX, T.P.
G.FAUTEUX, P.ENG.
P.A.PELLETIER,P.ENG.

(3)

14.10

CONTROL RELAY
1/10

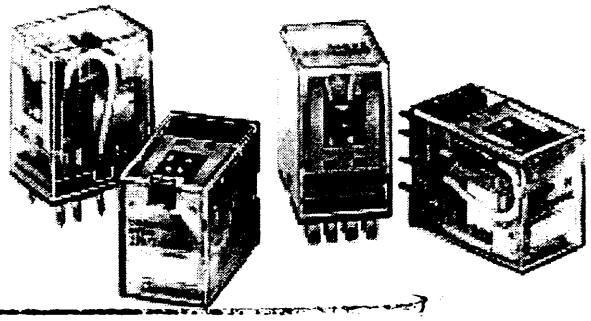
OMRON®

# General-purpose Relay

**MY**

## Versatile, Multi-featured, Two-and Four-Pole Miniature Power Relays for Sequence Control and Power Switching Applications

- Increased reliability through automated production
- Multiple features available, including LED indicator, test button, bifurcated contacts, built-in diode and CR (surge suppression)
- Max. switching current: two-pole/10 A, four-pole/5 A
- Environment-friendly cadmium-free contacts
- Built-in operation indicator and name-plate is standard



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## Ordering Information

### ■ RELAYS

**Standard Coil Polarity**

| Type | Contact form | Part number | | |
|---|---|---|---|---|
| | | Plug-in socket/Solder terminals | | |
| | | Standard with LED indicator | With LED indicator and test button | Without LED indicator |
| Standard | DPDT | **MY2N** | **MY2IN** | **MY2** |
| | 4PDT | **MY4N** | **MY4IN** AC120 | **MY4** |
| | 4PDT (bifurcated) | **MY4ZN** | **MY4ZIN** | **MY4Z** |
| With built-in diode (DC only) | DPDT | **MY2N-D2** | **MY2IN-D2** | --- |
| | 4PDT | **MY4N-D2** | **MY4IN-D2** | --- |
| | 4PDT (bifurcated) | **MY4ZN-D2** | **MY4ZIN-D2** | --- |
| With built-in CR (220/240 VAC, 110/120 VAC only) | DPDT | **MY2N-CR** | **MY2IN-CR** | --- |
| | 4PDT | **MY4N-CR** | **MY4IN-CR** | --- |
| | 4PDT (bifurcated) | **MY4ZN-CR** | **MY4ZIN-CR** | --- |

Note: 1. When ordering, add the rated coil voltage to the model number. Rated coil voltages are given in the coil ratings table.
Example: MY2 AC6(S)
↑
Rated coil voltage

2. Arc barrier standard on all four-pole relays.
3. Other models also available, such as, three-pole versions, flangemount, PCB, etc. Contact your Omron Representative for details.

JOB; WASTE WATER TREATMENT
PLANT AT IQUALUIT, NUNAVUT
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK, PER; C.FAUTEUX, T.P.
G.FAUTEUX, P.ENG.
P.A.PELLETIER,P.ENG.

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Ordering Information - continued from previous page

**Reverse Coil Polarity**

| Type | Contact form | Part number | |
|---|---|---|---|
| | | Plug-in socket/Solder terminals | |
| | | With LED indicator | With LED indicator and test button |
| Standard (DC only) | DPDT | **MY2N1** | **MY2IN1** |
| | 4PDT | **MY4N1** | **MY4IN1** |
| | 4PDT (bifurcated) | **MY4ZN1** | **MY4ZIN1** |
| With built-in diode (DC only) | DPDT | **MY2N1-D2** | **MY2IN1-D2** |
| | 4PDT | **MY4N1-D2** | **MY4IN1-D2** |
| | 4PDT (bifurcated) | **MY4ZN1-D2** | **MY4ZIN1-D2** |

Note: 1. When ordering, add the rated coil voltage to the model number. Rated coil voltages are given in the coil ratings table.
Example: MY2 AC6(S)
↑
Rated coil voltage

2. Arc barrier standard on all four-pole relays.

# Specifications

## ■ COIL RATINGS

| Rated voltage | | Rated current | | Coil resistance | Inductance (reference value) | | Must operate | Must release | Max. voltage | Power consumption (approx.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 50 Hz | 60 Hz | | Arm. OFF | Arm. ON | % of rated voltage | | | |
| AC | 6 V* | 214.1 mA | 183 mA | 12.2 Ω | 0.04 H | 0.08 H | 80% max. | 30% min. | 110% | 1.0 to 1.2 VA (60 Hz) |
| | 12 V | 106.5 mA | 91 mA | 46 Ω | 0.17 H | 0.33 H | | | | |
| | 24 V | 53.8 mA | 46 mA | 180 Ω | 0.69 H | 1.30 H | | | | |
| | 48 V* | 25.7 mA | 22 mA | 788 Ω | 3.22 H | 5.66 H | | | | |
| | 110/120 V | 9.9/10.8 mA | 8.4/9.2 mA | 4,430 Ω | 19.20 H | 32.1 H | | | | 0.9 to 1.1 VA (60 Hz) |
| | 220/240 V | 4.8/5.3 mA | 4.2/4.6 mA | 18,790 Ω | 83.50 H | 136.4 H | | | | |
| DC | 6 V* | 151 mA | | 39.8 Ω | 0.17 H | 0.33 H | | 10% min. | | 0.9 W |
| | 12 V | 75 mA | | 160 Ω | 0.73 H | 1.37 H | | | | |
| | 24 V | 37.7 mA | | 636 Ω | 3.20 H | 5.72 H | | | | |
| | 48 V* | 18.8 mA | | 2,560 Ω | 10.60 H | 21.0 H | | | | |
| | 100/110 V | 9.0/9.9 mA | | 11,100 Ω | 45.60 H | 86.2 H | | | | |

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of +15%/-20% for rated currents and ±15% for DC coil resistance.
2. Performance characteristic data are measured at a coil temperature of 23°C.
3. AC coil resistance and impedance are provided as reference values (at 60 Hz).
4. Power consumption drop was measured for the above data. When driving transistors, check leakage current and connect a bleeder resistor if required.
5. Rated voltage denoted by "*" will be manufactured upon request. Ask your OMRON representative.



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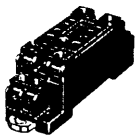
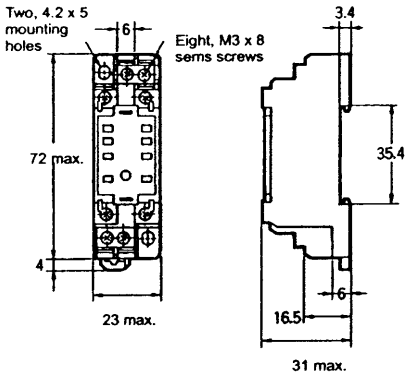
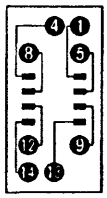
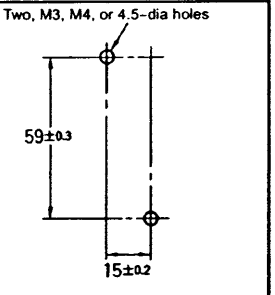
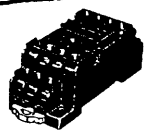
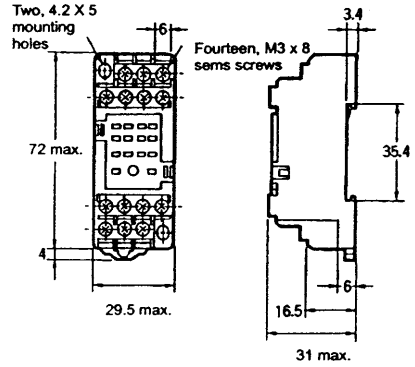
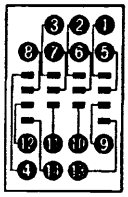
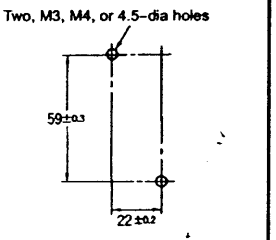
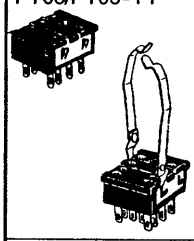
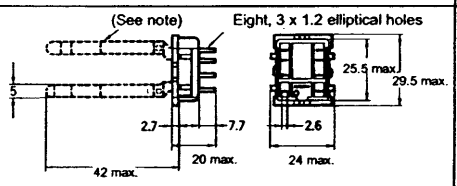
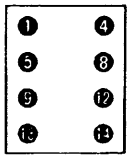
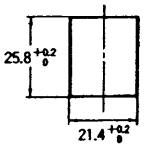
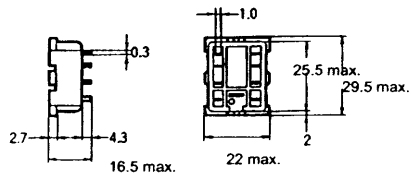
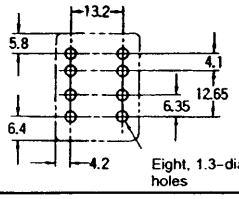
# Dimensions

Unit: mm (inch)

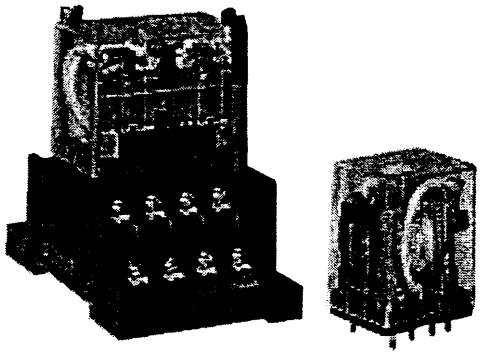
| Socket | Dimensions | Terminal arrangement/Internal connections (top view) | Mounting holes |
|---|---|---|---|
| PYF08A-E  |   |  |   (TOP VIEW) **Note:** Track mounting is also possible. Refer to page NO TAG for supporting tracks. |
| PYF14A-E  |   |  |   (TOP VIEW) **Note:** Track mounting is also possible. Refer to page NO TAG for supporting tracks. |
| PY08/PY08-Y1  |   **Note:** The PY08-Y1 includes sections indicated by dotted lines. |  |   |
| PY08-02 |   | |   |

4 LY4 i4N

OMRON

# General Purpose Relay — LY

- Arc barrier equipped
- High dielectric strength (2,000 VAC)
- Long dependable service life assured by AgCdO contacts
- Choose models with single or bifurcated contacts, LED indicator, diode surge suppression, push-to-test button, or RC circuit
- All models meet UL and CSA approvals; VDE, LR, and SEV approved versions are available



## Ordering Information

To Order: Select the part number and add the desired coil voltage rating (e.g., LY1-*DC6*).

| Type | Terminal | Contact form | Part number | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Single contact | | | Bifurcated contact | | |
| | | | Standard bracket mounting | Upper mounting bracket | Lower mounting bracket | Standard bracket mounting | Upper mounting bracket | Lower mounting bracket |
| Standard | Plug-in/solder | SPDT | **LY1** | **LY1F** | **LY1S** | — | — | — |
| | | DPDT | **LY2** | **LY2F** | **LY2S** | **LY2Z** | **LY2ZF** | **LY2ZS** |
| | | 3PDT | **LY3** | **LY3F** | **LY3S** | — | — | — |
| | | 4PDT | **LY4** | **LY4F** | **LY4S** | — | — | — |
| | PCB | SPDT | **LY1-0** | — | — | — | — | — |
| | | DPDT | **LY2-0** | — | — | **LY2Z-0** | — | — |
| | | 3PDT | **LY3-0** | — | — | — | — | — |
| | | 4PDT | **LY4-0** | — | — | — | — | — |
| LED indicator | Plug-in/solder | SPDT | **LY1N** | — | — | — | — | — |
| | | DPDT | **LY2N** | — | — | **LY2ZN** | — | — |
| | | 3PDT | **LY3N** | — | — | — | — | — |
| | | 4PDT | **LY4N** | — | — | — | — | — |
| Diode surge suppression | | SPDT | **LY1-D** | — | — | — | — | — |
| | | DPDT | **LY2-D** | — | — | **LY2Z-D** | — | — |
| | | 3PDT | **LY3-D** | — | — | — | — | — |
| | | 4PDT | **LY4-D** | — | — | — | — | — |
| LED indicator and diode surge suppression | | SPDT | **LY1N-D2** | — | — | — | — | — |
| | | DPDT | **LY2N-D2** | — | — | **LY2ZN-D2** | — | — |
| | | 4PDT | **LY4N-D2** | — | — | — | — | — |
| RC circuit | | SPDT | **LY1-CR** | — | — | — | — | — |
| | | DPDT | **LY2-CR** | — | — | **LY2Z-CR** | — | — |
| LED indicator and RC circuit | | SPDT | **LY1N-CR** | — | — | — | — | — |
| | | DPDT | **LY2N-CR** | — | — | **LY2ZN-CR** | — | — |

Note: 1. Types with specifications other than those listed are available. Contact your OMRON Sales representative.
2. To order connecting sockets and mounting tracks, see "Accessories" section.

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# Ordering Information, continued

| Type | Terminal | Contact form | Part number | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Single contact | | | Bifurcated contact | | |
| | | | Standard bracket mounting | Upper mounting bracket | Lower mounting bracket | Standard bracket mounting | Upper mounting bracket | Lower mounting bracket |
| Push-to-test button | Plug-in/solder | SPDT | **LY1I4** | — | — | — | — | — |
| | | DPDT | **LY2I4** | — | — | **LY2ZI2** | — | — |
| | | 3PDT | **LY3I4** | — | — | — | — | — |
| | | 4PDT | **LY4I4** | — | — | — | — | — |
| LED indicator and push-to-test button | Plug-in/solder | DPDT | **LY2I4N** | — | — | **LY2ZI2N** | — | — |
| | | 4PDT | **LY4I4N** AC120 | — | — | — | — | — |

Note: 1. Types with specifications other than those listed are available. Contact your OMRON Sales representative.
2. To order connecting sockets and mounting tracks, see "Accessories" section.

## ■ ACCESSORIES

**Connecting Sockets**

To Order: Select the appropriate part numbers for sockets, clips, and mounting tracks (if required) from the following charts.

**Track mounted sockets**

| Relay | Socket* | Relay hold-down clip | | Mounting track |
|---|---|---|---|---|
| | | Standard | RC circuit | |
| SPDT DPDT | **PTF08A-E** | **PYC-A1** | **Y92H-3** | **PFP-100N/PFP-50N &** **PFP-M** or **PFP-100N2** **PFP-S** (Option spacer) |
| 3PDT | **PTF11A** | | | |
| 4PDT | **PTF14A-E** | | | |

* Track mounted socket can be used as a front connecting socket.

**Back connecting sockets**

| Relay | Solder terminal socket | Wire wrap terminal socket | Relay hold-down clip | | | | Socket Mounting Plate | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Standard | Push-to-test | RC circuit | Mtg. plate | 1 | 10 | 12 | 18 |
| SPDT DPDT | **PT08** | **PT08QN** | **PYC-P** | **PYC-P2** | **PYC-1** | **PYC-S** | **PYP-1** | – | – | **PYP-18** |
| 3PDT | **PT11** | **PT11QN** | | | | | **PTP-1-3** | – | **PTP-12** | – |
| 4PDT | **PT14** | **PT14QN** | | | | | **PTP-1** | **PTP-10** | – | – |

Note: Types PYP-18, PTP-12 and PTP-10 may be cut to any desired length.

| Relay | PC terminal socket | Relay hold-down clip | | |
|---|---|---|---|---|
| | | Standard | Push-to-test | RC circuit |
| SPDT DPDT | **PT08-0** | **PYC-P** | **PYC-P2** | **PYC-1** |
| 3PDT | **PT11-0** | | | |
| 4PDT | **PT14-0** | | | |

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# Specifications

## ■ CONTACT DATA

| Load | Single contact | | | | Bifurcated contact | |
|---|---|---|---|---|---|---|
| | SPDT | | DPDT, 3PDT, 4PDT | | DPDT | |
| | Resistive load (p.f. = 1) | Inductive load (p.f. = 0.4) (L/R = 7 ms) | Resistive load (p.f. = 1) | Inductive load (p.f. = 0.4) (L/R = 7 ms) | Resistive load (p.f. = 1) | Inductive load (p.f. = 0.4) (L/R = 7 ms) |
| Rated load | 15 A at 110 VAC<br>15 A at 24 VDC | 10 A at 110 VAC<br>7 A at 24 VDC | 10 A at 110 VAC<br>10 A at 24 VDC | 7.5 A at 110 VAC<br>5 A at 24 VDC | 5 A at 110 VAC<br>5 A at 24 VDC | 4 A at 110 VAC<br>4 A at 24 VDC |
| Contact material | AgCdO | | | | | |
| Carry current | 15 A | | 10 A | | 7 A | |
| Max. operating voltage | 250 VAC<br>125 VDC | | | | | |
| Max. operating current | 15 A | | 10 A | | 7 A | |
| Max. switching capacity | 1,700 VA<br>360 W | 1,100 VA<br>170 W | 1,100 VA<br>240 W | 830 VA<br>120 W | 550 VA<br>120 W | 440 VA<br>100 W |
| Min. permissible load | 100 mA, 5 VDC | | | | 10 mA, 5 VDC | |

## ■ COIL DATA

**1- and 2-pole types – AC**

| Rated voltage (V) | Rated current (mA) | | Coil resistance (Ω) | Coil inductance (ref. value) (H) | | Pick-up voltage | Dropout voltage | Maximum voltage | Power consumption (VA, W) |
|---|---|---|---|---|---|---|---|---|---|
| | 50 Hz | 60 Hz | | Armature OFF | Armature ON | (% of rated voltage) | | | |
| 6 | 214.10 | 183 | 12.20 | 0.04 | 0.08 | 80% max. | 30% min. | 110% | Approx. 1.00 to 1.20 (60 Hz) |
| 12 | 106.50 | 91 | 46 | 0.17 | 0.33 | | | | |
| 24 | 53.80 | 46 | 180 | 0.69 | 1.30 | | | | |
| 50 | 25.70 | 22 | 788 | 3.22 | 5.66 | | | | |
| 100/110 | 11.70/12.90 | 10/11 | 3,750 | 14.54 | 24.60 | | | | Approx. 0.90 to 1.10 (60 Hz) |
| 110/120 | 9.90/10.80 | 8.40/9.20 | 4,430 | 19.20 | 32.10 | | | | |
| 200/220 | 6.20/6.80 | 5.30/5.80 | 12,950 | 54.75 | 94.07 | | | | |
| 220/240 | 4.80/5.30 | 4.20/4.60 | 18,790 | 83.50 | 136.40 | | | | |

**1- and 2-pole types – DC**

| Rated voltage (V) | Rated current (mA) | Coil resistance (Ω) | Coil inductance (ref. value) (H) | | Pick-up voltage | Dropout voltage | Maximum voltage | Power consumption (VA, W) |
|---|---|---|---|---|---|---|---|---|
| | | | Armature OFF | Armature ON | (% of rated voltage) | | | |
| 6 | 150 | 40 | 0.16 | 0.33 | 80% max. | 10% min. | 110% | Approx. 0.90 |
| 12 | 75 | 160 | 0.73 | 1.37 | | | | |
| 24 | 36.90 | 650 | 3.20 | 5.72 | | | | |
| 48 | 18.50 | 2,600 | 10.60 | 21 | | | | |
| 100/110 | 9.10/10 | 11,000 | 45.60 | 86.20 | | | | |

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C (73°F) with tolerances of +15%, -20% for AC rated current, and ±15% for DC rated coil resistance.
2. The AC coil resistance and inductance are reference values at 60 Hz.
3. The performance characteristics are measured at a coil temperature of 23°C (73°F).
4. Class B coil insulation is available.

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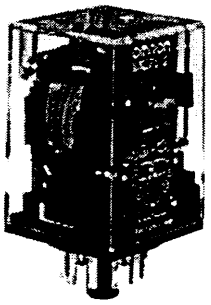
OMRON

# General Purpose Relay
# MK

- Exceptionally reliable general purpose relay.
- Long life (minimum 100,000 electrical operations) assured by silver contacts.
- Built-in operation indicator (mechanical, LED), diode surge suppression, Varistor surge suppression.
- The contact operation can be easily checked by mechanical indicator and/or push-to-test button options.
- Conforms to CENELEC standards.
- VDE approved versions available.



## Ordering Information

To Order: Select the part number and add the desired coil voltage rating (e.g., MK3P5-S-*AC120*).

| Type | Terminal | Coil | Contact form | Model | |
|---|---|---|---|---|---|
| | | | | Mechanical indicator | Mechanical indicator & push-to-test button |
| Standard | Plug-in | AC/DC | DPDT | **MK2P-I** | **MK2P-S** |
| | | | 3PDT | **MK3P-5-I** | **MK3P-5-S** |
| ED indicator | | | DPDT | **MK2PN-I** | **MK2PN-S** |
| | | | 3PDT | **MK3PN-5-I** | **MK3PN-5-S** |
| LED indicator and diode | | DC | DPDT | **MK2PND-I** | **MK2PND-S** 24VDC |
| | | | 3PDT | **MK3PND-5-I** | **MK3PND-5-S** |
| LED indicator and varistor | | AC | DPDT | **MK2PNV-I** | **MK2PNV-S** |
| | | | 3PDT | **MK3PNV-5-I** | **MK3PNV-5-S** 120VAC |
| Diode | | DC | DPDT | **MK2PD-I** | **MK2PD-S** |
| | | | 3PDT | **MK3PD-5-I** | **MK3PD-5-S** |
| Varistor | | AC | DPDT | **MK2PV-I** | **MK2PV-S** |
| | | | 3PDT | **MK3PV-5-I** | **MK3PV-5-S** |

**Note: 1.** Reverse polarity versions available on DC coil types. Consult your OMRON representative for further information.
**2.** VDE approved versions are available. Consult your OMRON representative for further information.

## ■ Accessories (Order separately)

To Order: Select the appropriate part numbers for sockets, clips, and mounting tracks (if required) from the available types chart.

### Track Mounted Sockets

| Relay type | Model | | |
|---|---|---|---|
| | Socket | Relay hold-down clip | Mounting track/end plate |
| SPDT<br>DPDT | **PF083A-E** | **PFC-A1** | **PFP-100N** or **PFP-50N** and **PFP-M** (end plate) |
| 3PDT | **PF113A-E** | **PFC-A1** | **PFP-100N** or **PFP-50N** and **PFP-M** (end plate) |

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## ■ Accessories (continued)

### Back Connecting Sockets

| Relay type | Model | |
|---|---|---|
| | Socket | Relay hold-down clip |
| SPDT | PL08 | PLC-E |
| DPDT | PLE08-0 | PLC-10 |
| | PL08-Q | PLC-E |
| 3PDT | PL11 | PLC-E |
| | PLE11-0 | PLC-10 |
| | PL11-Q | PLC-E |

# Specifications

## ■ Contact Data

| Load | Resistive load (p.f. = 1) | | Inductive load (p.f. = 0.4) |
|---|---|---|---|
| | 2 Pole | 3 Pole | |
| Rated load | 10 A at 250 VAC<br>10 A at 28 VDC | 10 A at 120 VAC<br>10 A at 28 VDC<br>10 A at 250 VAC | 7 A at 250 VAC |
| Contact material | Ag | | |
| Carry current | 10 A | | |
| Max. operating voltage | 250 VAC, 250 VDC | | |
| Max. operating current | 10 A | | |
| Max. switching capacity | 2,500 VA<br>280 W | 2,500 VA/1,250 VA (NO/NC contacts)<br>280 W | 1,750 VA |
| Min. permissible load | 10 mA at 1 VDC | | |

## ■ Coil Data

### AC

| Rated voltage (VAC) | Rated current (mA) (at 60 Hz) | Coil resistance (Ω) | Coil inductance (Ref. value) (H) | | Pick-up voltage | Dropout voltage | Maximum voltage | Power consumption (mW) |
|---|---|---|---|---|---|---|---|---|
| | | | Armature OFF | Armature ON | % of rated voltage | | | |
| 6 | 360 | 3.9 | 0.0423 | 0.0201 | 80% max.<br>Approx.<br>2.7 VA | 30% min.<br>(at 60 Hz)<br>25% min.<br>(at 50 Hz) | 110% max. | Approx.<br>2.3 VA<br>(at 60 Hz)<br>Approx.<br>2.7 VA<br>(at 50 Hz) |
| 12 | 180 | 16.3 | 0.3270 | 0.1666 | | | | |
| 24 | 88.0 | 68.0 | 0.6940 | 0.3760 | | | | |
| 50 | 39.0 | 338 | 3.195 | 1.530 | | | | |
| 110 | 21.0 | 1240 | 13.45 | 7.32 | | | | |
| 120 | 18.0 | 1578 | 15.04 | 7.19 | | | | |
| 220 | 11.0 | 5090 | 49.73 | 27.02 | | | | |
| 240 | 9.2 | 6737 | 58.62 | 32.07 | | | | |

### DC

| Rated voltage (VDC) | Rated current (mA) (at 60 Hz) | Coil resistance (Ω) | Coil inductance (Ref. value) (H) | | Pick-up voltage | Dropout voltage | Maximum voltage | Power consumption (mW) |
|---|---|---|---|---|---|---|---|---|
| | | | Armature OFF | Armature ON | % of rated voltage | | | |
| 6 | 255 | 23.5 | 0.206 | 0.106 | 80% max.<br>Approx.<br>2.7 VA | 15% min. | 110% max. | Approx.<br>1.5 W |
| 12 | 126 | 95 | 0.963 | 0.449 | | | | |
| 24 | 56 | 430 | 4.915 | 2.478 | | | | |
| 48 | 29.5 | 1630 | 16.685 | 10.487 | | | | |
| 110 | 15.1 | 7300 | 80.2 | 42.6 | | | | |

**Note:** 1. The rated current and coil resistance are measured at a coil temperature of 23°C (73°F) with a tolerance of ±15% for DC rated current and +15%, -20% for AC rated current.

2. The rated current is reference value.

3. Performance characteristic data are measured at a coil temperature of 23°C (73°F).

4. For models with the LED indicator built-in, add an LED current of approximately 0 thru 5 mA to the rated current.

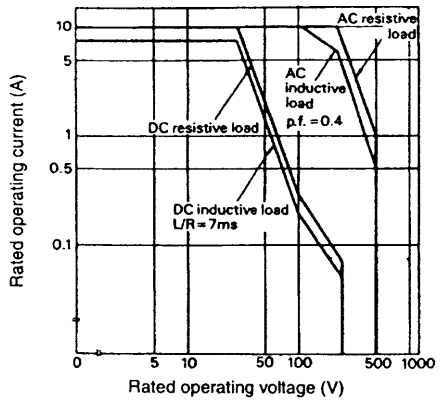
## ■ Characteristics

| | | |
|---|---|---|
| Contact resistance | | 50 mΩ max. |
| Operate time | | AC: 20 ms max. DC: 30 ms max. |
| Release time | | 20 ms max. |
| Operating frequency | Mechanical | 18,000 operations/hour |
| | Electrical | 1,800 operations/hour (under rated load) |
| Insulation resistance | | 100 MΩ min. (at 500 VDC) |
| Dielectric strength | | 2,500 VAC, 50/60 Hz for 1 minute between coil and contacts<br>1,000 VAC, 50/60 Hz for 1 minute between contacts of same poles, between terminals of the same polarity<br>2,500 VAC, 50/60 Hz for 1 minute between current-carrying parts, noncurrent-carrying parts, and terminals of opposite polarity |
| Vibration | Mechanical durability | 10 to 55 Hz, 1.50 mm (0.06 in) double amplitude |
| | Malfunction durability | 10 to 55 Hz, 1.00 mm (0.04 in) double amplitude |
| Shock | Mechanical durability | 1,000 m/s² (approx. 100 G) |
| | Malfunction durability | 100 m/s² (approx. 10 G) |
| Ambient temperature | | Operation: -10° to 40°C (14° to 104°F) |
| Humidity | | 35 to 85% RH |
| Service Life | Mechanical | 10 million operations min. (at operating frequency of 18,000 operations/hour) |
| | Electrical | 100,000 operations at rated load (at operating frequency of 1,800 operations/hour) |
| Weight | | Approx. 0.85 g (3.0 oz) |

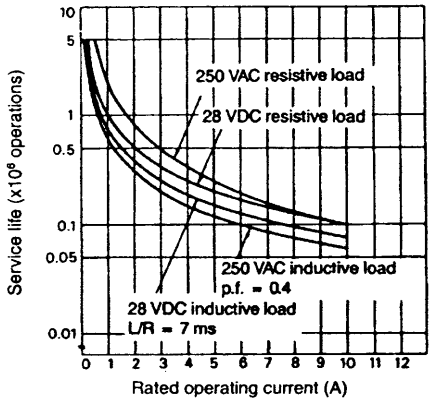
**Note:** Data shown are of initial value.

## ■ Characteristic Data

**Maximum switching capacity**
**MK2P-S**

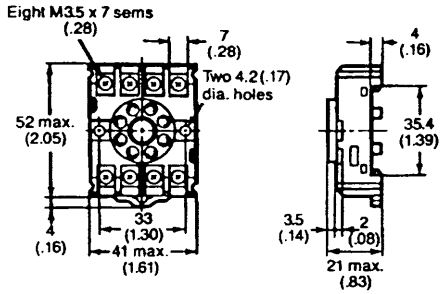



**Electrical service life**
**MK2P-S, MK3P5-S**

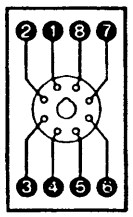


# Accessories

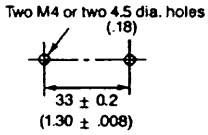
**Track mounted socket**
**PF083A-E (conforming to DIN EN 50022)**



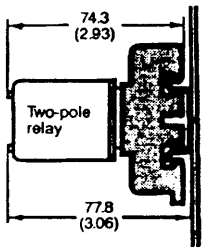

**Terminal arrangement**




**Mounting holes**

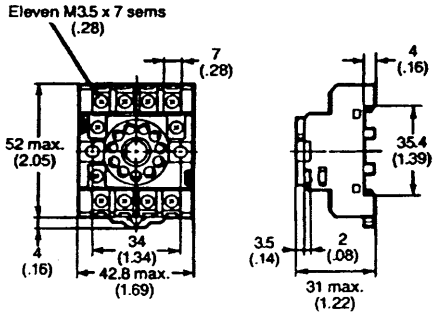



**Mounting dimensions of relay with socket**

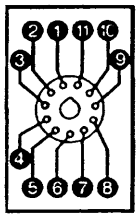



**Note:** Model PF083A-E can be used as a front connecting socket.

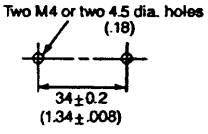
**Track mounted socket**
**PF113A-E (conforming to DIN EN 50022)**



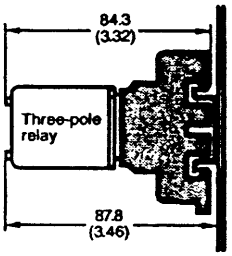

**Terminal arrangement**




**Mounting holes**



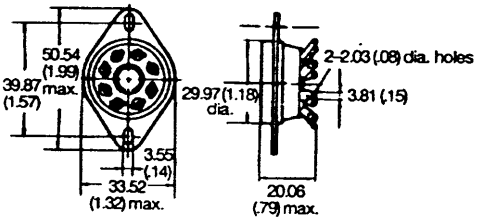

**Mounting dimensions of relay with socket**



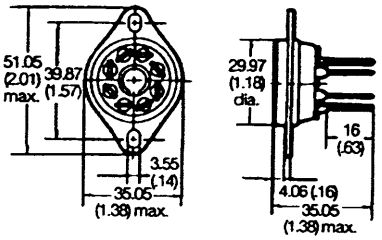

**Note:** Model PF113A-E can be used as a front connecting socket.

**Back connecting socket**
**MK2 sockets (8 pin)**

**PL08** (UL File No. E87929)
**Solder terminals**

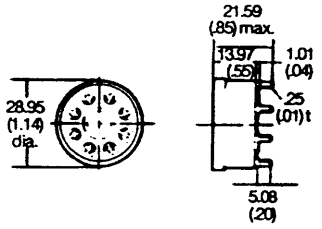



**PL08-Q**
**Wire wrap terminals**

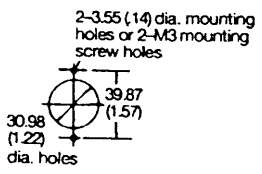



**Printed circuit board socket**

**PLE08-0**

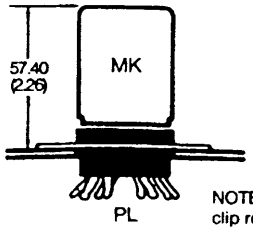



**Mounting holes**
**PL08**



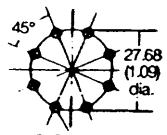

Mounting holes and panel cut-out applies to PL08 and PL08-Q

**PL08 type sockets and MK2 relay**
**Total height dimension**



NOTE: Hold down clip recommended.

**Recommended PCB layout**
**PLE08-0**




JOB; WASTE WATER TREATMENT
PLANT AT IQUALUIT, NUNAVUT
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK, PER; C.FAUTEUX, T.P.
G.FAUTEUX, P.ENG.

10

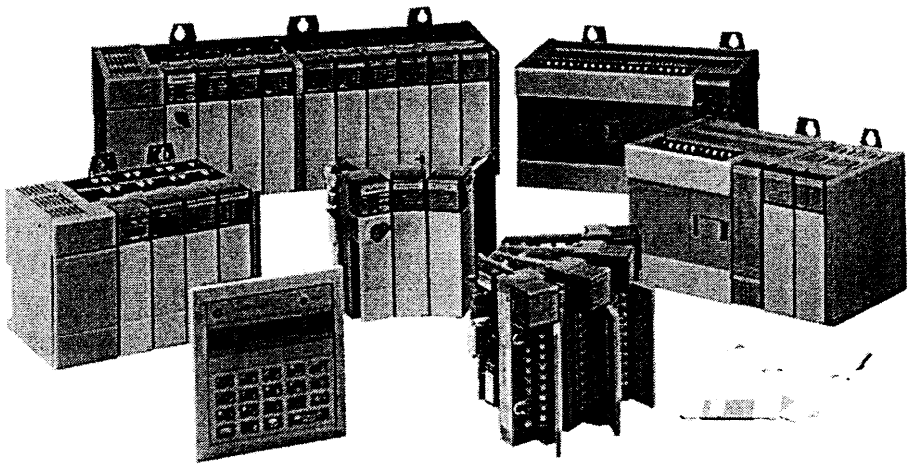


14.11

Rockwell Automation

# SLC 500™ Programmable Controllers

## Selection Guide—Bulletin 1746/1747

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# What's New

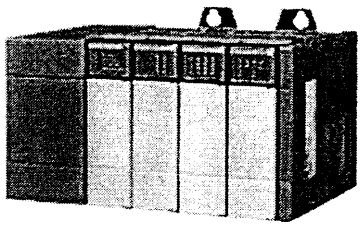
| New Products | Available | For ordering information, see page |
|---|---|---|
| **SLC 5/03, 5/04, 5/05 Upgrade Kits** - OS upgrade kits provide access to eight new instructions: RIO Block Transfers (BTW, BTR); Ramp (RMP); Time Stamp (RHC, TDF); Encoding (ENC); File Bit Comparison (FBC); and Diagnostic Detect (DDT). | Now | 6 |
| **1747-PSD Program Storage Device** - This new program storage device provides one-program upload and download capability for SLC 5/03, 5/04, 5/05, and MicroLogix 1000, 1200, and 1500. The 1747-PSD connects to the RS-232 port running DF1 Full-Duplex communication protocol. | Now | 7 |
| **1746-NI16I and 1746-NI16V Analog Input Modules** - These software-configurable, high-density analog input modules provide high accuracy and fast analog signal conversion for demanding process control applications. The modules also feature 14- to 16-bit resolution and the ability to interface to current (NI16I) and voltage (NI16V) signals from a variety of process sensors. | Now | 9 |
| **1746-NR8 RTD Input Module** - The new RTD module, available in Spring 2000, provides on-board RTD temperature scaling in degrees Celsius or Fahrenheit, or resistance scaling in ohms. With eight input channels, the module supports connections from two- or three-wire RTD sensors. The input channels are individually configurable using ladder logic. | Now | 10 |
| **1746-BAS-T BASIC Module** - The BASIC-T module uses the same BASIC Development Software (1747-PBASE) and offers the same BASIC language set and hardware specifications as the 1746-BASIC module, with a response speed that is four times faster. | Now | 11 |
| **1747-BSN Backup Scanner Module** - In addition to all the features of a remote I/O scanner, the backup module provides continuous redundant backup operation for SLC 5/02 and higher processors. A pair of 1747-BSN modules is required, with one in the primary system, and the other in the backup system. The modules communicate over a high speed serial link to continuously update the secondary processor. In the event of a fault in the primary system, the secondary processor is ready to assume control. | Now | 13 |
| **1747-SCNR ControlNet Scanner Module** - The ControlNet scanner provides scheduled message capability, allowing SLC processors to control I/O events in real time over ControlNet. The module can exchange data simultaneously with the SLC backplane and the ControlNet network. The module connects to the ControlNet network via the standard BNC connectors. | Now | 13 |
| **1747-ACN15 and 1747-ACNR15 ControlNet Adapter Modules** - Each ControlNet Adapter can control up to 30 slots of 1746 remote I/O on the ControlNet network. Up to 64 connections per adapter are possible, with 255 words per connection. The modules feature high speed data transfer, diagnostic messages, and local network communication access. In addition, the 1747-ACNR15 features redundant media. | Now | 13 |

(2)

14.12

***New or changed since previous issue.**

# Overview



**Modular Hardware Style -** You select the processor, power supply, and I/O modules to fit your application. Modular style chassis are available in 4-, 7-, 10-, and 13-slot versions.

**SLC 500 I/O modules** are available with 4, 8, 16, or 32 points. Combination modules with
2 inputs/2 outputs, 4 inputs/4 outputs, and 6 inputs/6 outputs are also available. A wide variety of I/O voltages (including AC, DC, and TTL), analog I/O, and specialty modules are available to help you create a close fit for your application.

**Programming -** Familiar ladder diagram programming makes the SLC 500 family easy to program using a personal computer. In addition, the SLC 5/01 and SLC 5/02 controllers can be programmed with a Hand-Held Terminal.

**Tested Design -** All SLC 500 devices are UL Listed, CSA Certified, and CE compliant for all applicable directives when product or packaging is marked. All SLC 500 devices are also certified for Class I Division 2, Groups A, B, C, and D hazardous locations.

**Modular Processors**

| Specification | SLC 5/01 | SLC 5/02 | SLC 5/03 | SLC 5/04 | SLC 5/05 |
|---|---|---|---|---|---|
| **Catalogue Number** | 1747-L511<br>1747-L514 | 1747-L524 | 1747-L531<br>1747-L532 | 1747-L541<br>1747-L542<br>1747-L543 | 1747-L551<br>1747-L552<br>1747-L553 |
| **Memory Size (Words)** | 1747-L511: 1K<br>1747-L514: 4K | 1747-L524: 4K | 1747-L531: 8K<br>1747-L532: 16K | 1747-L541: 16K<br>1747-L542: 32K<br>1747-L543: 64K | 1747-L551: 16K<br>1747-L552: 32K<br>1747-L553: 64K |
| **Power Supply Loading** | 350 mA at 5V dc<br>105 mA at 24V dc | 350 mA at 5V dc<br>105 mA at 24V dc | 500 mA at 5V dc<br>175 mA at 24V dc | 1000 mA at 5V dc<br>200 mA at 24V dc | 1000 mA at 5V dc<br>200 mA at 24V dc |
| **Max. I/0 Capacity** | 3940 discrete inputs<br>3940 discrete outputs | 4096 discrete inputs<br>4096 discrete outputs | 4096 discrete inputs<br>4096 discrete outputs | 4096 discrete inputs<br>4096 discrete outputs | 4096 discrete inputs<br>4096 discrete outputs |
| **Max. Local Chassis Slots** | 3/30 | 3/30 | 3/30 | 3/30 | 3/30 |
| **On-board Communications** | DH-485 Slave | DH-485 | DH-485 and RS-232 | DH+ and RS-232 | Ethernet and RS-232 |
| **Optional Memory Module** | EEPROM and UVPROM | EEPROM and UVPROM | flash EEPROM | flash EEPROM | flash EEPROM |
| **Programming** | Hand-Held Terminal<br>RSLogix 500<br>SLC 500 A.I. Series Advanced Programming Software | Hand-Held Terminal<br>RSLogix 500<br>SLC 500 A.I. Series Advanced Programming Software | RSLogix 500<br>SLC 500 A.I. Series | RSLogix 500<br>SLC 500 A.I. Series | RSLogix 500<br>SLC 500 A.I. Series |
| **Programming Instructions** | 52 | 71 | 107 | 107 | 107 |
| **Typical Scan Time[1]** | 8 ms/K | 4.8 ms/K | 1 ms/K | 0.9 ms/K | 0.9 ms/K |
| **Program Scan Hold-up Time after Loss of Power** | 20 ms to 3 s (dependent on power supply loading) | | | | |
| **Bit Execution (XIC)** | 4 µs | 2.4 µs | 0.44 µs | 0.37 µs | 0.37 µs |
| **Clock/Calendar Accuracy** | not applicable | not applicable | ±54 seconds/month at +25°C (+77°F)<br>±81 seconds/month at +60°C (+140°F) | | |

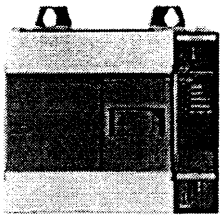
*(1) The scan times are typical for a 1K ladder logic program consisting of simple ladder logic and communication servicing. Actual scan times depend on your program size, instructions used, and the communication protocol.*

***New or changed since previous issue.**

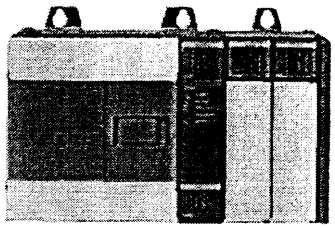
# Fixed Hardware Style

There are 24 fixed hardware style processors available in the following versions:

- (11) 20 I/O 12 inputs/8 outputs
- (6) 30 I/O 18 inputs/12 outputs
- (7) 40 I/O 24 inputs/16 outputs



*20 I/O Configuration*



*20 I/O with 2-Slot Expansion*

### 120/240V ac Ratings

- Voltage: 85-265V ac
- Frequency: 47-63 Hz
- Inrush: 20A maximum

### 24V dc Ratings

- Voltage: 24V dc (±10%)
- Inrush: 20A maximum

**2-Slot Expansion Chassis** - The 20, 30, and 40 I/O fixed hardware style units accept a 2-slot expansion chassis. The expansion chassis mounts on the right side of the processor without mounting hardware. Expansion chassis have a mounting tab at the top and bottom that accepts #10 hardware.

**NOTE:** The 1746-A2 Expansion Chassis supports only specific combinations of modules based on module current draw. For information on module compatibility in the expansion chassis, refer to the Technical Support Knowledge Base, **www.ab.com/support**, and search for document 12519.

**Catalogue Numbers**

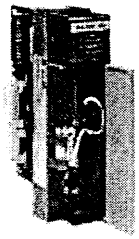
| Description | | | Line Power | Catalogue Number |
|---|---|---|---|---|
| Total I/O | Inputs | Outputs | | |
| 20 | (12) 120V ac | (8) Relay | 120/240V ac | **1747-L20A** |
| | (12) 120V ac | (8) Triac | 120/240V ac | **1747-L20B** |
| | (12) DC Sink | (8) Relay | 120/240V ac | **1747-L20C** |
| | (12) DC Sink | (8) Triac | 120/240V ac | **1747-L20D** |
| | (12) DC Sink | (8) DC Source | 120/240V ac | **1747-L20E** |
| | (12) DC Sink | (8) Relay | 24V dc | **1747-L20F** |
| | (12) DC Sink | (8) DC Source | 24V dc | **1747-L20G** |
| | (12) DC Source | (8) DC Sink | 120/240V ac | **1747-L20L** |
| | (12) DC Source | (8) DC Sink | 24V dc | **1747-L20N** |
| | (12) 240V ac | (8) Triac | 120/240V ac | **1747-L20P** |
| | (12) 240V ac | (8) Relay | 120/240V ac | **1747-L20R** |
| 30 | (18) 120V ac | (12) Relay | 120/240V ac | **1747-L30A** |
| | (18) 120V ac | (12) Triac | 120/240V ac | **1747-L30B** |
| | (18) DC Sink | (12) Relay | 120/240V ac | **1747-L30C** |
| | (18) DC Sink | (12) Triac | 120/240V ac | **1747-L30D** |
| | (18) DC Source | (12) DC Sink | 120/240V ac | **1747-L30L** |
| | (18) 240V ac | (12) Triac | 120/240V ac | **1747-L30P** |
| 40 | (24) 120V ac | (16) Relay | 120/240V ac | **1747-L40A** |
| | (24) 120V ac | (16) Triac | 120/240V ac | **1747-L40B** |
| | (24) DC Sink | (16) Relay | 120/240V ac | **1747-L40C** |
| | (24) DC Sink | (16) DC Source | 120/240V ac | **1747-L40E** |
| | (24) DC Sink | (16) Relay | 24V dc | **1747-L40F** |
| | (24) DC Source | (16) DC Sink | 120/240V ac | **1747-L40L** |
| | (24) 240V ac | (16) Triac | 120/240V ac | **1747-L40P** |
| 2-Slot Expansion Chassis (can only be used with fixed hardware style configurations) | | | | **1746-A2** |

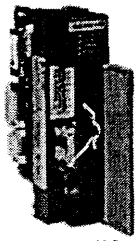
***New or changed since previous issue.**

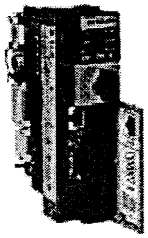
(4)

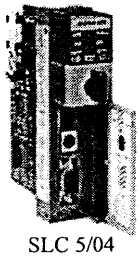
14.12

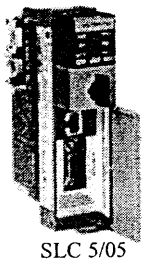
# Modular Hardware Style


SLC 5/01


SLC 5/02


SLC 5/03


SLC 5/04


SLC 5/05

**SLC 5/01** - This processor offers a basic set of 51 instructions with the choice of 1K or 4K of memory in a modular hardware configuration. Modular I/O systems that include an SLC 5/01 processor can be configured with a maximum of three chassis (30 total slots) and from 4 I/O points to a maximum of 3940 I/O points.

**SLC 5/02** - This processor offers additional complex instructions, enhanced communications, faster scan times, and extensive diagnostics that allow it to function in more complex applications. Modular I/O systems can be configured with a maximum of 3 chassis (30 total slots) and from 4 I/O points to a maximum of 4096 I/O points.

**SLC 5/03** - This processor introduces improved throughput times and provides 8K or 16K of memory. Modular I/O systems can be configured with a maximum of 3 chassis (30 total slots) and from 4 I/O points to a maximum of 4096 I/O points.

**SLC 5/04** - The standard DH-485 port has been replaced with a DH+™ port, providing high-speed SLC 5/04-to-SLC 5/04 communications and direct connection to PLC-5®s. Modular I/O systems can be configured with a maximum of 3 chassis (30 total slots) and from 4 I/O points to a maximum of 4096 I/O points. The available memory options are 16K, 32K, or 64K. Designed specifically for the Plastics Industry, the SLC 5/04P contains ERC2 algorithms for Plastics Machinery Control.

**SLC 5/05** -The SLC 5/05 processor provides the same functionality as the SLC 5/04 processor with standard Ethernet communications rather than DH+ communications. Ethernet communication takes place at 10 Mbps, providing you with a high performance network for program upload/download, online editing, and peer-to-peer messaging. Modular I/O systems can be configured with a maximum of 3 chassis (30 total slots) and from 4 I/O points to a maximum of 4096 I/O points. Designed specifically for the Plastics Industry, the SLC 5/05P contains ERC2 algorithms for Plastics Machinery Control.

**Catalogue Numbers**

| Description | Memory Size | Power Supply Loading (Amperes) | | Catalogue Number |
|---|---|---|---|---|
| | | 5V dc | 24V dc | |
| SLC 5/01 Processor | 1K | 0.350 | 0.105 | **1747-L511** |
| SLC 5/01 Processor | 4K | 0.350 | 0.105 | **1747-L514** |
| SLC 5/02 Processor | 4K | 0.350 | 0.105 | **1747-L524** |
| SLC 5/03 Processor | 8K | 0.500 | 0.175 | **1747-L531** |
| SLC 5/03 Processor | 16K | 0.500 | 0.175 | **1747-L532** |
| SLC 5/04 Processor | 16K | 1.0 | 0.200 | **1747-L541** |
| SLC 5/04 Processor | 32K | 1.0 | 0.200 | **1747-L542** |
| SLC 5/04 Processor | 64K | 1.0 | 0.200 | **1747-L543** |
| SLC 5/04P Processor | 32K | 1.0 | 0.200 | **1747-L542P** |
| SLC 5/04P Processor | 64K | 1.0 | 0.200 | **1747-L543P** |
| SLC 5/05 Processor | 16K | 1.0 | 0.200 | **1747-L551** |
| SLC 5/05 Processor | 32K | 1.0 | 0.200 | **1747-L552** |
| SLC 5/05 Processor | 64K | 1.0 | 0.200 | **1747-L553** |
| SLC 5/05P Processor | 64K | 1.0 | 0.200 | **1747-L553P** |

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***New or changed since previous issue.**

**Upgrade Kits** - Series C (OS302, OS401, DU501) upgrade kits feature eight new instructions: RIO Block Transfers (BTR, BTW); Ramp (RMP); Time Stamp (RHC, TDF); Encoding (ENC); File Bit Comparison (FBC); and Diagnostic Detect (DDT).

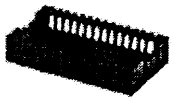
**Catalogue Numbers**

| Description | Catalogue Number |
|---|---|
| SLC 5/03 Upgrade Kit | **1747-OS302*** |
| SLC 5/04 Upgrade Kit | **1747-OS401*** |
| SLC 5/05 Flash Upgrade Kit – contains (2) diskettes and instructions for upgrading the SLC 5/05 processors | **1747-DU501*** |
| SLC 5/03 Upgrade Kit Labels | **1747-RL302*** |
| SLC 5/04 Upgrade Kit Labels | **1747-RL401*** |
| SLC 5/05 Upgrade Kit Labels | **1747-RL501*** |

## Accessories

**Memory Modules** - These optional memory modules provide non-volatile memory in convenient modular form. The modules plug into a socket on the processor.

1747-M1 EEPROM



Adapter Socket

**Adapter Sockets (1747-M5, -M15)** - Adapter sockets are required when using commercial PROM programmers to program and erase memory modules. The memory module fits into the adapter socket, and then the adapter socket fits into the zero insertion force (ZIF) socket on the PROM burner.

**Modular Card Slot Fillers** - Use these fillers in empty chassis slots to protect equipment from dust or debris.

**SLC 500 Demonstration Units** - Learn how to program with these useful demonstration and practice units.

**Catalogue Numbers**

| Description | Catalogue Number |
|---|---|
| SLC 5/01 and SLC 5/02 EEPROM Memory Module, 1K User Memory Backup | **1747-M1** |
| SLC 5/01 and SLC 5/02 EEPROM Memory Module, 4K User Memory Backup | **1747-M2** |
| SLC 5/01 and SLC 5/02 UVPROM Memory Module, 1K User Memory Backup | **1747-M3**(SP-7/01/01) |
| SLC 5/01 and SLC 5/02 UVPROM Memory Module, 4K User Memory Backup | **1747-M4**(SP-7/01/01) |
| SLC 5/01 and SLC 5/02 Adapter Socket (Five sockets per package. Order must be for five sockets or multiples of five.) | **1747-M5** |
| SLC 5/03, 5/04, and 5/05 Memory Module with 32K User Memory Backup | **1747-M11**(SP-04/01/01) |
| SLC 5/03, 5/04, and 5/05 Memory Module with 64K User Memory Backup | **1747-M12** |
| SLC 5/03, 5/04, and 5/05 Memory Module Adapter for 1747-M11 and 1747-M12 | **1747-M15** |
| Modular Card Slot Fillers (Orders must be for two or multiples of two.) | **1746-N2** |
| Modular hardware style demonstration unit with Modular Processor (Catalogue Number 1747-L524), AC I/O (Catalogue Numbers, 1746-A4, -IA8, -IA4, and -OW8) and chassis-mount power supply (Catalogue Number 1746-P1). Demo unit plugs into 120V ac grounded outlet. Includes:<br>• 6 selector switches<br>• 6 momentary contact push buttons<br>• 8 pilot lights | **1747-DEMO-3** |
| Modular hardware style demonstration unit with Modular Processor (Catalogue Number 1747-L524), DC I/O (Catalogue Numbers, 1746-A4, -IB8 (2), and -OV8) and chassis-mount power supply (Catalogue Number 1746-P1). Demo unit uses 120V or 240V AC input power. Includes:<br>• 6 selector switches<br>• 6 momentary contact push buttons<br>• 8 pilot lights | **1747-DEMO-4** |
| Modular hardware style demonstration unit with AC I/O (Catalogue Numbers, 1746-A4, -IA8, -IA4, and -OW8) and chassis-mount power supply (Catalogue Number 1746-P1). Demo unit plugs into 120V ac grounded outlet. Includes:<br>• 6 selector switches<br>• 6 momentary contact push buttons<br>**Note:** This Demonstration Unit *does not* include an HHT or a processor. The user selects their own processor.<br>• 8 pilot lights | **1747-DEMO-7** |
| Battery Jumper for SLC 5/01 Programmable Controllers (set of 4) | **1747-BAJMPR/A** |

*SP — Silver Series Product. Date shown is the last that the product may be ordered.*

1/12.6

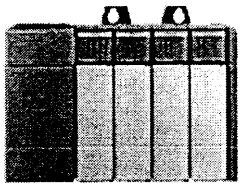
***New or changed since previous issue.**

**Program Storage Device** - The 1747-PSD is a hand-held program transfer device that provides one-program storage and retrieval for SLC 5/03, SLC 5/04, SLC 5/05 and MicroLogix 1000, 1200, and 1500 controllers. The device connects to the RS-232 port running DF1 Full-Duplex communication protocol using a 1747-CP3 cable (SLC) or 1761-CBL-PM02 (MicroLogix).

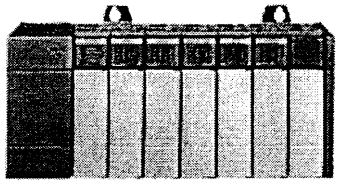
**Catalogue Number**

| Description | Catalogue Number |
|---|---|
| Program Storage Device | 1747-PSD* |

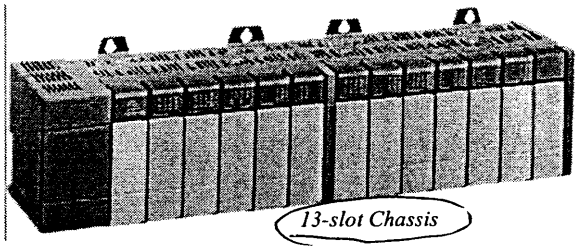
# Chassis



*4-Slot Chassis*



*7-Slot Chassis*



*13-slot Chassis*

The chassis houses the processor and the I/O modules. The power supply mounts on the left side of the chassis. Each chassis requires a separate power supply. Chassis do not include interconnect cables. If an interconnect cable is required, refer to the chassis interconnect cables in the table below.

**Catalogue Numbers**

| Description | Catalogue Number |
|---|---|
| 4-Slot Chassis | 1746-A4 |
| 7-Slot Chassis | 1746-A7 |
| 10-Slot Chassis | 1746-A10 |
| 13-Slot Chassis | 1746-A13 |
| Chassis Interconnect Cable - This ribbon cable is used when linking modular hardware style chassis up to 152.4 mm (6 in.) apart in an enclosure. | 1746-C7 |
| Chassis Interconnect Cable - This cable is used when linking modular hardware style chassis from 152.4 mm (6 in.) up to 914.4 mm (36 in.) apart in an enclosure. | 1746-C9 |
| Chassis Interconnect Cable - This cable is used when linking modular hardware style chassis from 0.914m (36 in.) up to 1.27m (50 in.) apart in an enclosure. | 1746-C16 |

# Power Supplies

**Important:** The power supply mounts on the left side of the chassis with two screws. For AC power supplies, 120/240 volt selection is made by a jumper. Place the jumper to match the input voltage. Consider future system expansion when purchasing power supplies.

**Catalogue Numbers**

| Line Voltage | Internal Current Capacity | | User Current Capacity | Maximum Inrush Current | Catalogue Number |
|---|---|---|---|---|---|
| | at 5V dc | at 24V dc | | | |
| 85-132/170-265V ac, 47/63 Hz | 2A | 0.46A | 0.2A at 24V dc | 20A | 1746-P1 |
| 85-132/170-265V ac, 47/63 Hz | 5A | 0.96A | 0.2A at 24V dc | 20A | 1746-P2 |
| 19.2 to 28.8V dc | 3.6A | 0.87A | – | 20A | 1746-P3 |
| 85 to 132/170-265V ac, 47/63 Hz | 10A(1) | 2.88A(1) | 1A at 24V dc(1) | 45A | 1746-P4 |
| 90 to 146V dc | 5A | 0.96A | 0.2A at 24V dc | 20A | 1746-P5 |
| 30 to 60V dc | 5A | 0.96A | 0.2A at 24V dc | 20A | 1746-P6 |
| 10 to 30V dc, isolated | 12V dc input: 2A<br>24V dc input: 3.6A | 12V dc input: 0.46A<br>24V dc input: 0.87A | – | 20A | 1746-P7* |
| Ambient Operating Temperature Rating: 0°C to +60°C (+32°F to +140°F)<br>(Current capacity derated by 5% above 55°C for P1, P2, P3, P5, P6 and P7; no derating for P4) | | | | | All |
| Humidity Rating: 5-95% (non-condensing) | | | | | All |
| Wiring: #14 AWG (2mm²) | | | | | All |

*(1) Total of all output power (5 volt backplane, 24 volt backplane, and 24 volt user source) must not exceed 70 W.*

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***New or changed since previous issue.**

# Discrete I/O Modules

Terminals on the 4-, 8-, 12-, and 16-point modules have self-lifting pressure plates that accept two 14 AWG ($2mm^2$) wires. LED indicators on the front of each module display the status of each I/O point.

32-point I/O modules are equipped with a 40-pin, MIL-C-83503 type header and a removable wiring connector (1746-N3). The connector can be assembled with the wire type and length of your choice.

Wiring the 16- and 32-point modules can also be done with a Catalogue 1492 Interface module and pre-wired cable. All 16-point I/O modules, Catalogue Numbers 1746-OX8, -OBP8, -OAP12, and 1746-IO12, are equipped with colour-coded removable terminal blocks.

High current solid-state output modules, Catalogue No. 1746-OBP16, -OVP16, and -OAP12, have fused commons with a blown fuse LED. The 1746-OB16E, -OB6EI, and -OB32E modules provide electronic protection from short circuit and overload conditions.

**NOTE:** For compatibility in an 1746-A2 expansion chassis, see Technical Support Knowledge Base, **www.ab.com/support**, and search for document 12519.

**Catalogue Numbers**

| DC Modules | | | | | | |
|---|---|---|---|---|---|---|
| Module Description | Voltage Category | Input/ Output | Number of I/O | Power Supply Loading (A) | | Catalogue Number |
| | | | | 5V dc | 24V dc | |
| Current Sinking DC Input Module | 24V dc | Input | 8 | 0.050 | 0 | 1746-IB8 |
| Current Sinking DC Input Module | 24V dc | Input | 16 | 0.085 | 0 | 1746-IB16 |
| Current Sinking DC Input Module | 24V dc | Input | 32 | 0.050(1) | 0 | 1746-IB32 |
| Fast Response DC Sinking Input Module | 24V dc | Input | 16 | 0.085 | 0 | 1746-ITB16 |
| Current Sourcing DC Input Module | 24V dc | Input | 8 | 0.050 | 0 | 1746-IV8 |
| Current Sourcing DC Input Module | 24V dc | Input | 16 | 0.085 | 0 | 1746-IV16 |
| Current Sourcing DC Input Module | 24V dc | Input | 32 | 0.050(1) | 0 | 1746-IV32 |
| Fast Response DC Sourcing Input Module | 24V dc | Input | 16 | 0.085 | 0 | 1746-ITV16 |
| 48V Current Sinking DC Input Module | 48V dc | Input | 16 | 0.085 | 0 | 1746-IC16 |
| Current Sourcing TTL Input Module | 5V dc/TTL | Input | 16 | 0.140 | 0 | 1746-IG16 |
| 125V Current Sinking Sinking DC Input Module | 125V dc | Input | 16 | 0.085 | 0 | 1746-IH16 |
| Current Sourcing DC Output Module | 24V dc | Output | 8 | 0.135 | 0 | 1746-OB8 |
| Current Sourcing DC Output Module | 24V dc | Output | 16 | 0.280 | 0 | 1746-OB16 |
| Current Sourcing DC Output Module | 24V dc | Output | 32 | 0.190(1) | 0 | 1746-OB32 |
| Electronically Protected Isolated Sourcing DC Output | 24V dc | Output | 6 | 0.046 | 0 | 1746-OB6EI |
| Electronically Protected Current Sourcing DC Output | 24V dc | Output | 16 | 0.135 | 0 | 1746-OB16E |
| Electronically Protected Current Sourcing DC Output | 24V dc | Output | 32 | 0.190 | 0 | 1746-OB32E |
| Current Sourcing DC Output Module | 24V dc | Output | 8 | 0.135 | 0 | 1746-OBP8 |
| High Current Sourcing DC Output Module | 24V dc | Output | 16 | 0.250 | 0 | 1746-OBP16 |
| Current Sinking TTL Output Module | 5V dc/TTL | Output | 16 | 0.180 | 0 | 1746-OG16 |
| High Current Sinking DC Output Module | 24V dc | Output | 16 | 0.250 | 0 | 1746-OVP16 |
| Current Sinking DC Output Module | 24V dc | Output | 8 | 0.135 | 0 | 1746-OV8 |
| Current Sinking DC Output Module | 24V dc | Output | 16 | 0.270 | 0 | 1746-OV16 |
| Current Sinking DC Output Module | 24V dc | Output | 32 | 0.190(1) | 0 | 1746-OV32 |

*(1) Power supply loading for series D or later modules.*

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***New or changed since previous issue.**

| AC/DC Modules | | | | | | |
|---|---|---|---|---|---|---|
| Module Description | Voltage Category | Input/ Output | Number of I/O | Power Supply Loading (A) | | Catalogue Number |
| | | | | 5V dc | 24V dc | |
| 24 VAC/VDC Input Module | 24V ac/V dc | Input | 16 | 0.085 | 0 | 1746-IN16 |
| Relay (hard contact) Output Module | ac/dc Relay | Output | 4 | 0.045 | 0.045 | 1746-OW4 |
| Relay (hard contact) Output Module | ac/dc Relay | Output | 8 | 0.085 | 0.090 | 1746-OW8 |
| Relay (hard contact) Output Module | ac/dc Relay | Output | 16 | 0.170 | 0.180 | 1746-OW16 |
| Isolated Relay Output Module | ac/dc Relay | Output | 8 | 0.085 | 0.090 | 1746-OX8 |
| Combination Input/Output Module | 120 V ac Inputs - ac/dc Relay Outputs | both | 2 in - 2 out | 0.030 | 0.025 | 1746-IO4 |
| Combination Input/Output Module | 120 V ac Inputs - ac/dc Relay Outputs | both | 4 in - 4 out | 0.060 | 0.045 | 1746-IO8 |
| Combination Input/Output Module | 120 V ac Inputs - ac/dc Relay Outputs | both | 6 in - 6 out | 0.090 | 0.070 | 1746-IO12 |
| Combination Input/Output Module | 24 V dc Inputs - ac/dc Relay Outputs | both | 6 in - 6 out | 0.080 | 0.060 | 1746-IO12DC |

| AC Modules | | | | | | |
|---|---|---|---|---|---|---|
| Module Description | Voltage Category | Input/ Output | Number of I/O | Power Supply Loading (A) | | Catalogue Number |
| | | | | 5V dc | 24V dc | |
| 120V ac Input Module | 100/120V | Input | 4 | 0.035 | 0 | 1746-IA4 |
| 120V ac Input Module | 100/120V | Input | 8 | 0.050 | 0 | 1746-IA8 |
| 120V ac Input Module | 100/120V | Input | 16 | 0.085 | 0 | 1746-IA16 |
| 240V ac Input Module | 200/240V | Input | 4 | 0.035 | 0 | 1746-IM4 |
| 240V ac Input Module | 200/240V | Input | 8 | 0.050 | 0 | 1746-IM8 |
| 240V ac Input Module | 200/240V | Input | 16 | 0.085 | 0 | 1746-IM16 |
| 120/240V ac Output Module | 120/240V | Output | 8 | 0.185 | 0 | 1746-OA8 |
| 120/240V ac Output Module | 120/240V | Output | 16 | 0.370 | 0 | 1746-OA16 |
| High Current AC Output Module | 120/240V | Output | 12 | 0.370 | 0 | 1746-OAP12 |

# Analog I/O Modules

The 1746-NI4, -NIO4I, and -NIO4V input channels are filtered to reject high frequency noise and provide 14- to 16-bit (range-dependent) resolution. The 1746-FIO4I and -FIO4V have less input filtering and can sense more rapidly changing inputs. However, their input resolution is only 12-bit. All analog output channels provide 14-bit resolution and 2.5 ms conversion rate. The 1746-NI8 provides high accuracy and fast analog signal conversion. The 1746-NI8, -NI16I and -NI16V are high density analog input modules that are software configurable.

### Catalogue Numbers

| Module Description | Points per Module | Voltage Category | Power Supply Loading (A) | | Catalogue Number |
|---|---|---|---|---|---|
| | | | 5V dc | 24V dc | |
| High Resolution Analog Input Module | 4 | -20 mA to +20 mA (or) -10V dc to +10V dc | 0.025 | 0.085 | 1746-NI4 |
| High Resolution Analog Input Module | 8 | -20 mA to +20 mA (or) -10V dc to +10V dc | 0.200 | 0.100 | 1746-NI8 |
| High Resolution Analog Input Module(1) | 16 | -20 mA to +20 mA | 0.125 | 0.075 | 1746-NI16I* |
| High Resolution Analog Input Module(1) | 16 | -10V dc to +10V dc | 0.125 | 0.075 | 1746-NI16V* |
| High Resolution Analog Combination I/O Module | 2 Inputs<br>2 Outputs | -20 mA to +20 mA (or) -10V dc to +10V dc<br>0 to 20 mA | 0.055 | 0.145 | 1746-NIO4I |
| High Resolution Analog Combination I/O Module | 2 Inputs<br>2 Outputs | -20 mA to +20 mA (or) -10V dc to +10V dc<br>-10V dc to +10V dc | 0.055 | 0.115 | 1746-NIO4V |
| Fast Analog Combination I/O Module | 2 Inputs<br>2 Outputs | 0 to 20 mA (or) 0 to 10V dc<br>0 to 20 mA | 0.055 | 0.150 | 1746-FIO4I |
| Fast Analog Combination I/O Module | 2 Inputs<br>2 Outputs | 0 to 10V dc (or) 0 to 20 mA<br>-10V dc to +10V dc | 0.055 | 0.120 | 1746-FIO4V |
| Analog Output Module | 4 | 0 to 20 mA | 0.055 | 0.195 | 1746-NO4I |
| Analog Output Module | 4 | -10V dc to +10V dc | 0.055 | 0.145 | 1746-NO4V |

*(1) Single-ended connections only.*

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***New or changed since previous issue.**

# Specialty Modules

**SLC 500 Thermocouple/mV Modules** - All modules interface to thermocouple types J, K, T, E, R, S, B, and N, and also accept millivolt signals that standard analog modules are not able to detect. The 1746-INT4 also interfaces with thermocouple types C and D. **NOTE:** Block transfers are required in a remote I/O configuration, using a 1747-ASB with a PLC.

**Barrel Temperature Module** - The module provides four zones of Autotuned PID heat/cool temperature control, and can accept either J or K type thermocouples. It is compatible with SLC 5/02 and higher processors.

**Catalogue Numbers**

| Module Description | Power Supply Loading (Amperes) | | Catalogue Number |
|---|---|---|---|
| | 5V dc | 24V dc | |
| Thermocouple/mV Module | 0.060 | 0.040 | 1746-NT4 |
| Thermocouple/mV Module | 0.120 | 0.070 | 1746-NT8 |
| Isolated Thermocouple/mV Module | 0.110 | 0.085 | 1746-INT4 |
| Barrel Temperature Module | 0.110 | 0.085 | 1746-BTM |

**RTD Input Modules** - The RTD modules interface with platinum, nickel, copper, and nickel-iron RTDs, and with variable resistance devices such as potentioneters (0 to 3000Ω maximum). The module provides on-board RTD temperature scaling in degrees Celsius and degrees Fahrenheit or resistance scaling in ohms. **NOTE:** Block transfers are required in a remote I/O configuration, using a 1747-ASB with a PLC.

**High Speed Counter Modules** - The 1746-HSCE module offers a single bi-directional counting channel, which supports quadrature, pulse/direction, or up/down counter input. The 1746-HSCE2 Multi-Channel High Speed Counter provides two sets of ±A, ±B, and ±Z input channels, allowing up to two quadrature, differential line driver, or incremental encoders to be monitored. A and B input channels can also be configured to count single-ended pulse inputs from up to four input devices. **NOTE:** The 1747-ASB module is not compatible with the 1746-HSCE module.

**Catalogue Numbers**

| Module Description | Power Supply Loading (Amperes) | | Catalogue Number |
|---|---|---|---|
| | 5V dc | 24V dc | |
| RTD/Resistance Input Module | 0.050 | 0.050 | 1746-NR4 |
| RTD/Resistance Input Module | 0.100 | 0.055 | 1746-NR8* |
| High-Speed Counter Encoder Module | 0.320 | 0 | 1746-HSCE |
| Multi-Channel High-Speed Counter Encoder Module | 0.250 | 0 | 1746-HSCE2 |

**Open-Loop Velocity Control Module** - This module povides an ideal control strategy for simple hydraulic applications. It can accelerate and decelerat the hydraulic ram, using as many as seven extend and seven retract segments. I/O update is two milliseconds.

**Synchronized Axes Module** - The module offers four axes of closed-loop servo positioning control, using internal logic to synchronize multiple axes. I/O update is two milliseconds. We recommend that you purchase the 1492-AIFMQS interface module and the 1492-ACABLExxQ pre-wired cable for use witht he 1746-QS module.

**Blow Molding Module** - The module features four independent axes of PID control plus one discrete I/O pair per channel for channel synchronization for comparison wall thickness control in blow molding machines. The 1746-BLM provides 256 points of resolution for each parison channel with interpolation, and has loop update times of 100 microseconds.

**Catalogue Numbers**

| Module Description | Points per Module | Voltage Category | Power Supply Loading (Amperes) | | Catalogue Number |
|---|---|---|---|---|---|
| Open-Loop Velocity Control Module | 1 Input<br>1 Output | Temposonics II(DPM & RPM) (or) Balluff (BTL-2-L2 & -M2)<br>-10V dc to +10V dc | 0.215 | 0 | 1746-QV |
| Synchronized Axes Module | 4 Input<br>4 Output | Input - LDT with RPM or DPM<br>Output: -10V dc to +10V dc | 1.0 | 0.200 | 1746-QS |
| Blow Molding Module | 4 Analog Inputs<br>4 Analog Outputs<br>4 Discrete Inputs<br>4 Discrete Outputs | Analog I/O: -10V to + 10V<br>Discrete I/O: 0 to +24V | 1.0 | 0 | 1746-BLM |

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*New or changed since previous issue.

**BASIC Modules** - The Basic modules add data collection and report generation capability to any SLC system. Two configurable channels enable you to connect to printers, operator interface terminals, modems, and other foreign devices. The module programs in the BASIC language using an ASCII terminal. Optional memory modules available for the processor can be used in the 1746-BAS module (Catalogue numbers 1747-M1, -M2, -M3, and -M4). The 1746-BAS-T module uses the 1771-DBMEM1 and -DBMEM2 memory modules.

**BASIC Development Software** - An optional software package, BASIC Development Software, provides a structured and efficient means to create and debug BASIC programs. It uses the personal computer to facilitate editing, compiling, uploading, and downloading of BASIC programs.

**Catalogue Numbers**

| Description | Power Supply Loading (Amperes) | | Comments | Catalogue Number |
|---|---|---|---|---|
| | 5V dc | 24V dc | | |
| BASIC Module | 0.150 | 0.040 (see comments) | If the BASIC Module DH-485 channel is connected to a Catalogue Number **1747-AIC** Link Coupler, add 0.085A to the BASIC module's power supply loading value at 24V dc. | **1746-BAS** |
| BASIC-T Module | 0.150 | 0.040 (see comments) | If the BASIC Module is connected to any device (HHT, DTAM, PIC) either directly or through a 1747-AIC Link Coupler, add the appropriate current loading for the device to the BASIC module's power supply loading value at 24V dc. | **1746-BAS-T*** |
| BASIC Development Software | Not Applicable | | The BASIC module can be programmed with this software and an MS-DOS personal computer. The personal computer requires 640K bytes of RAM, a fixed disk drive with 2M bytes of free disk space, and DOS version 3.1 or later | **1747-PBASE** |

**Support Continuation Information -**

| Software Catalogue Number | Support Continuation Description | Support Program Catalogue Number(1) |
|---|---|---|
| **1747-PBASE** | one year support renewal | **1747-PBASES** |
| **1747-PBASE** | one year support reinstatement (out of warranty purchase) | **1747-PBASER** |

*(1) Not subject to discount schedule. Consult your local Rockwell Automation sales office for more information.*

## Communication Devices

**1761-NET-AIC Advanced Interface Converter (AIC+)** - This device is an isolated RS-232 to RS-485 converter. It allows two RS-232 devices
(SLC 5/03, SLC 5/04, SLC 5/05; MicroLogix 1000, 1200, and 1500; DTAM Micro; PanelView 500 and 900) to connect to the DH-485 network.

**1747-AIC Isolated Link Coupler** - The panel-mountable isolated link coupler is used to connect SLC 500 fixed, SLC 5/01, SLC 5/02, and SLC 5/03 processors to a DH-485 network. Where there are two or more SLC 500 processors (fixed or modular) on the link, one isolated link coupler is required for each processor. When another device (DTAM, HHT, or personal computer) is connected to an SLC 500 processor at a distance greater than 6.09 m (20 ft), an isolated link coupler must be connected at each end of the link. A 1747-C11 cable is included with the coupler for connection to the processor.
**Important:** The 1747-PIC does not have a driver that is Windows 2000 compliant. The existing driver is for use with Windows 98 and NT operating systems.

**1747-PIC Personal Interface Converter** - This device is an RS-232 to DH-485 converter. It is typically used with an SLC 500 fixed, SLC 5/01,
SLC 5/02, or SLC 5/03 processor to interface to a personal computer. A 1747-C10 cable is included with this product.
**Important:** The 1747-PIC does not have a driver that is Windows 2000 compliant. The existing driver is for use with Windows 98 and NT operating systems.

**1747-KE DH-485/RS-232C Interface Module** - This module is a communication interface that acts as a bridge between DH-485 networks and RS-232C devices using DF1 protocol. It enables you to access your SLC 500 through an RS-232C link.

**Specialty Module to AIC Cable** - When using a BASIC or KE module, you may use a 1747-C13 Specialty Module to Isolated Link Coupler Cable to connect these modules to an isolated link coupler.

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*New or changed since previous issue.

**Catalogue Numbers**

| Module Description[1] | Power Supply Loading (Amperes) | | Catalogue Number |
|---|---|---|---|
| | 5V dc | 24V dc | |
| Advanced Interface Converter (AIC+) | 0 | 0.120 | **1761-NET-AIC** |
| Isolated Link Coupler - includes a 1747-C11 cable | 0 | 0.085 | **1747-AIC** |
| Personal Interface Converter - includes a 1747-C10 cable | 0 | 0.060 [2] | **1747-PIC** |
| DH-485/RS-232C Interface Module | 0.150 | 0.040 [3] | **1747-KE** |

*(1) A listing of communication cables that can be purchased separately for use with any of the above modules is provided in the table on page 12.*

*(2) The 24V dc loading values of the PIC are included in the 24V dc loading value of the processor.*

*(3) If the KE module's DH-485 channel is connected to a 1747-AIC Link Coupler, add 0.085A to the KE module's power supply loading. If the KE module is connected to any device (HHT, DTAM, PIC) either directly or through a 1747-AIC Link Coupler, add that device's current loading to the KE module's power supply loading value at 24V dc.*

**1747-PCI Interface-** This interface is a PCI Bus Card that provides high-speed local I/O by linking a personal computer based (PC-based) controller to the 1746 I/O chassis over the standard PCI bus used in personal computers. Using any soft programmable controller, including SoftLogix™ 5 (release 1.1 or later) software, the PCI Interface supports as many as three local 1746 chassis (30 I/O modules maximum). PCI Interface components are sold separately or in bundled packages.

**1747-PCI_ _** is a bundled Catalogue number that includes the following items:

- a PCI bus card with choice of memory (1747-PCIA_ or 1747-PCIB_),
- an interconnect cable with choice of length (1747-PCI_A or 1747-PCI_B), and
- a chassis interface module

**Component Catalogue Numbers**

| Description | Catalogue Number |
|---|---|
| 256K Static Memory PCI Bus Card | **1747-PCIS** |
| 1MB Static Memory PCI Bus Card | **1747-PCIS2** |
| 3-meter Interconnect Cable | **1747-PCIC** |
| 10-meter Interconnect Cable | **1747-PCIC2** |
| Chassis Interface Module | **1747-PCIL** |
| API Software for MS-DOS® | **1747-PCIDOS** |
| API Software for Windows NT™ | **1747-PCINT** |

**Bundled Package Catalogue Numbers**

| Description | Catalogue Number |
|---|---|
| 256K Static Memory PCI Bus Card, 3-meter Interconnect Cable, and Chassis Interface Module | **1747-PCIAA** |
| 256K Static Memory PCI Bus Card, 10-meter Interconnect Cable, and Chassis Interface Module | **1747-PCIAB** |
| 1MB Static Memory PCI Bus Card, 3-meter Interconnect Cable, and Chassis Interface Module | **1747-PCIBA** |
| 1MB Static Memory PCI Bus Card, 10-meter Interconnect Cable, and Chassis Interface Module | **1747-PCIBB** |

**Communication Cables** - Additional cable selection information can be found in the on page 18.

**Catalogue Numbers**

| Description | Catalogue Number |
|---|---|
| SLC 5/03, 5/04, and 5/05 Communication Cable - This 45 cm (17.7 in.) cable has two 9-pin DTE connectors and is used to connect the SLC 5/03, 5/04, or 5/05 processor RS-232 channel (channel 0) to port 1 of the 1761-NET-AIC. | **1761-CBL-AC0 0** |
| SLC 5/03, 5/04, and 5/05 Communication Cable - This 45 cm (17.7 in.) cable has a 9-pin DTE and an 8-pin mini DIN connector and is used to connect the SLC 5/03, 5/04, or 5/05 processor RS-232 channel (channel 0) to port 2 of the 1761-NET-AIC. | **1761-CBL-AP0 0** |
| SLC 5/03, 5/04, and 5/05 Communication Cable - This 2m (6.5 ft.) cable has a 9-pin DTE and an 8-pin mini DIN connector and is used to connect the SLC 5/03, 5/04, or SLC 5/05 processor RS-232 channel (channel 0) to port 2 of the 1761-NET-AIC. | **1761-CBL-PM0 2** |
| RJ45 to 6-Pin Phoenix Connector Communication Cable - This 3 m (9.8 ft) cable is used to connect the SLC 500 fixed, SLC 5/01, SLC 5/02, and SLC 5/03 processor RJ45 port to port 3 of the 1761-NET-AIC. | **1761-CBL-AS03** |
| RJ45 to 6-Pin Phoenix Connector Communication Cable - This 9.5 m (31.2 ft) cable is used to connect the SLC 500 fixed, SLC 5/01, SLC 5/02, and SLC 5/03 processor RJ45 port to port 3 of the 1761-NET-AIC. | **1761-CBL-AS09** |

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***New or changed since previous issue.**

| Description | Catalogue Number |
|---|---|
| SLC 5/03, 5/04, and 5/05 RS-232 Programmer Cable - This 3.96 m (12 ft) cable has two 9-pin DTE connectors and is used to connect the SLC processor RS-232 channel (channel 0) to a personal computer serial port. | 1747-CP3 |
| Ferrite Collar -The ferrite collar is intended for use with an RS-232 cable connected to a 1747-L541, -L542, -L542P, or -L543 processor. | 1747-FC |

## ControlNet Devices

**ControlNet Scanner** - The 1747-SCNR provides scheduled ControlNet network connections for SLC 5/02, 5/03, 5/04, and 5/05 processors. With scheduled messaging, the SLC processor can control I/O events in real time on the ControlNet network.

**ControlNet Adapters** - The 1747-ACN15 and -ACNR15 enable up to three 1746 chassis of I/O modules to produce/consume scheduled I/O on the ControlNet network. Both adapters are compatible with all 1746 discrete, analog, and specialty I/O, except those requiring G-file configuration.

**ControlNet Messaging Module** - The 1747-KFC15 modules provides the capability for an SLC 5/03, 5/04, and 5/05 processor to send or receive unscheduled ControlNet messages. With unscheduled messaging, the SLC controller program can send peer-to-peer messages or be accessed and edited over the ControlNet network using RSLogix 500.

**Catalogue Numbers**

| Module Description | Power Supply Loading (Amperes) | | Catalogue Number |
|---|---|---|---|
| | 5V dc | 24V dc | |
| ControlNet Scanner | 0.900 | – | 1747-SCNR |
| ControlNet Adapter | 0.900 | – | 1747-ACN15 |
| ControlNet Adapter | 0.900 | – | 1747-ACNR15 |
| ControlNet Messaging Module | 0.640 | – | 1747-KFC15 |

## Remote I/O (RIO) Devices

**Remote I/O Scanner** - The 1747-SN module provides communication between an SLC 5/02 or higher processor and an Allen-Bradley or Encompass-certified RIO-compatible operator interface device or control devices via the RIO Link. The module supports up to four logical chassis of I/O data on the RIO Link.

**Backup Scanner** - The 1747-BSN module contains the full complement of RIO scanner features, plus backup capability for support of redundant processor applications. The backup system consists of one or more pairs of complementary modules, with one module residing in the primary system and the other in the backup system. The primary system controls the operation of remote I/O, while the backup system monitors communications via the high-speed serial link and is available to take control in the event of a fault in the primary system.

**Direct Communications Module** - This module is used to transfer data between an SLC 500 programmable controller and a supervisory Allen-Bradley programmable controller located on the RIO Link.

**Remote I/O Adapter Module** - This ASB module provides a communication link between SLC or PLC scanners and a wide variety of 1746 I/O modules over the RIO Link. The module maps the image of the I/O modules in its remote chassis directly to the SLC or PLC image table. Both discrete and block transfer image mapping are supported.

**Catalogue Numbers**

| Module Description | Power Supply Loading (Amperes) | | Catalogue Number |
|---|---|---|---|
| | 5V dc | 24V dc | |
| Remote I/O Scanner | 0.600 | – | 1747-SN |
| Backup Scanner | 0.800 | – | 1747-BSN |
| Direct Communications Module | 0.360 | – | 1747-DCM |
| Remote I/O Adapter Module | 0.375 | – | 1747-ASB |

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*New or changed since previous issue.

# DeviceNet Device

**DeviceNet Scanner** - This scanner module enables communication between and SLC 5/02 or higher processor with a maximum of 63 DeviceNet-compatible I/O devices. The scanner is the DeviceNet master, supporting up to 150 words of input data and 150 words of output data transfer between DeviceNet slave devices using the strobe and poll message mode. The scanner supports all standard DeviceNet communication rates (125K, 250K, and 500K bit/s). The SLC system supports multiple scanners in a single-processor chassis.

**DeviceNet Interface** - The DNI is a "smart" DeviceNet-to-DF1 interface, allowing connection of DF1-compatible devices to a DeviceNet network where the DNI functions as a DeviceNet slave. In addition, the DNI enables the setup of a peer-to-peer communications network on DeviceNet with other devices using DNIs, similar to a DH-485 or DH+ network.

**DeviceNet Catalogue Numbers**

| Module Description | Power Supply Loading (Amperes) | | Catalogue Number |
|---|---|---|---|
| | 5V dc | 24V dc | |
| DeviceNet Scanner | 0.5 | – | **1747-SDN** |
| DeviceNet Interface (DNI) | not applicable | | **1761-NET-DNI** |

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***New or changed since previous issue.**

# Programming Options

**RSLogix 500 Starter Programming Software -** The RSLogix 500 Starter programming software offers the basic functionality of the full-featured version with many of the advanced features and communications adapters disabled. The starter only supports the 1747-PIC and DF1 full-duplex communication drivers. RSLogix 500 Starter is an effective solution for cost conscious or entry-level users. RSLogix 500 Starter may only be used with Windows 95®, Windows 98®, Windows 2000 or Windows NT™ (4.0)

**RSLogix 500 Programming Software -** The RSLogix 500 programming software is used to create, modify, and monitor application programs used by both the SLC 500 and MicroLogix Programmable Controller families. RSLogix 500 may only be used with Windows 95®, Windows 98®, Windows 2000 or Windows NT™ (4.0).

**SLC 500 A.I. Series Programming Software -** The SLC 500 A.I. Series programming software can be used with any 386DX personal computer or higher. The A.I. series DOS-based software brings a common look and feel to programming for Allen-Bradley MicroLogix™ 1000, SLC 500, PLC-2 PLC-3®, PLC-5, and PLC-5/250™ processors. With its menu-driven interface and function key programming, this software is an excellent tool for programming and troubleshooting your application.

**RSPocketLogix** - RSPocketLogix is a Microsoft® Windows CE®-based software that, when running on a hand-held Personal Computer (HPC), delivers a compact, portable, easy-to-use tool for factory floor maintenance and troubleshooting. Designed for Allen-Bradley SLC 500 and MicroLogix programmable controllers, it uses open CE technologies and a familiar look and feel to give users a flexible, robust program, easily tailored to specific control applications. Catalogue Number 9501-RL0H150ENF includes a Jornada 680e, cables, and the RSPocketLogix software (pre-installed).

**Advanced Programming Software -** The SLC 500 APS software can be used with an MS-DOS personal computer. Your computer must have:

- 640K bytes of RAM (minimum 2M bytes of extended memory required)
- 10M bytes fixed-disk drive (3.5M bytes of free hard-disk space)
- DOS version 3.3 or higher

**Important:** APS cannot be used with SLC 5/03 (Catalogue number 1747-L531) or SLC 5/05 (Catalogue numbers 1747-L551, L552, and L553). APS will not be able to program the new instructions available in OS302 Series C, and OS401 Series C operating systems.

**Catalogue Numbers**

| Description | Catalogue Number |
|---|---|
| Personal Interface Converter (driver is not Windows 2000-compliant) | **1747-PIC** |
| Advanced Interface Converter (driver is not Windows 2000-compliant) | **1761-NET-AIC** |
| Advanced Programming Software (v 6.0) - English (1) | **9323-PA2E** |
| SLC 500 PID Logistics - Requires 9323-S5300D. Auto-tune SLC 500 PID Ladder Logic Instruction. | **9323-S5250D** |
| RSTune – PID Loop Tuner | **9323-1003D** |
| RSTune/WINtelligent Linx | **9323-TL1303D** |
| RSTune/RSLinx | **9323-TRSL1303D** |
| SLC 500 A.I. Series Programming Software - Allows you to program SLC 500 and MicroLogix 1000 Programmable Controllers. Includes RSLinx Lite (2) (3) | **9323-S5300D** |
| RSLogix 500 Starter Programming Software (CD-ROM) – GERMAN (2) (3) (4) | **9324-RL0100DEE** |
| RSLogix 500 Starter Programming Software (CD-ROM) – ENGLISH (2) (3) (4) | **9324-RL0100ENE** |
| RSLogix 500 Starter Programming Software (CD-ROM) – SPANISH (2) (3) (4) | **9324-RL0100ESE** |
| RSLogix 500 Starter Programming Software (CD-ROM) – FRENCH (2) (3) (4) | **9324-RL0100FRE** |
| RSLogix 500 Starter Programming Software (CD-ROM) – ITALIAN (2) (3) (4) | **9324-RL0100ITE** |
| RSLogix 500 Starter Programming Software (CD-ROM) – PORTUGUESE (2) (3) (4) | **9324-RL0100PTE** |
| RSLogix 500 Programming Software (CD-ROM) – GERMAN - Includes RSLinx Lite. (2) (3) | **9324-RL0300DEE** |
| RSLogix 500 Programming Software (CD-ROM) – ENGLISH - Includes RSLinx Lite. (2) (3) | **9324-RL0300ENE** |
| RSLogix 500 Programming Software (CD-ROM) – SPANISH - Includes RSLinx Lite. (2) (3) | **9324-RL0300ESE** |
| RSLogix 500 Programming Software (CD-ROM) – FRENCH - Includes RSLinx Lite. (2) (3) | **9324-RL0300FRE** |
| RSLogix 500 Programming Software (CD-ROM) – ITALIAN - Includes RSLinx Lite. (2) (3) | **9324-RL0300ITE** |
| RSLogix 500 Programming Software (CD-ROM) – PORTUGUESE - Includes RSLinx Lite. (2) (3) | **9324-RL0300PTE** |
| RSLogix Emulate 500 | **9310-WE0200D** |

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***New or changed since previous issue.**

| Description | Catalogue Number |
|---|---|
| SLC 500 Ladder Emulation Module - Requires SLC 500 A.I. Series programming software. | 9343-S5200D |
| RSPocketLogix (includes a Jornada 680e, cables and pre-installed RSPocketLogix software) | 9501-RL0H150ENF* |
| Personal Interface Converter | 1747-PIC |
| Advanced Interface Converter | 1761-NET-AIC |

*(1) When using APS to program SLC 500 Processors, you must provide a means to communicate between the PC and the processor. For SLC 500 Fixed Controllers, SLC 5/01, SLC 5/02, and SLC 5/03 processors, use one of the Interface Converters listed above (see page 16 for more details). For SLC 5/04 processors, purchase the Controller-to-Personal Computer Cable (1747-CP3).*

*(2) When using RSLogix 500 or SLC 500 A.I. Series software to program SLC 500 Processors, you must provide a means to communicate between the PC and the processor. For SLC 500 Fixed Controllers, SLC 5/01, SLC 5/02, and SLC 5/03 processors, use one of the Interface Converters listed above (see page 11 for more details). For SLC 5/04 and SLC 5/05 processors, purchase the Controller-to-Personal Computer Cable (1747-CP3).*

*(3) When using RSLogix 500 or SLC 500 A.I. Series software to program MicroLogix Controllers, you must purchase the Controller-to-Personal Computer Cable (1761-CBL-PM02).*

*(4) Includes communications drivers for 1747-PIC and full-duplex DF1 (MicroLogix and SLC 500 CH0) only. 1747-PIC driver is not Windows 2000-compliant.*

**RSLogix and A.I. Series Support -** Rockwell Software provides a full one-year limited warranty for RSLogix 500 and SLC 500 A.I. Series programming software products. Additional one-year terms of support can be purchased as shown below.

**Ordering Procedures -** Orders for support continuation agreements must be accompanied by customer's name, address, software serial number and version number (or a copy of the customer's registration card). Orders should be sent to the local Allen-Bradley sales office or authorized distributor.

**Support Continuation Information -**

| Software Catalogue Number | Support Continuation Description | Support Program Catalogue Number |
|---|---|---|
| 9323-1003D | one year support renewal | **9323-1003ENS** |
| 9323-1003D | one year support reinstatement (out of warranty purchase) | **9323-1003ENR** |
| 9323-PA2E (English) | Advanced Programming Software with one year support renewal | **9323-PA2ES** |
| 9323-PA2E (English) | one year support reinstatement (out of warranty purchase) | **9323-PA2ER** |
| 9323-S5250D | one year support renewal | **9323-S5250S** |
| 9323-S5250D | one year support reinstatement (out of warranty purchase) | **9323-S5250R** |
| 9323-S5300D | one year support renewal | **9323-S5300S** |
| 9323-S5300D | one year support reinstatement (out of warranty purchase) | **9323-S5300R** |
| 9343-S5200D | one year support renewal | **9343-S5200S** |
| 9343-S5200D | one year support reinstatement (out of warranty purchase) | **9343-S5200R** |
| 9324-RL0100DEE | one year support renewal | **9324-RL0100DES** |
| 9324-RL0100DEE | one year support reinstatement (out of warranty purchase) | **9324-RL0100DER** |
| 9324-RL0100ENE | one year support renewal | **9324-RL0100ENS** |
| 9324-RL0100ENE | one year support reinstatement (out of warranty purchase) | **9324-RL0100ENR** |
| 9324-RL0100ESE | one year support renewal | **9324-RL0100ESS** |
| 9324-RL0100ESE | one year support reinstatement (out of warranty purchase) | **9324-RL0100ESR** |
| 9324-RL0100FRE | one year support renewal | **9324-RL0100FRS** |
| 9324-RL0100FRE | one year support reinstatement (out of warranty purchase) | **9324-RL0100FRR** |
| 9324-RL0100ITE | one year support renewal | **9324-RL0100ITS** |
| 9324-RL0100ITE | one year support reinstatement (out of warranty purchase) | **9324-RL0100ITR** |
| 9324-RL0100PTE | one year support renewal | **9324-RL0100PTS** |
| 9324-RL0100PTE | one year support reinstatement (out of warranty purchase) | **9324-RL0100PTR** |
| 9324-RL0300DEE | one year support renewal | **9324-RL0300DES** |
| 9324-RL0300DEE | one year support reinstatement (out of warranty purchase) | **9324-RL0300DER** |
| 9324-RL0300ENE | one year support renewal | **9324-RL0300ENS** |

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***New or changed since previous issue.**

| Software Catalogue Number | Support Continuation Description | Support Program Catalogue Number |
|---|---|---|
| 9324-RL0300ENE | one year support reinstatement (out of warranty purchase) | **9324-RL0300ENR** |
| 9324-RL0300ESE | one year support renewal | **9324-RL0300ESS** |
| 9324-RL0300ESE | one year support reinstatement (out of warranty purchase) | **9324-RL0300ESR** |
| 9324-RL0300FRE | one year support renewal | **9324-RL0300FRS** |
| 9324-RL0300FRE | one year support reinstatement (out of warranty purchase) | **9324-RL0300FRR** |
| 9324-RL0300ITE | one year support renewal | **9324-RL0300ITS** |
| 9324-RL0300ITE | one year support reinstatement (out of warranty purchase) | **9324-RL0300ITR** |
| 9324-RL0300PTE | one year support renewal | **9324-RL0300PTS** |
| 9324-RL0300PTE | one year support reinstatement (out of warranty purchase) | **9324-RL0300PTR** |
| 9310-WE0200D | one year support renewal | **9310-WE0200S** |
| 9310-WE0200D | one year support reinstatement (out of warranty purchase) | **9310-WE0200R** |

**Hand-Held Programming Terminal (HHT) -** The HHT can be used to easily enter, edit, and monitor a user program. The HHT can be connected to an SLC 5/01 or SLC 5/02 anywhere over the DH-485 Network (1219m / 4000 ft maximum), or used as a stand-alone programming device. An optional battery is recommended to provide back-up for the HHT RAM memory. A Memory Pak must be ordered with each HHT.

**HHT Specifications -**

| Description | Specification |
|---|---|
| Power Supply Loading | 0.105A at 24V dc (1) |
| Communications | DH-485 |
| Approximate Dimensions | Height = 201.3 mm (7.925 in.),Width = 193.04 mm (7.6 in.), Depth = 50.8 mm (2 in.) |
| | Dimensions are not intended to be used for manufacturing purposes. |
| **Important:** The HHT cannot be used with SLC 5/03 and higher processors. | |

*(1) The 24V dc loading values of the HHT, PIC, and DTAM are included in the 24V dc loading value of the processor.*

**Catalogue Numbers**

| Description | Catalogue Number |
|---|---|
| Hand-Held Terminal includes 1747-C10 cable. (No battery or Memory Pak included.) | **1747-PT1** |
| Wall Mount Power Supply (120V ac input) unregulated (for stand-alone offline programming). | **1747-NP1** |
| Memory Pak, English version (v 2.03) includes Hand-Held Terminal Overlay. | **1747-PTA1E(1)** |
| Memory Pak, French version (v 2.03) includes Hand-Held Terminal Overlay. | **1747-PTA1F(1)** |
| Memory Pak, German version (v 1.1) includes Hand-Held Terminal Overlay. | **1747-PTA1G(1)** |
| Memory Pak, Italian version (v 1.1) includes Hand-Held Terminal Overlay. | **1747-PTA1I(1)** |
| Global Desk Top Power Supply (85/265V ac input) unregulated (for stand-alone offline programming). | **1747-NP2** |
| Carrying case for Hand-Held Programmer. | **1747-PT1CC** |
| Battery (for RAM memory retention). | **1747-BA** |
| HHT Keypad Replacement Overlay | – |
| English Memory Pak Firmware Releases 1.02, 1.07 and 1.10 | **1747-R20** |
| French Memory Pak Firmware Releases 1.10 | **1747-R20F** |
| German Memory Pak Firmware Releases 1.10 | **1747-R20G** |
| Italian Memory Pak Firmware Releases 1.10 | **1747-R20I** |
| English Memory Pak Firmware Releases 2.00 and Later | **1747-R21** |
| French Memory Pak Firmware Releases 2.00 and Later | **1747-R21F** |

*(1) Consult your local Rockwell Automation sales office for price and delivery on an upgrade, if you have a Memory Pak version earlier than those listed.*

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# Replacement Parts

## Replacement Cables and Connectors

### Catalogue Numbers -

| Description | Catalogue Number |
|---|---|
| Chassis Interconnect Cable - The 1746-C7 is a 152.4 mm (6 in.) ribbon cable used when linking modular hardware style chassis up to 152.4 mm (6 in.) apart in an enclosure. | 1746-C7 |
| Chassis Interconnect Cable - The 1746-C9 is a 914.4 mm (36 in.) cable used when linking modular hardware style chassis from 152.4 mm (6 in.) up to 914.4 mm (36 in.) apart in an enclosure. | 1746-C9 |
| Chassis Interconnect Cable - The 1746-C16 is a 1.27m (50 in.) cable used when linking modular hardware style chassis from 0.914m (36 in.) up to 1.27m (50 in.) apart in an enclosure. This is the longest chassis interconnect cable recommended by Allen-Bradley. | 1746-C16 |
| 32 Point Mating Connector - This connector is used for terminating a user-made cable. It is compatible with the Catalogue Number 1492-IFM40x, DIN RAIL mountable terminal block interface module (used with 32-point I/O modules). | 1746-N3 |
| Replacement Processor to Peripheral Programming/Communication Cable - This 1.8 m (6 ft) cable is used to connect the interface converter to the SLC 500 controller when using personal computer interface software. This cable is also used to connect the Hand-Held Terminal to the SLC 500 controller and to connect the Data Table Access Module to the SLC 500 controller. | 1747-C10 |
| Replacement Processor to Isolated Link Coupler Cable - This 304.8 mm (12 in.) cable is used to connect the SLC 500 controller to the isolated link coupler. | 1747-C11 |
| Communication Module to Isolated Link Coupler Cable - This 914.4 mm (36 in.) cable is used to connect communication modules (i.e. 1746-BAS and 1747-KE) to the isolated link coupler. The isolated link coupler must be powered by an external power supply or connected to a device with a Catalogue Number 1747-C10 or 1747-C11 cable. | 1747-C13 |
| Replacement Processor to Peripheral Programming/Communication Cable - This 6.096 m (20 ft) cable is used to connect the interface converter to the SLC 500 controller when using personal computer interface software. This cable is also used to connect the Hand-Held Terminal to the SLC 500 controller and to connect the Data Table Access Module to the SLC 500 controller. | 1747-C20 |
| SLC 5/03, 5/04, and 5/05 RS-232 Programmer Cable - This 3.96 m (12 ft) cable has two 9-pin DTE connectors and is used to connect the SLC processor RS-232 channel (channel 0) to a personal computer serial port. | 1747-CP3 |
| SLC 5/03, 5/04, and 5/05 Communication Cable - This 45 cm (17.7 in.) cable has two 9-pin DTE connectors and is used to connect the SLC processor RS-232 channel (channel 0) to port 1 of the 1761-NET-AIC Advanced Interface Converter. | 1761-CBL-AC00 |
| SLC 5/03, 5/04, and 5/05 Communication Cable - This 2 m (6.5 in.) cable has a 9-pin DTE and an 8-pin mini DIN connector and is used to connect the SLC processor RS-232 channel (channel 0) to port 2 of the 1761-NET-AIC Advanced Interface Converter. | 1761-CBL-PM02 |
| SLC 5/03, 5/04, and 5/05 Communication Cable - This 45 cm (17.7 in.) cable has a 9-pin DTE and an 8-pin mini DIN connector and is used to connect the SLC processor RS-232 channel (channel 0) to port 2 of the 1761-NET-AIC Advanced Interface Converter. | 1761-CBL-AP00 |
| RJ45 to 6-Pin Phoenix Connector Communication Cable - This 3 m (9.8 ft) cable is used to connect the SLC 500 fixed, SLC 5/01, SLC 5/02, and SLC 5/03 processor RJ45 port to port 3 of the 1761-NET-AIC Advanced Interface Converter. | 1761-CBL-AS03 |
| RJ45 to 6-Pin Phoenix Connector Communication Cable - This 9.5 m (31.2 ft) cable is used to connect the SLC 500 fixed, SLC 5/01, SLC 5/02, and SLC 5/03 processor RJ45 port to port 3 of the 1761-NET-AIC Advanced Interface Converter. | 1761-CBL-AS09 |
| Catalogue 1492 Pre-wired Interface Cables (See publication 1492-2.15 for more information.) | |

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*New or changed since previous issue.

### Cable Connectivity Summary -

| For Connectivity Between These Devices | | Preferred Cable Catalogue Number | These Cables May Be Used |
|---|---|---|---|
| 1746-A4, -A7, -A10, or -A13 Chassis | 1746-A4, -A7, -A10, or -A13 Chassis | **1746-C7**<br>**1746-C9**<br>**1746-C16** | – |
| 1747-PIC Personal Interface Converter<br>1747-PT1 Hand-Held Programming Terminal<br>1747-DTAM-E Data Table Access Module<br>2707-Lxxx, -Vxxx DTAM Plus | 1747-AIC Isolated Link Coupler<br>SLC 500 Processors (DH-485 Channel) | **1747-C10** | 1747-C11<br>1747-C20 |
| 1747-AIC Isolated Link Coupler | SLC 500 Processors (DH-485 Channel) | **1747-C11** | 1747-C10<br>1747-C13<br>1747-C20 |
| 1747-KE DH-485/RS-232C Interface Module<br>1746-BAS BASIC Module | 1747-AIC Isolated Link Coupler | **1747-C13** | 1747-C11<br>1747-C10 |
| 1746-xx32 32 Point I/O Modules | 1492-IFM40x | **1492-CABLExH** | – |
| SLC 5/03 Processor (RS-232 Channel 0)<br>SLC 5/04 Processor (RS-232 Channel 0)<br>SLC 5/05 Processor (RS-232 Channel 0) | Personal Computer Serial Port (9-Pin DTE) | **1747-CP3** | – |
| 1746-I/O | 1492-IFMxx Interface Modules | **1492-CABLExx** | – |
| 1747-SN Remote I/O Scanner<br>1747-DCM Direct Communication Module<br>1747-ASB SLC Remote I/O Adapter Module<br>SLC 5/04 Processors (1747-L541, -542, and -543) | Remote I/O Network | **Belden 9463** | – |
| 1747-AIC Isolated Link Coupler<br>1770-KF3 DH-485 Communication Interface<br>1784-KR Personal Computer Interface | 1747-AIC Isolated Link Coupler | **Belden 9842** | – |

## Replacement Terminal Blocks

### Catalogue Numbers

| Description | Catalogue Number |
|---|---|
| Replacement Terminal Block (Blue) — Used with DC I/O modules, Catalogue Numbers 1746-IB16, -IC16, -IH16, -IV16, -OBP8, -OB16, -OB16E, -OBP16, -OVP16 -OV16, -IN16, -IG16, -OG16 | **1746-RT25B** |
| Replacement Terminal Block (Orange) — Used with relay output modules, Catalogue Numbers 1746-OW16, -OX8 | **1746-RT25C** |
| Replacement Terminal Block (Green) — Used with Specialty I/O modules, Catalogue Numbers 1746-HSCE, -IO12, -NR4, -NI8 | **1746-RT25G** |
| Replacement Terminal Block (Red) — Used with AC I/O modules, Catalogue Numbers 1746-IA16, -OA16, -IM16, -OAP12 | **1746-RT25R** |
| Replacement Terminal Block — 2-position terminal block used with analog outputs, Catalogue Numbers 1746-NO4I, -NO4V | **1746-RT26** |
| Replacement Terminal Block — 8-position terminal block used with analog outputs, Catalogue Numbers 1746-NO4I, -NO4V | **1746-RT27** |
| Replacement Terminal Block — Used with analog input modules, Catalogue Numbers 1746-NI4, -NIO4I, -NIO4V, -FIO4I, -FIO4V | **1746-RT28** |
| Replacement Terminal Block — Used with RIO Communication Modules, Catalogue Numbers 1747-SN, -DSN, -DCM | **1746-RT29** |
| Replacement Terminal Block — 6-position DH-485 plug/connector;<br>used with DH-485 Link Coupler, Catalogue Number 1747-AIC and Advanced Interface Converter, Catalogue Number 1761-NET-AIC | **1746-RT30** |
| Replacement Terminal Block — Used with SLC 500 Remote I/O Adapter Module, Catalogue Number 1747-ASB | **1746-RT31** |
| Replacement Terminal Block — Used with Thermocouple/mV Module, Catalogue Number 1746-NT4 | **1746-RT32** |
| Replacement Terminal Block — 3-position DH+ connector; used with SLC 5/04 Processors, Catalogue Numbers 1747-L541, 1747-L542, -L542P, 1747-L543 | **1746-RT33** |
| Replacement Terminal Block (Green) — Used with Thermocouple/mV Input Module, Catalogue Number 1746-NT8 | **1746-RT34** |
| Replacement Terminal Block (Green) — Used with RTD/Resistance Module, Catalogue Number 1746-NR8 | **1746-RT35** |

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## Other Replacement Hardware

### Catalogue Numbers

| Description | Catalogue Number |
|---|---|
| Replacement Fuses — Five fuses per package. Orders must be for multiples of five. | – |
| Catalogue Number for 1746-P1 power supply. | 1746-F1 |
| Catalogue Number for 1746-P2 power supply. | 1746-F2 |
| Catalogue Number for 1746-P3 power supply. | 1746-F3 |
| Fixed I/O AC units, MDL 1.25 Ampere. | 1746-F4 |
| Fixed I/O DC units, MDL 1.6 Ampere. | 1746-F5 |
| Catalogue Numbers for 1746-OBP16 and 1746-OVP16 output modules. | 1746-F8 |
| Catalogue Numbers for 1746-OAP12 output module. | 1746-F9 |
| Modular Card Slot Fillers — Two fillers per package. Orders must be for multiples of two. | 1746-N2 |
| Connector — Mating Connector for 32-point user-made cable | 1746-N3 |
| Kit consisting of 4 replacement terminal covers and labels for 4, 8, 16 I/O modules | 1746-R9 |
| Replacement Covers and Labels — Two covers per package. Orders must be for multiples of two covers. | – |
| Catalogue Number for 1746-P1. | 1746-R10 |
| Catalogue Numbers for 1746-P2 and -P3 power supplies. | 1746-R11 |
| SLC 5/01 and SLC 5/02 Processors. | 1746-R12 |
| Specialty I/O. | 1746-R13 |
| SLC 5/03, SLC 5/04, and SLC 5/05 Processor. | 1746-R14 |
| Catalogue Number for 1747-ASB. | 1746-R16 |
| Replacement Fuse Holder for Catalogue Number 1746-OAP12. Two fuse holders per package. Orders must be for multiples of two. | 1746-R17 |
| Replacement Retainer Clips — Four clips per package. Orders must be for multiples of four. | 1746-R15 |
| Replacement Remote I/O Address Labels: Includes five labels for remote PLC system and five labels for remote SLC system. | 1746-RL35 |
| Replacement Octal Label Kit — Kit includes one octal LED label and one door label. | – |
| for 1746-IA16. | 1746-RL40 |
| for 1746-IB16. | 1746-RL41 |
| for 1746-IG16. | 1746-RL42 |
| for 1746-IM16. | 1746-RL43 |
| for 1746-IN16. | 1746-RL44 |
| for 1746-IV16. | 1746-RL45 |
| for 1746-ITB16. | 1746-RL46 |
| for 1746-ITV16. | 1746-RL47 |
| for 1746-OA16. | 1746-RL50 |
| for 1746-OB16. | 1746-RL51 |
| for 1746-OG16. | 1746-RL52 |
| for 1746-OV16. | 1746-RL53 |
| for 1746-OW16. | 1746-RL54 |
| for 1746-OBP16. | 1746-RL55 |
| for 1746-OVP16. | 1746-RL56 |
| for 1746-OAP12. | 1746-RL57 |
| for 1746-IC16. | 1746-RL58 |
| for 1746-IH16. | 1746-RL59 |
| for 1746-IB32. | 1746-RL60 |
| for 1746-IV32. | 1746-RL61 |
| for 1746-OB32 and 1746-OB32E. | 1746-RL70 |
| for 1746-OV32. | 1746-RL71 |
| for 1746-OB16E. | 1746-RL72 |
| Lithium Battery Assembly. This is an optional part used for the SLC 500 Fixed and Modular Hardware Style processors and the Hand-Held Terminal. Refer to product documentation for proper storage and handling instructions. For disposal information, consult your nearest Allen-Bradley Sales Office. | 1747-BA |
| Replacement Keys for the SLC 5/03, SLC 5/04, and SLC 5/05 processors | 1747-KY1 |
| Replacement Parts Kit for 20 I/O Fixed Hardware Style Processor, consists of: two Output Terminal Covers, two Input Terminal Covers, two Prom/Battery Covers, and one HHT/Comm Connector Cover. | 1747-R5 |

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| Description | Catalogue Number |
|---|---|
| Replacement Parts Kit for 30 & 40 I/O Fixed Hardware Style Processors, consists of: two Output Terminal Covers, two Input Terminal Covers, two PROM/Battery Covers, and one HHT/Comm Connector Cover. | 1747-R7 |

## Manuals ALL MANUALS ON INCLUDED CD

### Catalogue Numbers

| Description[1] | Catalogue Number | Publication Number |
|---|---|---|
| Barrel Temperature Control Module (1746-BTM) User Manual | **D1746-6.10** | 1746-6.10 |
| Open-Loop Velocity Control Module (1746-QV) User Manual | **D1746-6.18** | 1746-6.18 |
| Multi-Channel High Speed Counter Module (1746-HSCE2) User Manual | **D1746-UM002A-US-P** | 1746-UM002A-US-P |
| SLC 500 NT8 Thermocouple/mV Module User Manual | **D1746-6.22** | 1746-6.22 |
| SLC 500 Analog I/O Modules User Manual | **D1746-6.4** | 1746-6.4 |
| High-Speed Counter Module (1746-HSCE) User Manual | **D1746-6.5** | 1746-6.5 |
| SLC 500 (1746-NT4) Thermocouple/mV Module User Manual | **D1746-6.6.1** | 1746-6.6.1 |
| SLC 500 (1746-NR4) RTD/Resistance Input Module User Manual | **D1746-6.7** | 1746-6.7 |
| 1746-NI8 Analog Input Module User Manual | **D1746-6.8** | 1746-6.8 |
| 1746-FIO4I and -FIO4V Fast Analog Modules User Manual | **D1746-6.9** | 1746-6.9 |
| BASIC Language Reference Manual | **D1746-RM001A-US-P** | 1746-RM001A-US-P |
| BASIC Development Software Programming Manual | **D1746-PM001A-US-P** | 1746-PM001A-US-P |
| SLC 500 (1746-NI16) Analog Input Module User Manual | **D1746-UM001A-US-P** | 1746-UM001A-US-P |
| SLC 500 (1746-NR8) RTD/Resistance Input Module User Manual | **D1746-UM003A-EN-P** | 1746-UM003A-EN-P |
| SLC 500 BASIC Module User Manual | **D1746-UM004A-US-P** | 1746-UM004A-US-P |
| ControlNet RS-232 Interface Module User Manual (1747-KFC15) | **D1747-5.34** | 1747-5.34 |
| Data Table Access Module (1747-DTAM-E) User Manual | **D1747-6.1** | 1747-6.1 |
| DH-485/RS-232C Interface Module (1747-KE) User Manual | **D1747-6.12** | 1747-6.12 |
| Remote I/O Adapter Module (1747-ASB) User Manual | **D1747-6.13** | 1747-6.13 |
| SLC 500 and MicroLogix 1000 Instruction Set Reference Manual | **D1747-6.15** | 1747-6.15 |
| Synchronized Axes Control Module (1746-QS) User Manual | **D1746-6.19** | 1746-6.19 |
| Modular Hardware Style Installation and Operation Manual | **D1747-6.2** | 1747-6.2 |
| Fixed Hardware Style Installation and Operation Manual | **D1747-6.21** | 1747-6.21 |
| Backup Scanner Module User Manual | **D1747-6.22** | 1747-6.22 |
| DeviceNet Scanner (1747-SDN) User Manual | **D1747-6.5.2** | 1747-6.5.2 |
| Remote I/O Scanner Module (1747-SN) User Manual | **D1747-6.6** | 1747-6.6 |
| Direct Communication Module (1747-DCM) User Manual | **D1747-6.8** | 1747-6.8 |
| HHT Getting Started Guide | **D1747-NM009** | 1747-NM009 |
| HHT User Manual | **D1747-NP002** | 1747-NP002 |
| ControlNet Scanner Module User Manual | **D1747-6.23** | 1747-6.23 |
| ControlNet Adapter Module User Manual | **D1747-UM003A-EN-P** | 1747-UM003A-EN-P |
| DeviceNet Interface (1761-NET-DNI) User Manual | **D1761-6.5** | 1761-6.5 |
| SLC 500 APS Import/Export Utility User Manual | **9399APSIE** | 9399APSIE |
| SLC 500 APS Manual Set | **9399APSMAN** | 9399APSMAN |
| SLC 500 APS Quick Start Guide | **9399APSQS** | 9399APSQS |
| SLC 500 APS User Manual | **9399APSUM** | 9399APSUM |
| RSLogix 500 Getting Results Guide | **9399RL50GR** | 9399RL50GR |
| MicroLogix 1000 and PLC 500 A.I. Series Manual Set | **9399S5MAN** | 9399S5MAN |
| SLC 500 A.I. Series Software Reference | **9399S5SR** | 9399S5SR |

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# Chapter 15 MAIN PLC SOFTWARE AS BUILT.

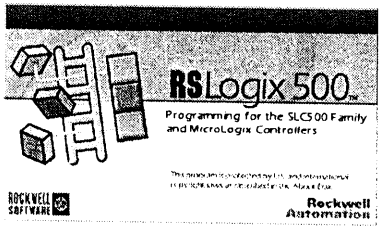
## MANUFACTURER/DISTRIBUTOR:

DEVCAR INC
368 21$^{E}$ AVENUE NORD
ST-JÉRÔME.QUE. J7Z-3W2
PHONE/FAX 450-436-3164

## 15.1 MAIN PLC SOFTWARE AS BUILT.

**END OF CHAPTER 15**

RSLogix500 Project Report




1.5.1



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## Processor Information

Processor Type: 1747-L551B/C 5/05 CPU - 16K Mem. OS501 Series C

Processor Name: WWTP

Total Memory Used: 1960 Instruction Words Used - 1205 Data Table Words Used

Total Memory Left: 10328 Instruction Words Left

Program Files: 13

Data Files: 22

Program ID: 92db





## I/O Configuration

| | | |
|---|---|---|
| 0 | 1747-L551B/C | 5/05 CPU - 16K Mem. OS501 Series C |
| 1 | 1746-IB16 | 16-Input (SINK) 24 VDC |
| 2 | 1746-IB16 | 16-Input (SINK) 24 VDC |
| 3 | 1746-OX8 | 8-Output Isolated Relay |
| 4 | 1746-OX8 | 8-Output Isolated Relay |
| 5 | 1746-NI8 | Analog 8 Channel Input - Class 3 |
| 6 | 1746-NO4I | Analog 4 Ch. Current Output |
| 7 | 1746-IA16 | 16-Input 100/120 VAC |
| 8 | 1746-IA16 | 16-Input 100/120 VAC |
| 9 | 1746-OX8 | 8-Output Isolated Relay |
| 10 | 1746-OX8 | 8-Output Isolated Relay |
| 11 | 1746-NT8 | Analog 8 Ch Thermocouple Input |
| 12 | 1746-OW16 | 16-Output (RLY) 240 VAC |
| -- | --- | --- |
| 13 | 1746-NO4I | Analog 4 Ch. Current Output |
| 14 | 1746-NI8 | Analog 8 Channel Input - Class 3 |
| 15 | | |
| 16 | | |

**PID - Rung #4:4 - N21:0**

Controller Gain, Kc: 0.1
Reset Term, Ti: 0.1
Rate Term, Td: 0.00
Loop Update Time: 10.23
Control Mode: E = SP - PV
PID Control: Auto
Time Mode: Timed
Output Limiting: No
Reset and Gain: No

Setpoint: 7680
Maximum Setpoint Limit: 0
Minimum Setpoint Limit: 0
Control Variable Percent (CV%): 0
Output Max CV(%): 0
Output Min CV(%): 0
Derivative Action(DA): No
Deadband: 200



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GENERAL
Channel 1 Write Protected: No
Channel 1 Edit Resource/Owner Timeout: 60
Channel 1 Passthru Link ID: 2
Channel 1 Diagnostic File: (Unused)

Channel 0 Write Protected: No
Channel 0 Edit Resource/Owner Timeout: 60
Channel 0 Passthru Link ID: 2
Channel 0 Current Mode: System
Channel 0 Mode Change Enabled: No
Channel 0 Mode Change Attention Character: \1b
Channel 0 Mode Change System Character: S
Channel 0 Mode Change User Character: U
Channel 0 Diagnostic File: 0

CHANNEL 1 (SYSTEM) - Driver: Ethernet
Broadcast Address: 0.0.0.0
Hardware Address: 00:00:BC:1E:9D:41
IP Address: 192.168.0.200
Subnet Mask: 255.255.255.0
Gateway Address: 0.0.0.0
Msg Connection Timeout (x 1mS): 15000
Msg Reply Timeout (x mS): 3000
Inactivity Timeout (x Min): 30
Bootp Enable: No
Bootp Valid: No
SNMP Enable: Yes
HTTP Enable: Yes
Auto Negotiate Enable: No
Port Speed Enable: 10 Mbps Half Duplex Forced
Contact:
Location:

CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex
Source ID: 0 (decimal)
Baud: 19200
Parity: NONE
Stop Bits: 1
Control Line : No Handshaking
Error Detection: CRC
Embedded Responses: Enabled
Duplicate Packet Detect: Yes
ACK Timeout: 50
NAK Retries: 3
ENQ Retries: 3





CHANNEL 0 (USER) - Driver: ASCII
Baud: 1200
Parity: NONE
Stop Bits: 1
Data Bits: 8
Control Line : No Handshaking
Delete mode: Ignore
Echo: No
XON/XOFF: No
Termination Character 1: \d
Termination Character 2: \ff
Append Character 1: \d
Append Character 2: \a

Multipoint Monitor

| | Address | Symbol | State | On Description | Off Description | Protected |
|---|---|---|---|---|---|---|
| 0 | | | | | | |
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
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| 25 | | | | | | |
| 26 | | | | | | |
| 27 | | | | | | |
| 28 | | | | | | |
| 29 | | | | | | |
| 30 | | | | | | |
| 31 | | | | | | |





Program File List

| Name | Number | Type | Rungs | Debug | Bytes |
|---|---|---|---|---|---|
| [SYSTEM] | 0 | SYS | 0 | No | 0 |
| | 1 | SYS | 0 | No | 0 |
| MAIN | 2 | LADDER | 15 | No | 193 |
| TIME BASE | 3 | LADDER | 21 | No | 757 |
| AHU | 4 | LADDER | 33 | No | 1467 |
| LIFTSTATIO | 5 | LADDER | 40 | No | 2860 |
| PRIM SCRN | 6 | LADDER | 27 | No | 1053 |
| PRIM FILT | 7 | LADDER | 44 | No | 1759 |
| FEW TANK | 8 | LADDER | 28 | No | 1276 |
| GAS ALARM | 9 | LADDER | 3 | No | 115 |
| BOILLERS | 10 | LADDER | 10 | No | 303 |
| ALARM | 11 | LADDER | 16 | No | 617 |
| FEW HEAT | 12 | LADDER | 18 | No | 476 |

Data File List

| Name | Number | Type | Scope | Debug | Words | Elements | Last |
|---|---|---|---|---|---|---|---|
| OUTPUT | 0 | O | Global | No | 135 | 45 | O:44 |
| INPUT | 1 | I | Global | No | 132 | 44 | I:43 |
| STATUS | 2 | S | Global | No | 0 | 83 | S:82 |
| BINARY | 3 | B | Global | No | 45 | 45 | B3:44 |
| TIMER | 4 | T | Global | No | 135 | 45 | T4:44 |
| COUNTER | 5 | C | Global | No | 18 | 6 | C5:5 |
| CONTROL | 6 | R | Global | No | 3 | 1 | R6:0 |
| INTEGER | 7 | N | Global | No | 254 | 254 | N7:253 |
| FLOAT | 8 | F | Global | No | 44 | 22 | F8:21 |
| ROUTINGTAB | 10 | N | Global | No | 128 | 128 | N10:127 |
| STRING | 11 | N | Global | No | 32 | 32 | N11:31 |
| CH1 Diag | 20 | N | Global | No | 256 | 256 | N20:255 |
| PID LEN 23 | 21 | N | Global | No | 23 | 23 | N21:22 |



151



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Initialization for Slot 14 - 1746-NI8 - Analog 8 Channel Input - Class 3

0000 First Pass S:1 15

COP
Copy File
Source #N11:20
Dest #O:14.0
Length 12

Initialization for Slot 11 - 1746-NT8 - Analog 8 Ch Thermocouple Input

0001 First Pass S:1 15

COP
Copy File
Source #N11:12
Dest #O:11.0
Length 8

Initialization for Slot 5 - 1746-NI8 - Analog 8 Channel Input - Class 3

0002 First Pass S:1 15

COP
Copy File
Source #N11:0
Dest #O:5.0
Length 12

0003
JSR
Jump To Subroutine
SBR File Number U:3

0004
JSR
Jump To Subroutine
SBR File Number U:4

0005
JSR
Jump To Subroutine
SBR File Number U:5

0006
JSR
Jump To Subroutine
SBR File Number U:6

0007
JSR
Jump To Subroutine
SBR File Number U:7

0008
JSR
Jump To Subroutine
SBR File Number U:8

0009
JSR
Jump To Subroutine
SBR File Number U:9





0010
JSR
Jump To Subroutine
SBR File Number U:10

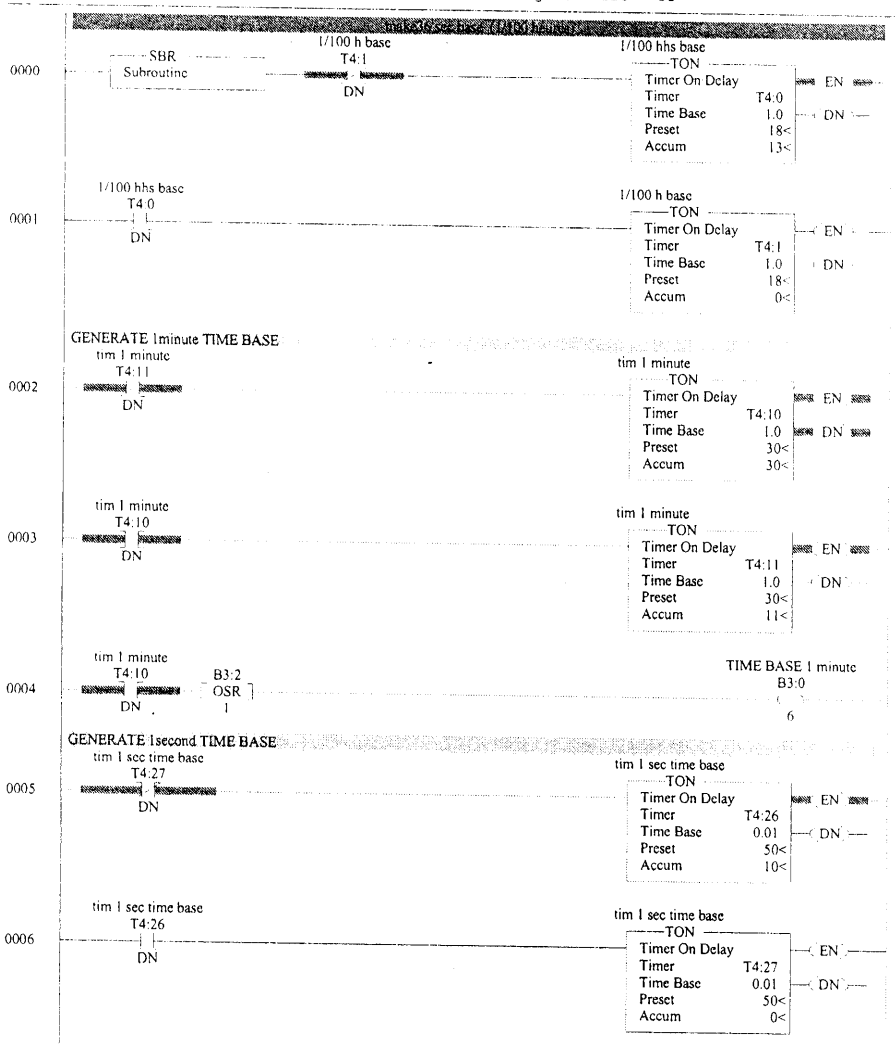
0011
JSR
Jump To Subroutine
SBR File Number U:11

0012
JSR
Jump To Subroutine
SBR File Number U:12

0013 B3:0 3

Overflow Trap S:5 U 0

0014 END


0000
SBR
Subroutine
1/100 h basc
T4:1
DN
1/100 hhs base
TON
Timer On Delay
Timer T4:0
Time Base 1.0
Preset 18<
Accum 13<
EN
DN
0001
1/100 hhs base
T4:0
DN
1/100 h base
TON
Timer On Delay
Timer T4:1
Time Base 1.0
Preset 18<
Accum 0<
EN
DN
GENERATE 1minute TIME BASE
0002
tim 1 minute
T4:11
DN
tim 1 minute
TON
Timer On Delay
Timer T4:10
Time Base 1.0
Preset 30<
Accum 30<
EN
DN
0003
tim 1 minute
T4:10
DN
tim 1 minute
TON
Timer On Delay
Timer T4:11
Time Base 1.0
Preset 30<
Accum 11<
EN
DN
0004
tim 1 minute
T4:10
DN
B3:2
OSR
1
TIME BASE 1 minute
B3:0
6
GENERATE 1second TIME BASE
0005
tim 1 sec time base
T4:27
DN
tim 1 sec time base
TON
Timer On Delay
Timer T4:26
Time Base 0.01
Preset 50<
Accum 10<
EN
DN
0006
tim 1 sec time base
T4:26
DN
tim 1 sec time base
TON
Timer On Delay
Timer T4:27
Time Base 0.01
Preset 50<
Accum 0<
EN
DN

0007
tim 1 sec time base
T4:26
DN
B3:2
OSR
4
1 second time base
valid one scan
B3:0
0

0008

alayays on
B3:0
14

0009

alayays on
B3:0
14

alaways off
B3:0
15





0010

1/100 h basc
T4:1
DN

raw sewer
PI02_RUN?
I:1
1
1746-IB16

ADD
Add
Source A F8:5 699.2209<
Source B 0.01 0.01<
Dest F8:5 699.2209<

PI03_RUN
I:1
13
1746-IB16

ADD
Add
Source A F8:6 304.6961<
Source B 0.01 0.01<
Dest F8:6 304.6961<

PI04_RUN
I:2
1
1746-IB16

ADD
Add
Source A F8:7 361.0611<
Source B 0.01 0.01<
Dest F8:7 361.0611<

sscr 105 run
I:7
1
1746-IA16

ADD
Add
Source A F8:8 459.7974<
Source B 0.01 0.01<
Dest F8:8 459.7974<

sscr 106 run
I:8
1
1746-IA16

ADD
Add
Source A F8:9 442.6807<
Source B 0.01 0.01<
Dest F8:9 442.6807<

FEW PUMP 1 RUN

FEW S_P1RUN
N7:65
2

ADD
Add
Source A F8:10 34.72018<
Source B 0.01 0.01<
Dest F8:10 34.72018<

FEW PUMP 2 RUN

FEW S_P2RUN
N7:65
3

ADD
Add
Source A F8:11 6.700058<
Source B 0.01 0.01<
Dest F8:11 6.700058<

few p3 run

FEW S_P3RUN
N7:65
4

ADD
Add
Source A F8:12 70.7067<
Source B 0.01 0.01<
Dest F8:12 70.7067<

not few hot water recirc p21
I:7
10
1746-IA16

few p21 recirc pump

ADD
Add
Source A F8:15 958.9944<
Source B 0.01 0.01<
Dest F8:15 958.9944<





not hot water booster pump run p20
I:7
11
1746-IA16

few p20 recirc pump

ADD
Add
Source A F8:16 1133.425<
Source B 0.01 0.01<
Dest F8:16 1133.425<

few elect heater running
I:7
12
1746-IA16

few electric heater heating

ADD
Add
Source A F8:17 11.18016<
Source B 0.01 0.01<
Dest F8:17 11.18016<

Build 0.1 2.3 second base

essai de sinus

Time Base

0011

| S:4 | B3:0 |
|---|---|
| 8 | OSR 5 |

ADD

| | |
|---|---|
| Add | |
| Source A | N7:3 2< |
| Source B | 1 1< |
| Dest | N7:3 2< |

0012

GRT

| | |
|---|---|
| Greater Than (A>B) | |
| Source A | N7:3 2< |
| Source B | 3 3< |

B3:0 3

MOV

| | |
|---|---|
| Move | |
| Source | 0 0< |
| Dest | N7:3 2< |





Build 0.1 2.3 second base

essai de sinus

Time Base

0013

| S:4 | B3:0 |
|---|---|
| 5 | OSR 4 |

SIM FAST RAMP

ADD

| | |
|---|---|
| Add | |
| Source A | N7:2 9< |
| Source B | 1 1< |
| Dest | N7:2 9< |

0014

SIM FAST RAMP

GRT

| | |
|---|---|
| Greater Than (A>B) | |
| Source A | N7:2 9< |
| Source B | 100 100< |

B3:0 3

SIM FAST RAMP

MOV

| | |
|---|---|
| Move | |
| Source | 0 0< |
| Dest | N7:2 9< |

essai de sinus

0015
Time Base
S:4
0
B3:0
OSR
2
SIM SIN
ADD
Add
Source A N7:0 409<
Source B 1 1<
Dest N7:0 409<

0016
SIM SIN
GRT
Greater Than (A>B)
Source A N7:0 409<
Source B 627 627<
B3:0
3
SIM SIN
MOV
Move
Source 0 0<
Dest N7:0 409<

0017
build sinus
DIV
Divide
Source A N7:0 409<
Source B 100.0 100.0<
Dest F8:0 4.19<

0018
build sinus
SIN
Sine
Source F8:0 4.19<
Dest F8:1 -0.8666297<

0019
SIM SIN OUT
MUL
Multiply
Source A F8:1 -0.8666297<
Source B 1000.0 1000.0<
Dest N7:1 -812<

0020
END



1.5.1



TOTAL TIME CALCULATION

0000
1/100 h base
T4:1
DN
mcc ahu3 sf
not running
I:8
6
1746-IA16
AHU SF TTSN
ADD
Add
Source A F8:13 3024.63<
Source B 0.01 0.01<
Dest F8:13 3024.63<
mcc ahu3 ef
not running
I:8
7
1746-IA16
AHU EF TTSN
ADD
Add
Source A F8:14 3024.63<
Source B 0.01 0.01<
Dest F8:14 3024.63<

COPY INFO FROM THERMOCOUPLE CARD FOR SIMULATION CONTROL

AHU-3 SUPPLY AIR TEM

AHU_S:SAT

0001

MOV
Move
Source I:11.0 208<
Dest N7:80 207<

AHU-3 EXHAUST AIR
temperature

AHU_S:HAT

MOV
Move
Source I:11.1 206<
Dest N7:82 206<

OUTSIDE AIR TEMPERA

OAT_S:TEMP

MOV
Move
Source I:11.2 199<
Dest N7:76 199<

AHU_S:OAT

DIV
Divide
Source A N7:76 199<
Source B 10 10<
Dest N7:85 20<

HEATING SYSTEM CUREN

BOILER_S:TEMP

MOV
Move
Source I:11.3 748<
Dest N7:75 748<





glycol temperatur
give real val
10 = 10c

GLYCOL:DIV

DIV
Divide
Source A N7:75 748<
Source B 10 10<
Dest N7:99 75<

trailler room
tempreature

MOV
Move
Source I:11.5 206<
Dest N7:97 206<

0002

SCP
Scale w/Parameters
Input N7:81 15<
Input Min. -60 -60<
Input Max. 100 100<
Scaled Min. 0 0<
Scaled Max. 16383 16383<
Output N21:2 7680<

0003

SCP
Scale w/Parameters
Input N7:80 207<
Input Min. -600 -600<
Input Max. 1000 1000<
Scaled Min. 0 0<
Scaled Max. 16383 16383<
Output N7:201 8263<

PID 2ND ITEM ON PID MODUL ADRESS BLOC (N21:2) IS THE SET POINT !!!!

0004

pid ahu3

PID

| PID | |
|---|---|
| Control Block | N21:0 |
| Process Variable | N7:201 |
| Control Variable | N7:202 |
| Control Block Length | 23 |
| Setup Screen | |

0005

AHU_S_MV

SCP

| Scale w/Parameters | |
|---|---|
| Input | N7:202 |
| | 0< |
| Input Min. | 0.0 |
| | 0.0< |
| Input Max. | 16383.0 |
| | 16383.0< |
| Scaled Min. | 0.0 |
| | 0.0< |
| Scaled Max. | 100.0 |
| | 100.0< |
| Output | N7:79 |
| | 0< |

0006

ahu-3 coil control valve

SCP

| Scale w/Parameters | |
|---|---|
| Input | N7:202 |
| | 0< |
| Input Min. | 0 |
| | 0< |
| Input Max. | 16384 |
| | 16384< |
| Scaled Min. | 0 |
| | 0< |
| Scaled Max. | 31208 |
| | 31208< |
| Output | O:6.3 |
| | 0< |

0007

auto

AHU_AUTO

I:7

7

1746-IA16

ahu3 auto

AHU_BIT_STATUS

N7:84

1



15.1



demultuiplex console on air handling unit

0008

high speed

AHU_HIGH_SPEED

I:7

8

1746-IA16

low speed

AHU_LOW_SPEED

I:7

9

1746-IA16

tim ahu on

TOF

| Timer Off Delay | |
|---|---|
| Timer | T4:7 |
| Time Base | 0.01 |
| Preset | 50< |
| Accum | 50< |

EN

DN

0009

tim ahu on

T4:7

DN

ahu3 hand

AHU_BIT_STATUS

N7:84

2

0010

high speed

AHU_HIGH_SPEED

I:7

8

1746-IA16

low speed

AHU_LOW_SPEED

I:7

9

1746-IA16

tim ahu

TON

| Timer On Delay | |
|---|---|
| Timer | T4:8 |
| Time Base | 0.01 |
| Preset | 50< |
| Accum | 0< |

EN

DN

0011

tim ahu

T4:8

DN

osr ahu

B3:1

OSR

4

1- ahu3 high speed

0- ahu low speed

AHU_BIT_STATUS

N7:84

L

3

0012

low speed

AHU_LOW_SPEED

I:7

9

1746-IA16

high speed

AHU_HIGH_SPEED

I:7

8

1746-IA16

ahu ls

TON

| Timer On Delay | |
|---|---|
| Timer | T4:9 |
| Time Base | 0.01 |
| Preset | 50< |
| Accum | 0< |

EN

DN

0013

ahu ls

T4:9

DN

osr ahu

B3:1

OSR

5

1- ahu3 high speed

0- ahu low speed

AHU_BIT_STATUS

N7:84

U

3

0014

high speed

AHU_HIGH_SPEED

I:7

8

1746-IA16

low speed

AHU_LOW_SPEED

I:7

9

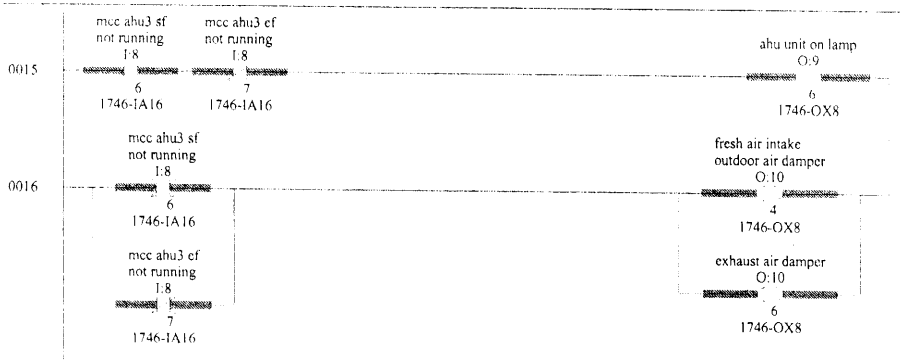
1746-IA16

selector remote ahu defrost

AHU_BIT_STATUS

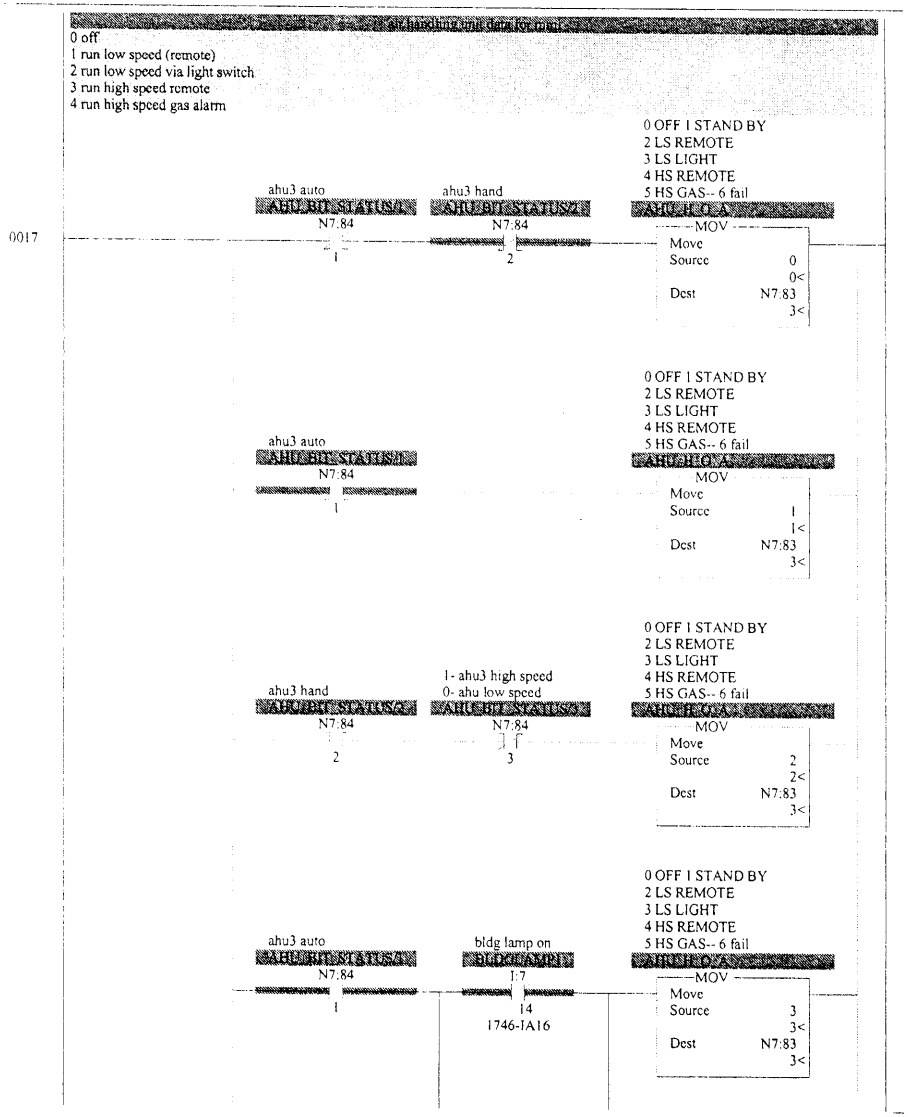
N7:84

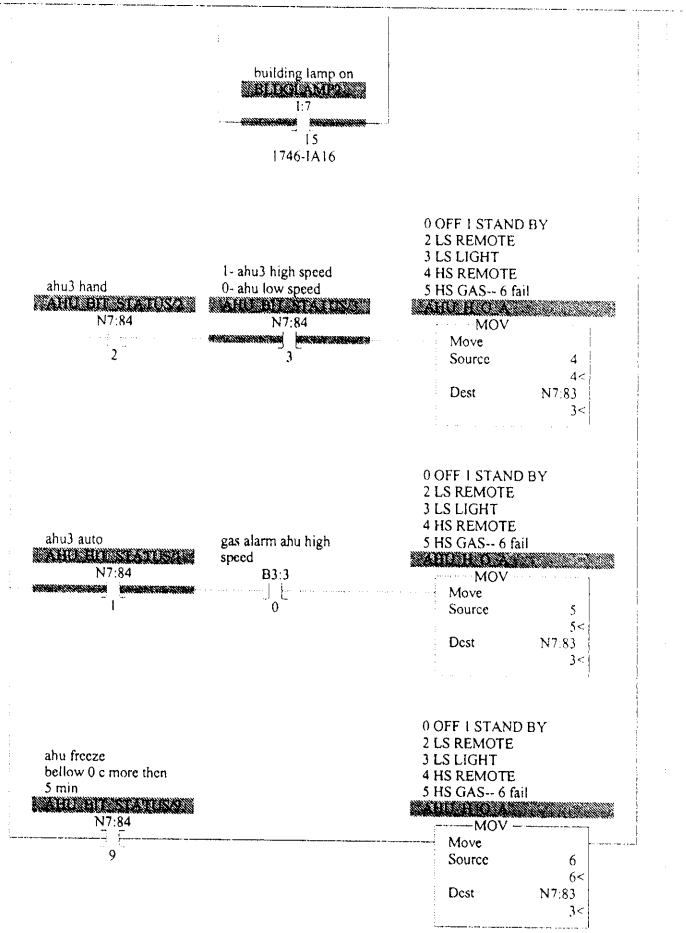
8


0015
mcc ahu3 sf
not running
I:8
6
1746-IA16
mcc ahu3 ef
not running
I:8
7
1746-IA16
ahu unit on lamp
O:9
6
1746-OX8
0016
mcc ahu3 sf
not running
I:8
6
1746-IA16
mcc ahu3 ef
not running
I:8
7
1746-IA16
fresh air intake
outdoor air damper
O:10
4
1746-OX8
exhaust air damper
O:10
6
1746-OX8



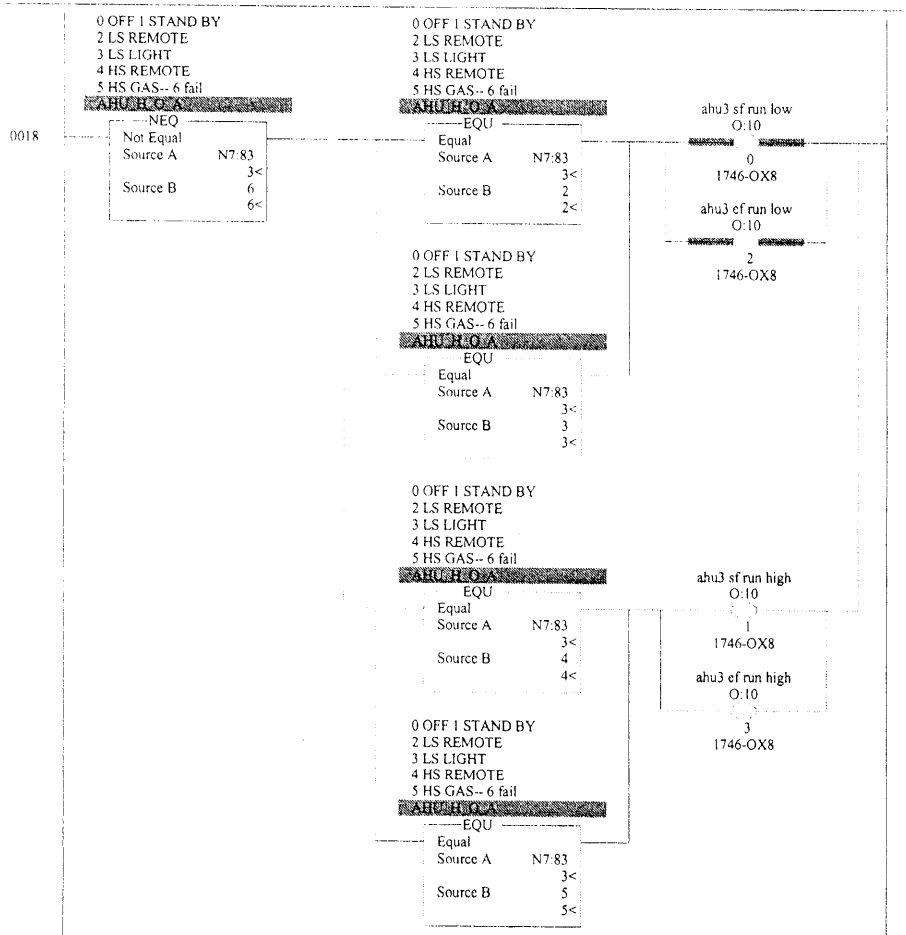



0 off
1 run low speed (remote)
2 run low speed via light switch
3 run high speed remote
4 run high speed gas alarm
0017
ahu3 auto
AHU_BIT_STATUS_0
N7:84
1
ahu3 hand
AHU_BIT_STATUS_1
N7:84
2
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
MOV
Move
Source 0
0<
Dest N7:83
3<
ahu3 auto
AHU_BIT_STATUS_0
N7:84
1
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
MOV
Move
Source 1
1<
Dest N7:83
3<
ahu3 hand
AHU_BIT_STATUS_1
N7:84
2
1- ahu3 high speed
0- ahu low speed
AHU_BIT_STATUS_3
N7:84
3
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
MOV
Move
Source 2
2<
Dest N7:83
3<
ahu3 auto
AHU_BIT_STATUS_0
N7:84
1
bldg lamp on
BLDG_LAMP_IN
I:7
14
1746-IA16
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
MOV
Move
Source 3
3<
Dest N7:83
3<


building lamp on
BUILDLAMP01
I:7
15
1746-IA16
ahu3 hand
AHU_BIT_STATUS2
N7:84
2
1- ahu3 high speed
0- ahu low speed
AHU_BIT_STATUS1
N7:84
3
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
AHU_H_O_A
MOV
Move
Source 4
4<
Dest N7:83
3<
ahu3 auto
AHU_BIT_STATUS2
N7:84
1
gas alarm ahu high speed
B3:3
0
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
AHU_H_O_A
MOV
Move
Source 5
5<
Dest N7:83
3<
ahu freeze
bellow 0 c more then
5 min
AHU_BIT_STATUS0
N7:84
9
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
AHU_H_O_A
MOV
Move
Source 6
6<
Dest N7:83
3<






0018
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
AHU_H_O_A
NEQ
Not Equal
Source A N7:83
3<
Source B 6
6<
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
AHU_H_O_A
EQU
Equal
Source A N7:83
3<
Source B 2
2<
ahu3 sf run low
O:10
0
1746-OX8
ahu3 ef run low
O:10
2
1746-OX8
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
AHU_H_O_A
EQU
Equal
Source A N7:83
3<
Source B 3
3<
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
AHU_H_O_A
EQU
Equal
Source A N7:83
3<
Source B 4
4<
ahu3 sf run high
O:10
1
1746-OX8
ahu3 ef run high
O:10
3
1746-OX8
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
AHU_H_O_A
EQU
Equal
Source A N7:83
3<
Source B 5
5<

supply fan data for mmf

0019

mcc ahu3 sf not running I:8/6 1746-IA16

0-off 1-low speed 2 high speed AHU_SF_STATUS

MOV Move Source 0 Dest N7:86

mcc ahu3 sf not running I:8/6 1746-IA16 ahu3 sf run low O:10/0 1746-OX8

0-off 1-low speed 2 high speed AHU_SF_STATUS

MOV Move Source 1 Dest N7:86

mcc ahu3 sf not running I:8/6 1746-IA16 ahu3 sf run high O:10/1 1746-OX8

0-off 1-low speed 2 high speed AHU_SF_STATUS

MOV Move Source 2 Dest N7:86

0020

mcc ahu3 sf not running I:8/6 1746-IA16 ahu3 sf run high O:10/1 1746-OX8 ahu3 sf run low O:10/0 1746-OX8

ahu sf fail

TON Timer On Delay Timer T4:13 Time Base 1.0 Preset 1 Accum 0 (EN) (DN)

ahu sf fail T4:13/DN

AHU_S_SF_FAIL N7:84/5





exhaust fan data for mmf

0021

mcc ahu3 ef not running I:8/7 1746-IA16

0-off 1-low speed 2 high speed AHU_EF_STATUS

MOV Move Source 0 Dest N7:87

mcc ahu3 ef not running I:8/7 1746-IA16 ahu3 ef run low O:10/2 1746-OX8

0-off 1-low speed 2 high speed AHU_EF_STATUS

MOV Move Source 1 Dest N7:87

mcc ahu3 ef not running I:8/7 1746-IA16 ahu3 ef run high O:10/3 1746-OX8

0-off 1-low speed 2 high speed AHU_EF_STATUS

MOV Move Source 2 Dest N7:87

0022

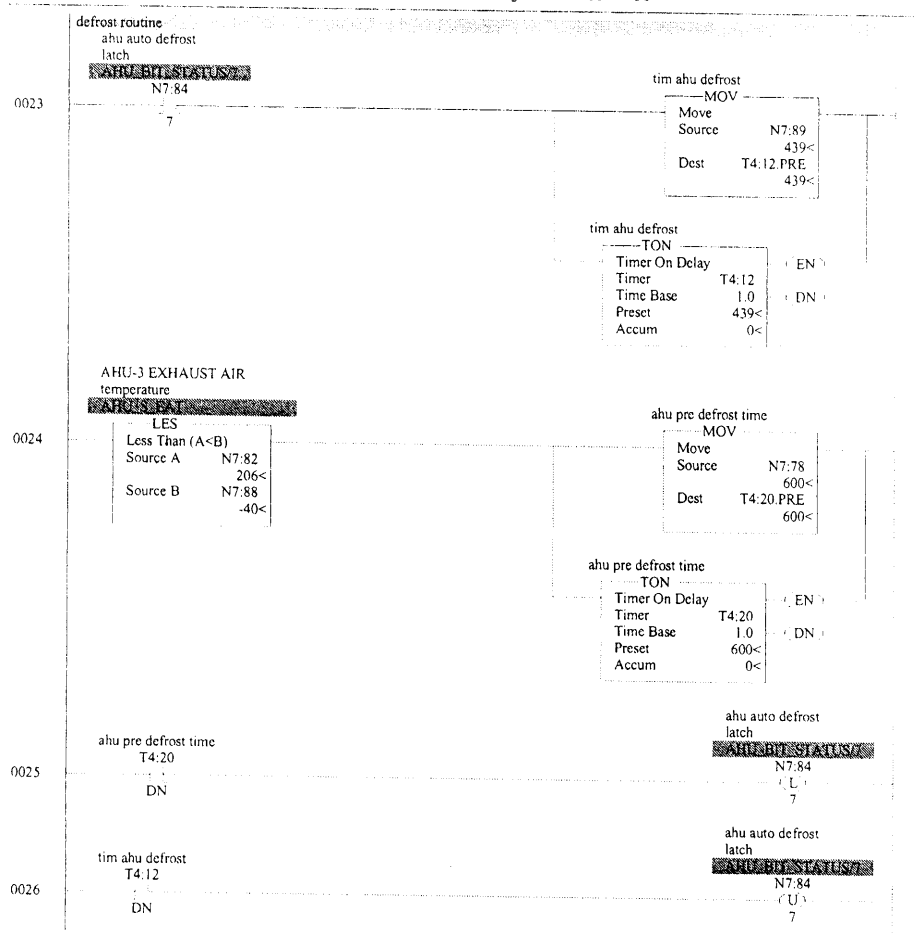
mcc ahu3 ef not running I:8/7 1746-IA16 ahu3 ef run high O:10/3 1746-OX8 ahu3 ef run low O:10/2 1746-OX8

ahu ef fail

TON Timer On Delay Timer T4:14 Time Base 1.0 Preset 1 Accum 0 (EN) (DN)

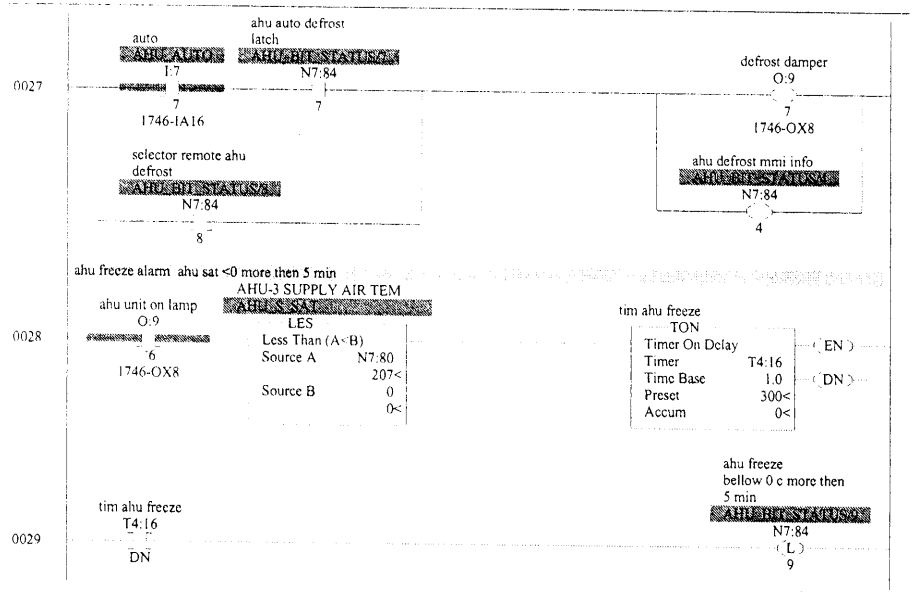
ahu ef fail T4:14/DN

AHU_S_EF_FAIL N7:84/6


defrost routine
ahu auto defrost latch
AHU_BIT_STATUS/7
N7:84
7
0023
tim ahu defrost
MOV
Move
Source N7:89 439<
Dest T4:12.PRE 439<
tim ahu defrost
TON
Timer On Delay
Timer T4:12
Time Base 1.0
Preset 439<
Accum 0<
EN
DN
AHU-3 EXHAUST AIR temperature
AHU3_EAT
LES
Less Than (A<B)
Source A N7:82 206<
Source B N7:88 -40<
0024
ahu pre defrost time
MOV
Move
Source N7:78 600<
Dest T4:20.PRE 600<
ahu pre defrost time
TON
Timer On Delay
Timer T4:20
Time Base 1.0
Preset 600<
Accum 0<
EN
DN
ahu pre defrost time
T4:20
DN
0025
ahu auto defrost latch
AHU_BIT_STATUS/7
N7:84
L
7
tim ahu defrost
T4:12
DN
0026
ahu auto defrost latch
AHU_BIT_STATUS/7
N7:84
U
7

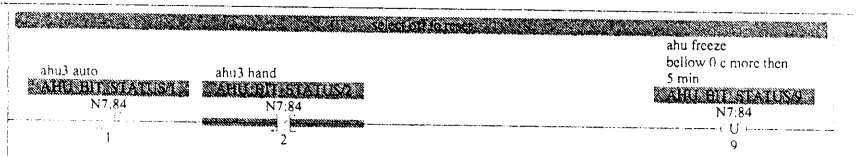





auto
AHU_AUTO
I:7
7
1746-IA16
ahu auto defrost latch
AHU_BIT_STATUS/7
N7:84
7
0027
defrost damper
O:9
7
1746-OX8
selector remote ahu defrost
AHU_BIT_STATUS/4
N7:84
8
ahu defrost mmi info
AHU_BIT_STATUS/4
N7:84
4
ahu freeze alarm ahu sat <0 more then 5 min
ahu unit on lamp
O:9
6
1746-OX8
AHU-3 SUPPLY AIR TEM
AHU_SAT
LES
Less Than (A<B)
Source A N7:80 207<
Source B 0 0<
0028
tim ahu freeze
TON
Timer On Delay
Timer T4:16
Time Base 1.0
Preset 300<
Accum 0<
EN
DN
ahu freeze bellow 0 c more then 5 min
AHU_BIT_STATUS/5
N7:84
L
9
tim ahu freeze
T4:16
DN
0029



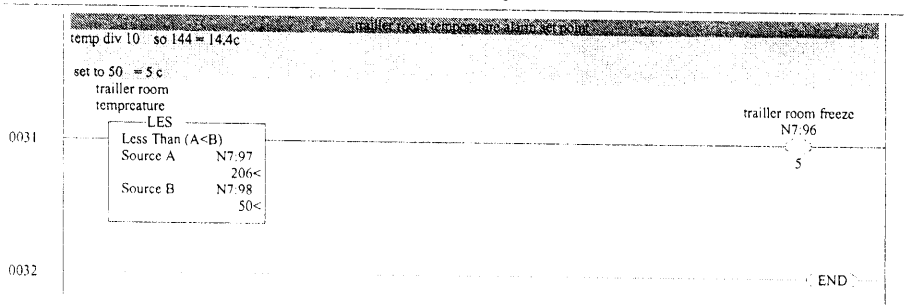
15.1




0030








0031

0032

0000

RAW SEWER LIFT STATION LEVEL IN %

SCP

| Scale w/Parameters | |
|---|---|
| Input | I:5.4 |
| | 10589< |
| Input Min. | 4000 |
| | 4000< |
| Input Max. | 20000 |
| | 20000< |
| Scaled Min. | 0 |
| | 0< |
| Scaled Max. | 100 |
| | 100< |
| Output | N7:41 |
| | 41< |

0001

RAW SEWER LIFT STATI LEVEL IN MM

SCP

| Scale w/Parameters | |
|---|---|
| Input | I:5.4 |
| | 10589< |
| Input Min. | 4000 |
| | 4000< |
| Input Max. | 20000 |
| | 20000< |
| Scaled Min. | 0 |
| | 0< |
| Scaled Max. | 3600 |
| | 3600< |
| Output | N7:42 |
| | 1483< |

0002

lit 101 waste water lift station level indication

LES

| Less Than (A<B) | |
|---|---|
| Source A | I:5.4 |
| | 10589< |
| Source B | 3500 |
| | 3500< |

lit 101 fail
N7:9
4





0003

RAW SEWER FLOW (L/min)

SCP

| Scale w/Parameters | |
|---|---|
| Input | I:5.2 |
| | 8377< |
| Input Min. | 4000 |
| | 4000< |
| Input Max. | 20000 |
| | 20000< |
| Scaled Min. | 0 |
| | 0< |
| Scaled Max. | 8000 |
| | 8000< |
| Output | N7:43 |
| | 2190< |

0004

RAW SEWER FLOW
(L/min)
FIT101.FLOW

LES
Less Than (A<B)
Source A N7:43
2190<
Source B 10
10<

RAW SEWER FLOW
(L/min)
FIT101.FLOW

MOV
Move
Source 0
0<
Dest N7:43
2190<





0005

liter by minutes
div 60 for liter/sec
div 1000 for m3/sec
1 second time base
valid one scan
B3:0
0

total volume m3
temp var

DIV
Divide
Source A N7:43
2190<
Source B 60000.0
60000.0<
Dest F8:20
0.03646667<

total volume
totaliser m3

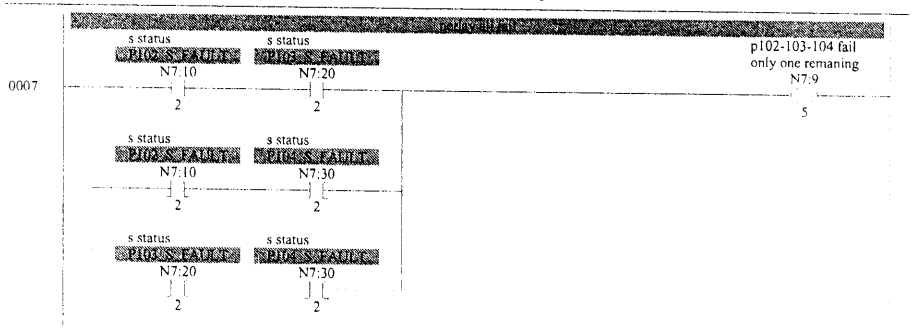
ADD
Add
Source A F8:21
385.7378<
Source B F8:20
0.03646667<
Dest F8:21
385.7378<

0006

fit total reset
fit102 flow
totaliser reset
N7:9
2

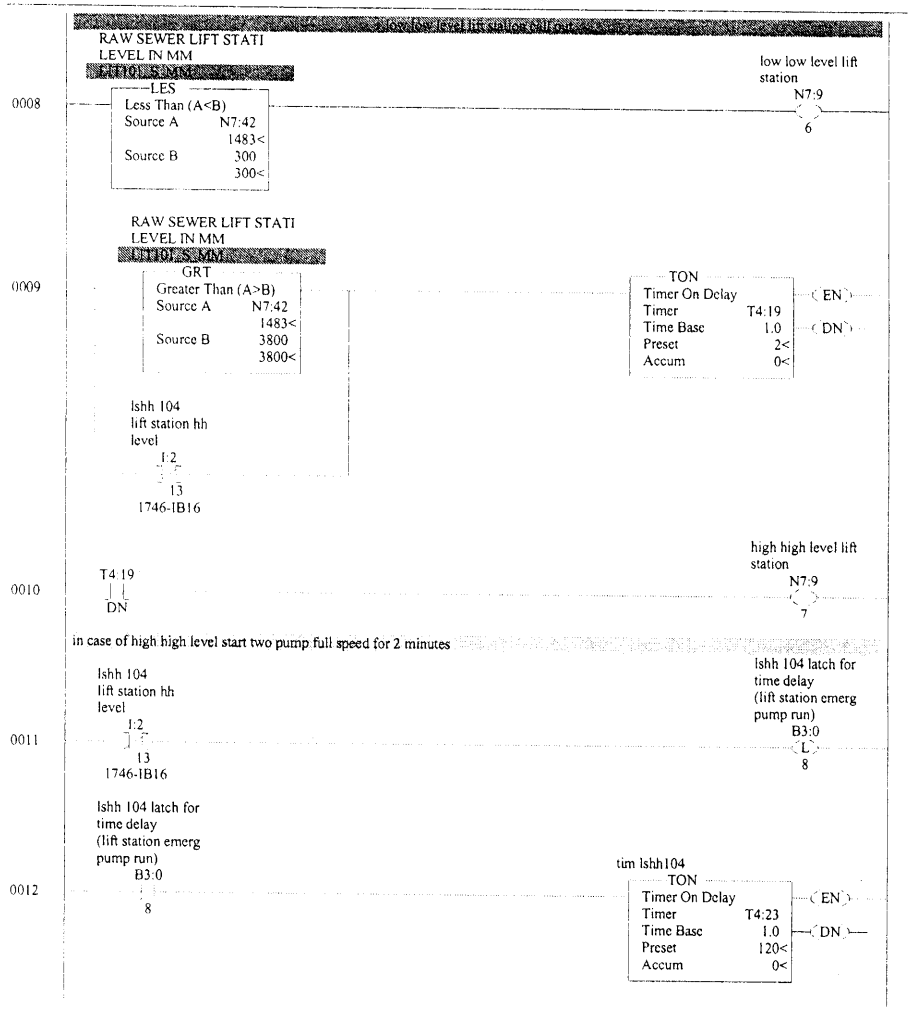
total volume
totaliser m3

MOV
Move
Source 0.0
0.0<
Dest F8:21
385.7378<


0007
s status
P102.S.FAULT
N7:10
2
s status
P103.S.FAULT
N7:20
2
p102-103-104 fail
only one remaning
N7:9
5
s status
P102.S.FAULT
N7:10
2
s status
P104.S.FAULT
N7:30
2
s status
P103.S.FAULT
N7:20
2
s status
P104.S.FAULT
N7:30
2






RAW SEWER LIFT STATI
LEVEL IN MM
LES
Less Than (A<B)
Source A N7:42
1483<
Source B 300
300<
low low level lift
station
N7:9
6
0008
RAW SEWER LIFT STATI
LEVEL IN MM
GRT
Greater Than (A>B)
Source A N7:42
1483<
Source B 3800
3800<
TON
Timer On Delay
Timer T4:19
Time Base 1.0
Preset 2<
Accum 0<
EN
DN
0009
lshh 104
lift station hh
level
I:2
13
1746-IB16
high high level lift
station
N7:9
7
T4:19
DN
0010
in case of high high level start two pump full speed for 2 minutes
lshh 104
lift station hh
level
I:2
13
1746-IB16
lshh 104 latch for
time delay
(lift station emerg
pump run)
B3:0
L
8
0011
lshh 104 latch for
time delay
(lift station emerg
pump run)
B3:0
8
tim lshh104
TON
Timer On Delay
Timer T4:23
Time Base 1.0
Preset 120<
Accum 0<
EN
DN
0012



151

0013

tim lshh104
T4:23
DN

lshh 104 latch for time delay (lift station emerg pump run)
B3:0
U
8





0014

status and resp p102

raw sewer
P102 AUTO
I:1
0
1746-IB16

e-stop p-102
I:7
6
1746-IA16

s status
UNDER PLC CONTROL
P102_S_AUTO
N7:10
0

raw sewer
P102 RUN
I:1
1
1746-IB16

s status
P102_S_RUNNING
N7:10
1

raw sewer
P102 FAULT
I:1
2
1746-IB16

s status
P102_S_FAULT
N7:10
2

s status
P102_S_FAULT
N7:20
2

s status
P104_S_FAULT
N7:30
2

0 LEAD, 1LAG 2 STAND
P102_S_PRIORITY

MOV
Move
Source 2
2<
Dest N7:14
0<

raw sewer
P102 LEAK
I:1
3
1746-IB16

s status
P102_S_LEEK
N7:10
3

0015

a -> action pv->plc
1AUTO 0HAND
[redacted]
N7:10
4

raw waste water
speed set point
analog out 4-20ma
int 6242-31208
[redacted]

SCP
Scale w/Parameters

| | |
|---|---|
| Input | N7:12 89< |
| Input Min. | 0 0< |
| Input Max. | 100 100< |
| Scaled Min. | 6242 6242< |
| Scaled Max. | 31208 31208< |
| Output | O:6.0 26964< |

a action (set point)
(0-100%)
[redacted]

B3:0
OSR
9

MOV
Move

| | |
|---|---|
| Source | N7:13 83< |
| Dest | N7:12 89< |

a -> action pv->plc
1AUTO 0HAND
[redacted]
N7:10
4

raw waste water
speed set point
analog out 4-20ma
int 6242-31208
[redacted]

SCP
Scale w/Parameters

| | |
|---|---|
| Input | N7:13 83< |
| Input Min. | 0 0< |
| Input Max. | 100 100< |
| Scaled Min. | 6242 6242< |
| Scaled Max. | 31208 31208< |
| Output | O:6.0 26964< |





0016

lshh 104 latch for
time delay
(lift station emerg
pump run)
B3:0
8

raw waste water
speed set point
analog out 4-20ma
int 6242-31208
[redacted]

MOV
Move

| | |
|---|---|
| Source | 31208 31208< |
| Dest | O:6.0 26964< |

s status
(CURRENT)(0-100%)
[redacted]

SCP
Scale w/Parameters

| | |
|---|---|
| Input | I:5.0 17133< |
| Input Min. | 4000 4000< |
| Input Max. | 20000 20000< |
| Scaled Min. | 0 0< |
| Scaled Max. | 100 100< |
| Output | N7:11 82< |

0017

a -> action pv->plc
1AUTO 0HAND
P102:A_0HAND
N7:10
4

a action (set point)
(0-100%)
P102:A_SPEED

GRT
Greater Than (A>B)
Source A N7:12 89<
Source B 30 30<

P102START
O:3
0
1746-OX8

a -> action pv->plc
1AUTO 0HAND
P102:A_0HAND
N7:10
4

E EXPECTED
(AUTO)(0-100%)
P102:E_SPEED

GEQ
Grtr Than or Eql (A>=B)
Source A N7:13 83<
Source B N7:47 75<

s status
(CURRENT)(0-100%)
P102:S_SPEED

GEQ
Grtr Than or Eql (A>=B)
Source A N7:11 82<
Source B 20 20<

lshh 104 latch for
time delay
(lift station emerg
pump run)
B3:0
8

0 LEAD, 1LAG 2 STAND
P102:A_PRIORITY

EQU
Equal
Source A N7:14 0<
Source B 0 0<

0 LEAD, 1LAG 2 STAND
P102:A_PRIORITY

EQU
Equal
Source A N7:14 0<
Source B 1 1<

0018

0 LEAD, 1LAG 2 STAND
P102:A_PRIORITY

MOV
Move
Source N7:14 0<
Dest N7:14 0<





0019

s status s status
1UNDER PLC CONTROL
P103:S_AUTO
N7:20
0

P103:AUTO
I:1
12
1746-IB16

e-stop p103
I:8
4
1746-IA16

s status
P103:S_RUNNING
N7:20
1

P103:RUN
I:1
13
1746-IB16

s status
P103:S_FAULT
N7:20
2

P103:FAULT
I:1
14
1746-IB16

s status
P103:S_FAULT0
N7:10
2

s status
P103:S_FAULT1
N7:30
2

0 LEAD, 1LAG 2 STAND
P103:A_PRIORITY

MOV
Move
Source 2 2<
Dest N7:24 1<

s status
P103:S_PEAK
N7:20
3

P103:PEAK
I:1
15
1746-IB16

0020

a -> action pv->plc
P101A_HAND
N7:20
4

raw waste water
speed set point
SCP[0]

SCP
Scale w/Parameters

| | |
|---|---|
| Input | N7:22 |
| | 0< |
| Input Min. | 0 |
| | 0< |
| Input Max. | 100 |
| | 100< |
| Scaled Min. | 6242 |
| | 6242< |
| Scaled Max. | 31208 |
| | 31208< |
| Output | O:6.2 |
| | 6242< |

a action (set point)
P101A_SPEED

B3:0
OSR
10

MOV
Move

| | |
|---|---|
| Source | N7:23 |
| | 0< |
| Dest | N7:22 |
| | 0< |

a -> action pv->plc
P102A_HAND
N7:20
4

raw waste water
speed set point
SCP[0]

SCP
Scale w/Parameters

| | |
|---|---|
| Input | N7:23 |
| | 0< |
| Input Min. | 0 |
| | 0< |
| Input Max. | 100 |
| | 100< |
| Scaled Min. | 6242 |
| | 6242< |
| Scaled Max. | 31208 |
| | 31208< |
| Output | O:6.2 |
| | 6242< |

lshh 104 latch for
time delay
(lift station emerg
pump run)
B3:0
8

raw waste water
speed set point
SCP[0]

MOV
Move

| | |
|---|---|
| Source | 31208 |
| | 31208< |
| Dest | O:6.2 |
| | 6242< |





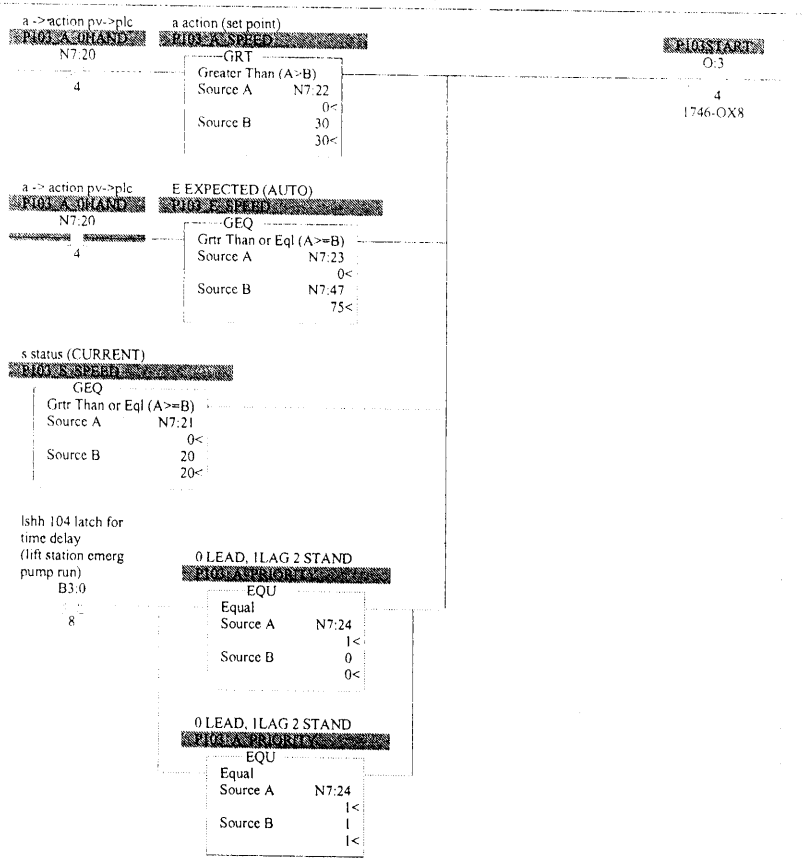
0021

s status (CURRENT)
P102A_SPEED

SCP
Scale w/Parameters

| | |
|---|---|
| Input | I:5.3 |
| | 3990< |
| Input Min. | 4000 |
| | 4000< |
| Input Max. | 20000 |
| | 20000< |
| Scaled Min. | 0 |
| | 0< |
| Scaled Max. | 100 |
| | 100< |
| Output | N7:21 |
| | 0< |

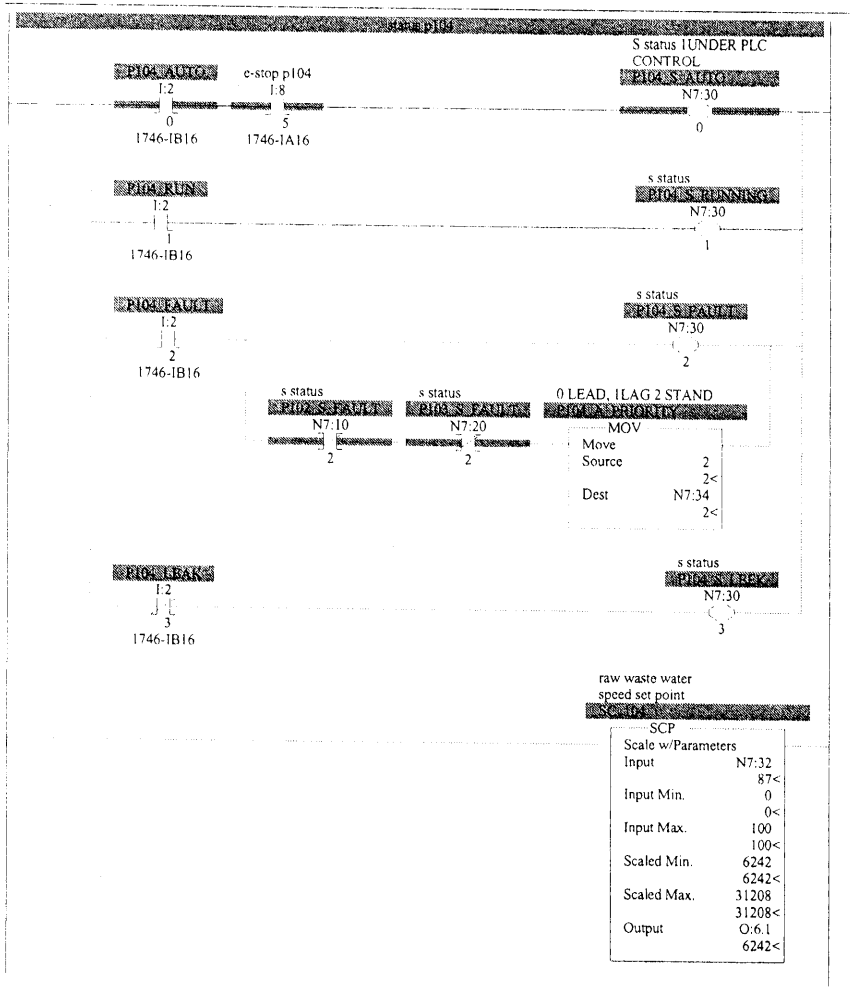
0022





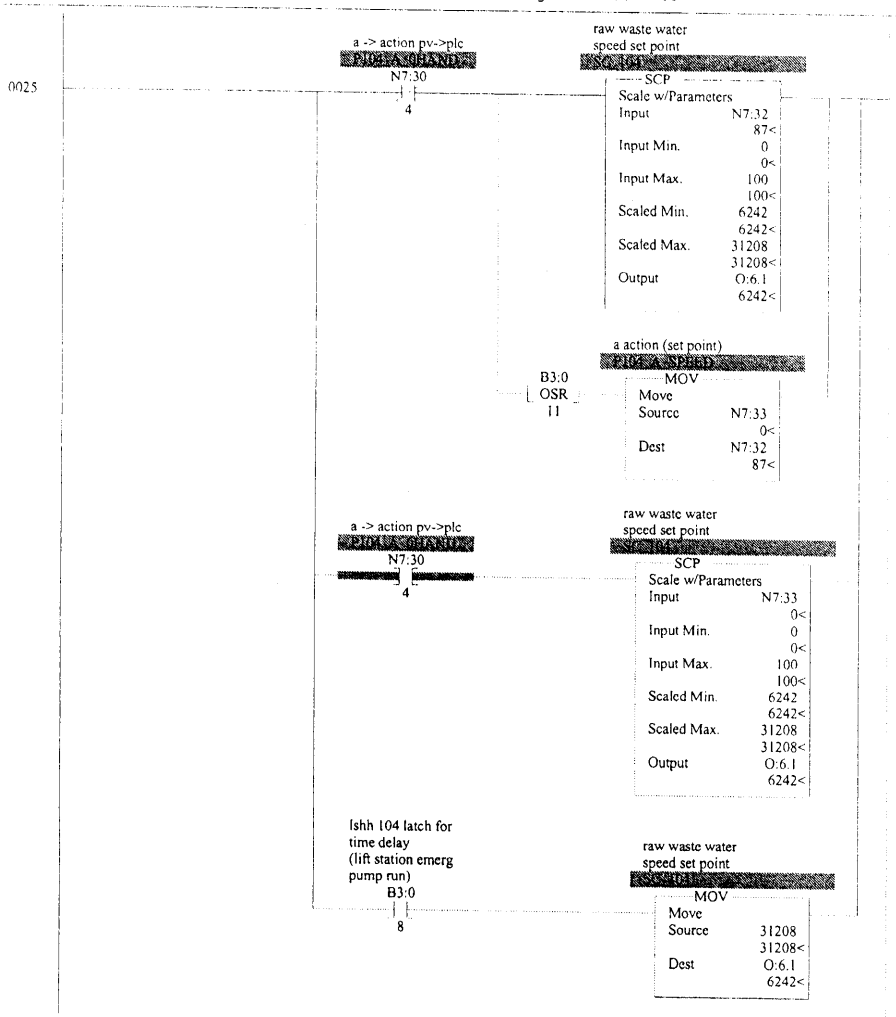



0023




0024

0025

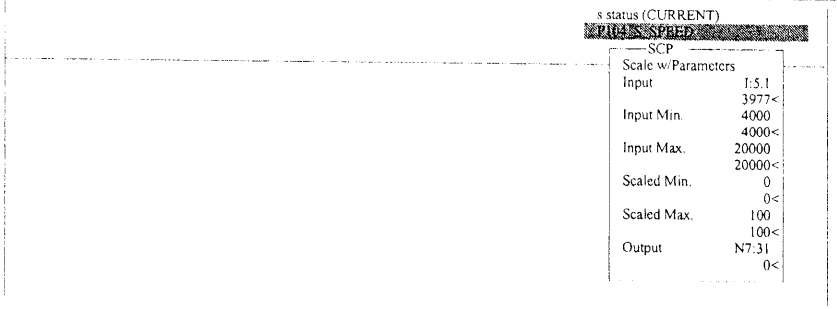


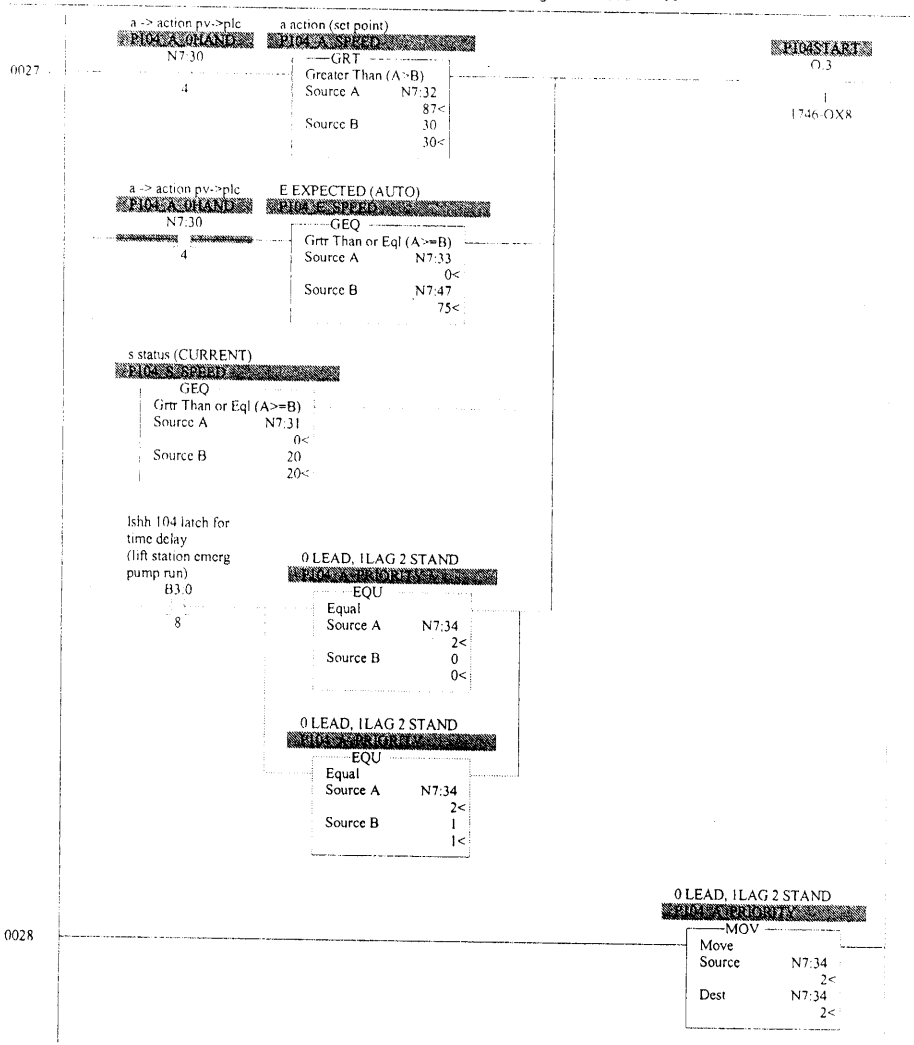



15.1



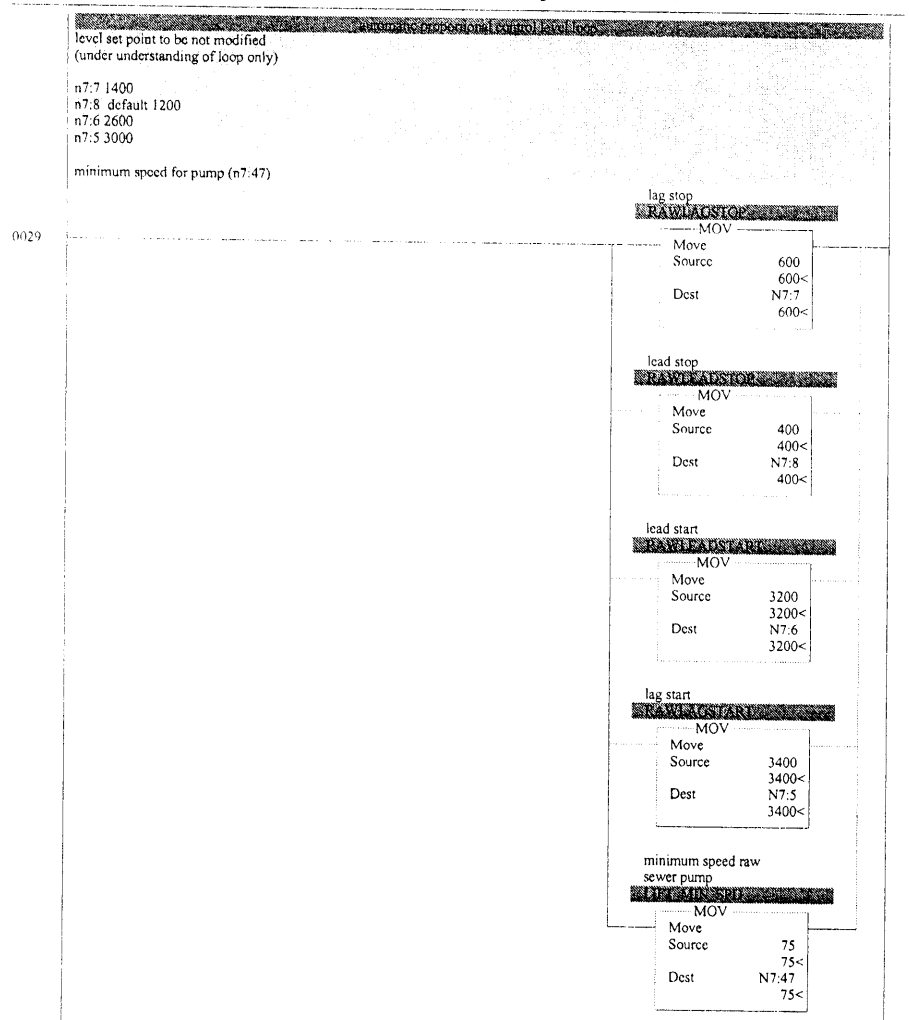
0026




a -> action pv->plc
P104:A.0HAND
N7:30
4
a action (set point)
P104:A.SPEED
GRT
Greater Than (A>B)
Source A N7:32
87<
Source B 30
30<
PI04START
O:3
1
1746:OX8
a -> action pv->plc
P104:A.0HAND
N7:30
4
E EXPECTED (AUTO)
P104:E.SPEED
GEQ
Grtr Than or Eql (A>=B)
Source A N7:33
0<
Source B N7:47
75<
s status (CURRENT)
P104:S.SPEED
GEQ
Grtr Than or Eql (A>=B)
Source A N7:31
0<
Source B 20
20<
lshh 104 latch for
time delay
(lift station emerg
pump run)
B3:0
8
0 LEAD, 1LAG 2 STAND
P104:A.PRIORITY
EQU
Equal
Source A N7:34
2<
Source B 0
0<
0 LEAD, 1LAG 2 STAND
P104:A.PRIORITY
EQU
Equal
Source A N7:34
2<
Source B 1
1<
0 LEAD, 1LAG 2 STAND
P104:A.PRIORITY
MOV
Move
Source N7:34
2<
Dest N7:34
2<






Automatic proportional control level loop
level set point to be not modified
(under understanding of loop only)
n7:7 1400
n7:8 default 1200
n7:6 2600
n7:5 3000
minimum speed for pump (n7:47)
lag stop
RAW.LAGSTOP
MOV
Move
Source 600
600<
Dest N7:7
600<
lead stop
RAW.LEADSTOP
MOV
Move
Source 400
400<
Dest N7:8
400<
lead start
RAW.LEADSTART
MOV
Move
Source 3200
3200<
Dest N7:6
3200<
lag start
RAW.LAGSTART
MOV
Move
Source 3400
3400<
Dest N7:5
3400<
minimum speed raw
sewer pump
PP1.MIN_SPD
MOV
Move
Source 75
75<
Dest N7:47
75<

set up level control

level control
start polni lead lag , to be defined

0030

RAW SEWER LIFT STATI
LEVEL IN MM

LES
Less Than (A<B)
Source A N7:42 1483<
Source B N7:7 600<

RAWLAGLATCH
N7:9
U
1

RAW SEWER LIFT STATI
LEVEL IN MM

LES
Less Than (A<B)
Source A N7:42 1483<
Source B N7:8 400<

RAWLEADLATCH
N7:9
U
0

RAW SEWER LIFT STATI
LEVEL IN MM

GRT
Greater Than (A>B)
Source A N7:42 1483<
Source B 1400 1400<

RAWLEADLATCH
N7:9
L
0

lshh 104 latch for
time delay
(lift station emerg
pump run)
B3:0
8

RAW SEWER LIFT STATI
LEVEL IN MM

GRT
Greater Than (A>B)
Source A N7:42 1483<
Source B 3200 3200<

RAWLAGLATCH
N7:9
L
1

lshh 104 latch for
time delay
(lift station emerg
pump run)
B3:0
8





0031

math temp raw

SCP
Scale w/Parameters
Input N7:42 1483<
Input Min. N7:7 600<
Input Max. N7:6 3200<
Scaled Min. N7:47 75<
Scaled Max. 100 100<
Output N7:4 83<

math temp raw

GRT
Greater Than (A>B)
Source A N7:4 83<
Source B 100 100<

math temp raw

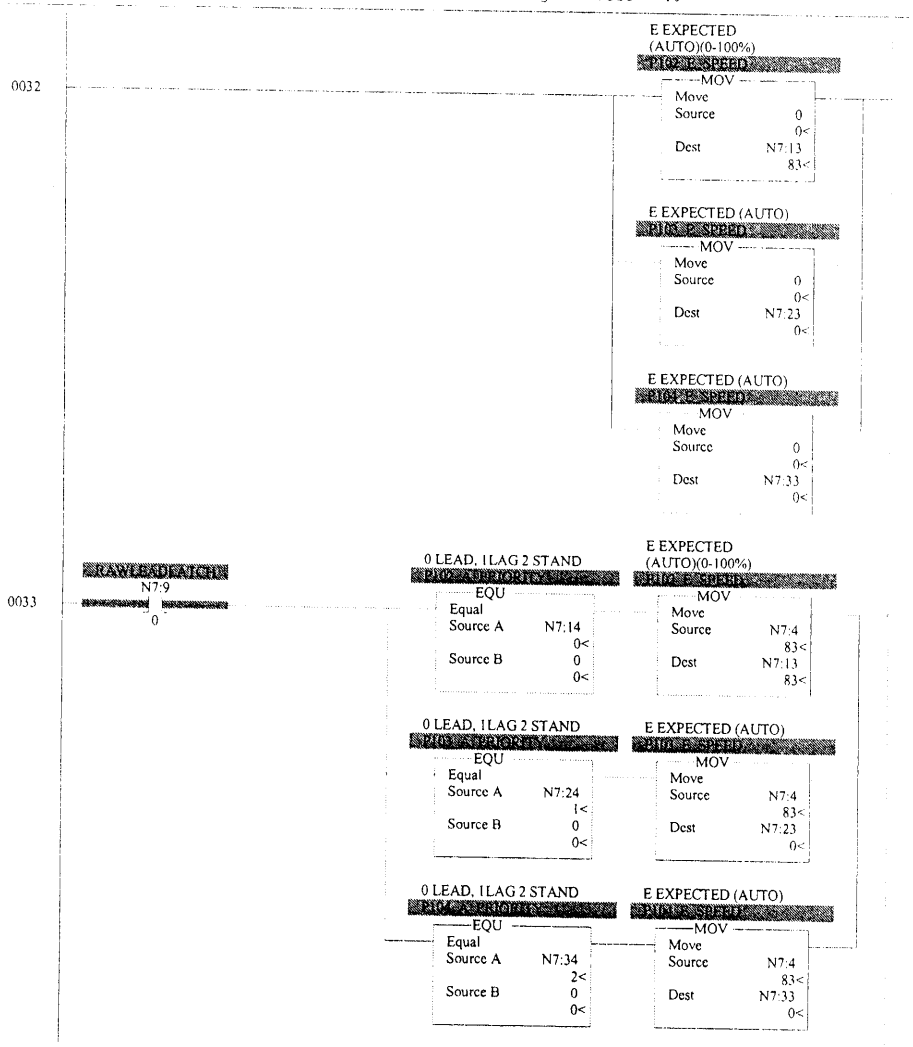
MOV
Move
Source 100 100<
Dest N7:4 83<

math temp raw

LES
Less Than (A<B)
Source A N7:4 83<
Source B N7:47 75<

math temp raw

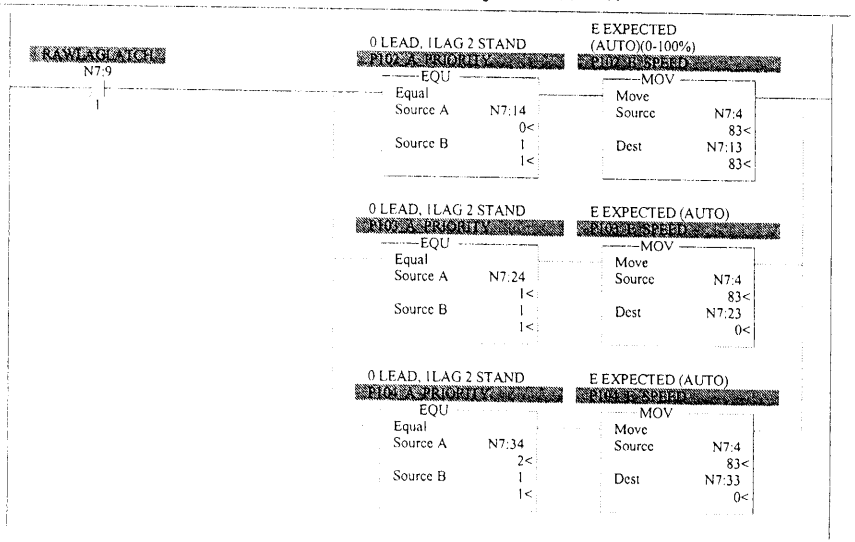
MOV
Move
Source N7:47 75<
Dest N7:4 83<


0032
E EXPECTED (AUTO)(0-100%)
P102 E SPEED
MOV
Move
Source 0 0<
Dest N7:13 83<
E EXPECTED (AUTO)
P103 E SPEED
MOV
Move
Source 0 0<
Dest N7:23 0<
E EXPECTED (AUTO)
P104 E SPEED
MOV
Move
Source 0 0<
Dest N7:33 0<
0033
RAWLEADLATCH
N7:9
0
0 LEAD, 1LAG 2 STAND
P102 A PRIORITY
EQU
Equal
Source A N7:14 0<
Source B 0 0<
E EXPECTED (AUTO)(0-100%)
P102 E SPEED
MOV
Move
Source N7:4 83<
Dest N7:13 83<
0 LEAD, 1LAG 2 STAND
P103 A PRIORITY
EQU
Equal
Source A N7:24 1<
Source B 0 0<
E EXPECTED (AUTO)
P103 E SPEED
MOV
Move
Source N7:4 83<
Dest N7:23 0<
0 LEAD, 1LAG 2 STAND
P104 A PRIORITY
EQU
Equal
Source A N7:34 2<
Source B 0 0<
E EXPECTED (AUTO)
P104 E SPEED
MOV
Move
Source N7:4 83<
Dest N7:33 0<



151




0034
RAWLAGLATCH
N7:9
1
0 LEAD, 1LAG 2 STAND
P102 A PRIORITY
EQU
Equal
Source A N7:14 0<
Source B 1 1<
E EXPECTED (AUTO)(0-100%)
P102 E SPEED
MOV
Move
Source N7:4 83<
Dest N7:13 83<
0 LEAD, 1LAG 2 STAND
P103 A PRIORITY
EQU
Equal
Source A N7:24 1<
Source B 1 1<
E EXPECTED (AUTO)
P103 E SPEED
MOV
Move
Source N7:4 83<
Dest N7:23 0<
0 LEAD, 1LAG 2 STAND
P104 A PRIORITY
EQU
Equal
Source A N7:34 2<
Source B 1 1<
E EXPECTED (AUTO)
P104 E SPEED
MOV
Move
Source N7:4 83<
Dest N7:33 0<

RESET MINICAS ALARM

0035

LEEK ALARM RESET
MINICASRESET
N7:10
5

MINICAS LEEK ALARM RESET
LEAKALARMSRESET
O:3
7
1746-OX8





priority management B102

0036

0 LEAD, 1LAG 2 STAND
B102:A PRIORITY
NEQ
Not Equal
Source A N7:14 0<
Source B N7:240 0<

COPY N7:14 ... N7:240
MOV
Move
Source N7:14 0<
Dest N7:240 0<

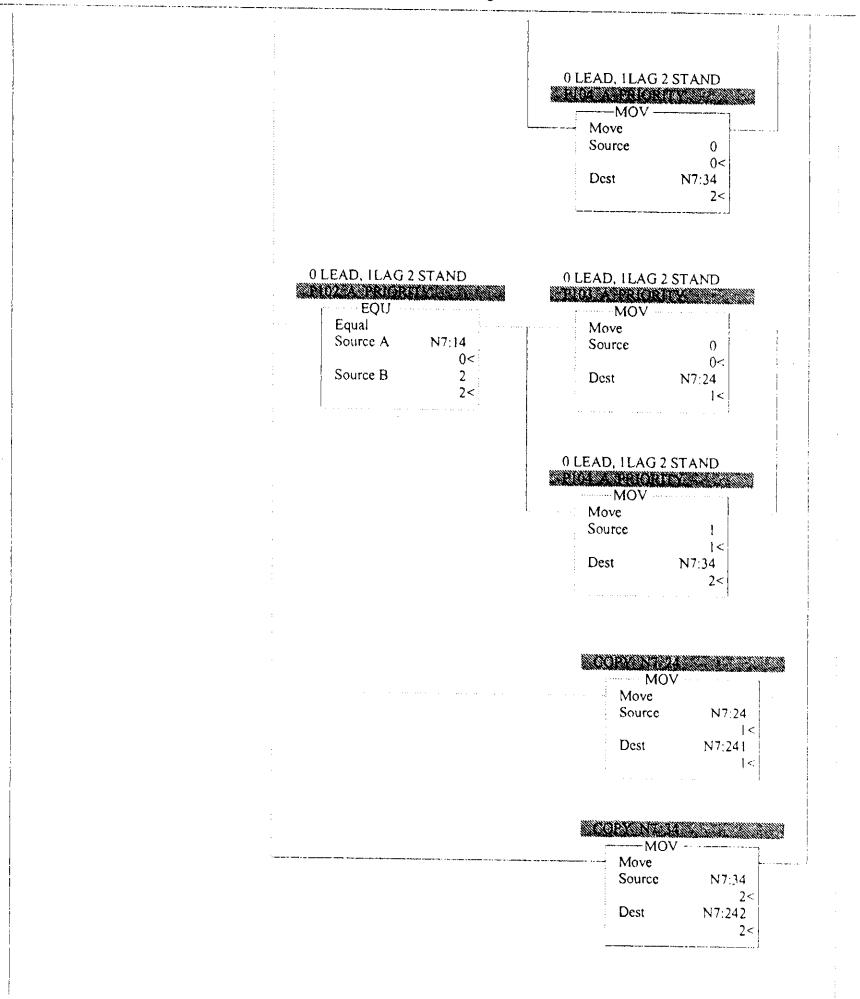
0 LEAD, 1LAG 2 STAND
B102:A PRIORITY
EQU
Equal
Source A N7:14 0<
Source B 0 0<

0 LEAD, 1LAG 2 STAND
B103:A PRIORITY
MOV
Move
Source 1 1<
Dest N7:24 1<

0 LEAD, 1LAG 2 STAND
B104:A PRIORITY
MOV
Move
Source 2 2<
Dest N7:34 2<

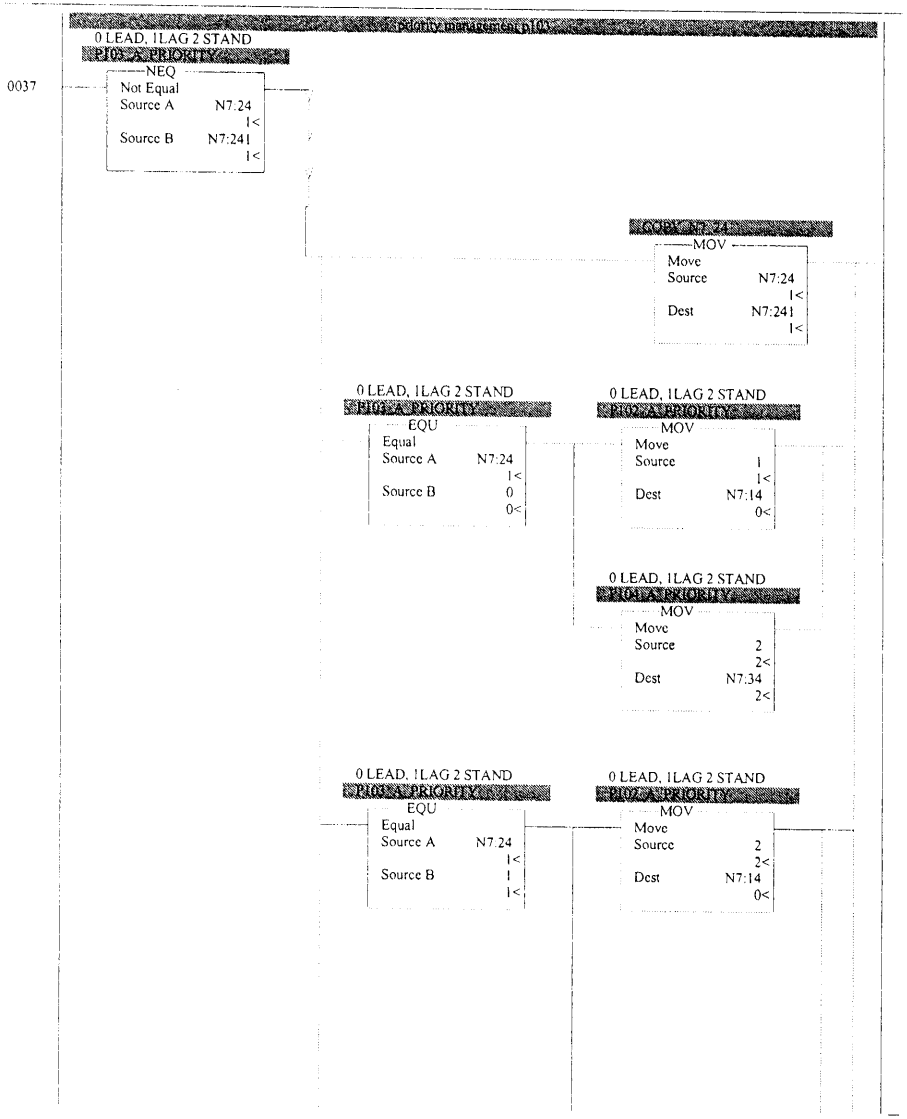
0 LEAD, 1LAG 2 STAND
B102:A PRIORITY
EQU
Equal
Source A N7:14 0<
Source B 1 1<

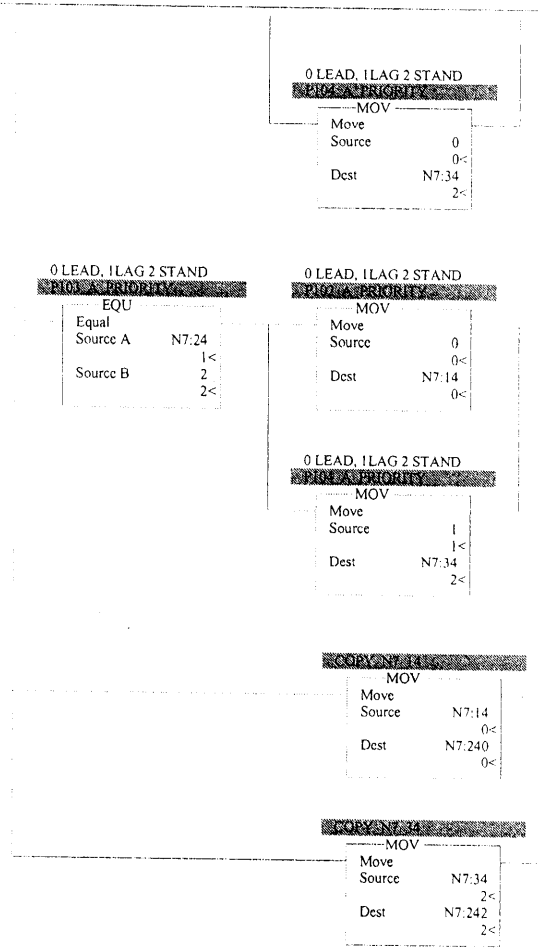
0 LEAD, 1LAG 2 STAND
B103:A PRIORITY
MOV
Move
Source 2 2<
Dest N7:24 1<


0 LEAD, 1LAG 2 STAND
MOV
Move
Source 0
Dest N7:34
0 LEAD, 1LAG 2 STAND
EQU
Equal
Source A N7:14
Source B 2
0 LEAD, 1LAG 2 STAND
MOV
Move
Source 0
Dest N7:24
0 LEAD, 1LAG 2 STAND
MOV
Move
Source 1
Dest N7:34
MOV
Move
Source N7:24
Dest N7:241
MOV
Move
Source N7:34
Dest N7:242



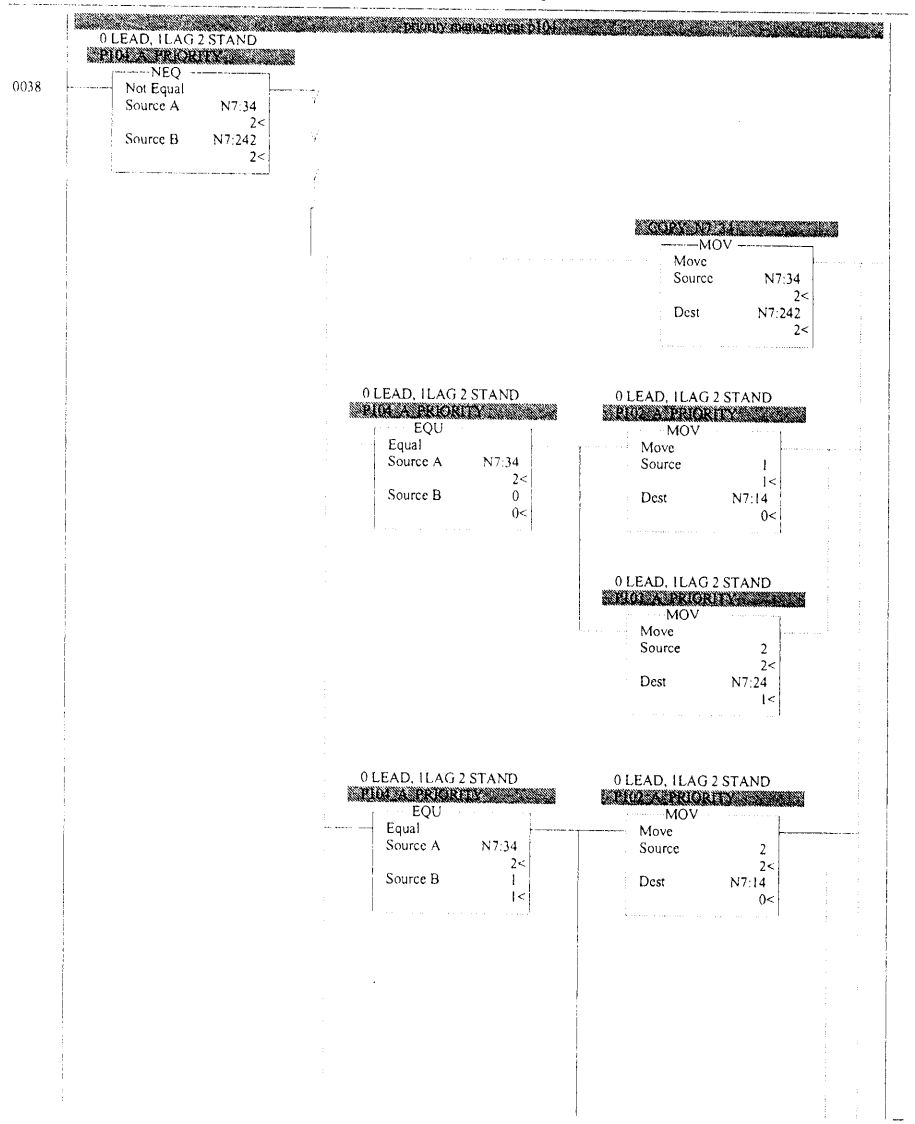


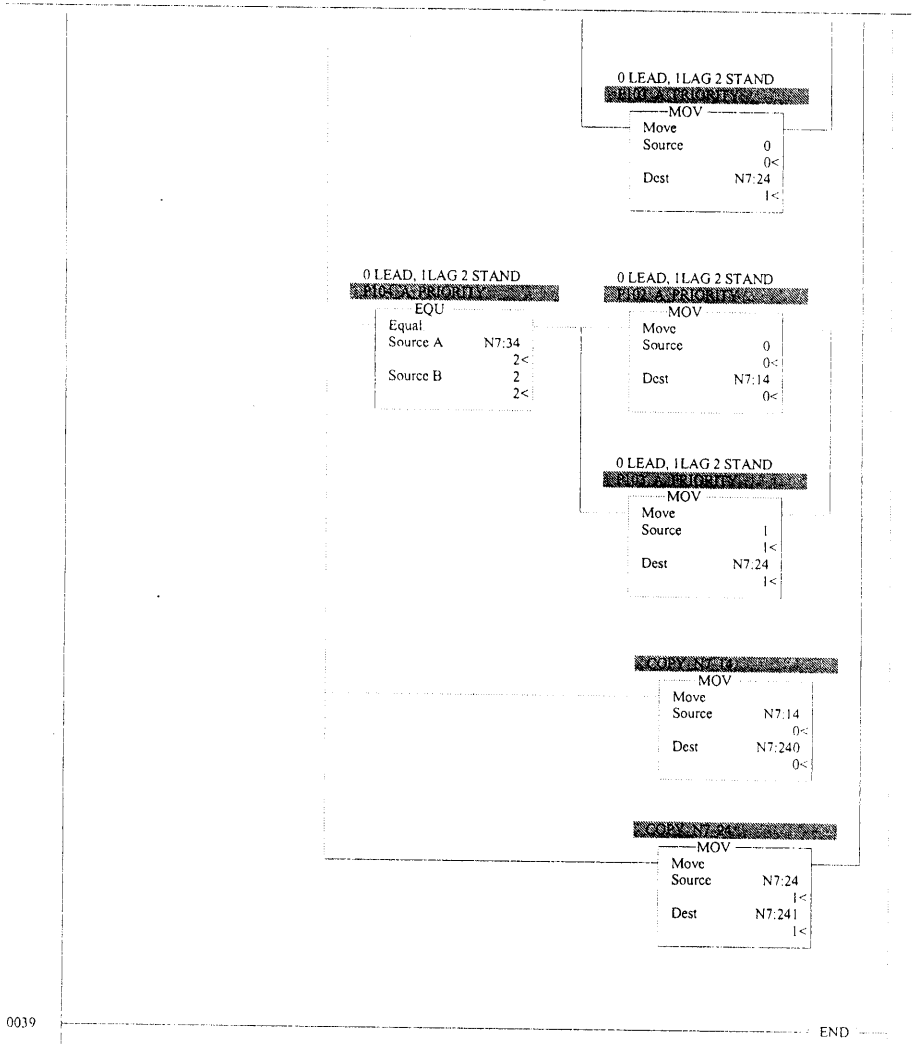

0 LEAD, 1LAG 2 STAND
0037
NEQ
Not Equal
Source A N7:24
Source B N7:241
MOV
Move
Source N7:24
Dest N7:241
0 LEAD, 1LAG 2 STAND
EQU
Equal
Source A N7:24
Source B 0
0 LEAD, 1LAG 2 STAND
MOV
Move
Source 1
Dest N7:14
0 LEAD, 1LAG 2 STAND
MOV
Move
Source 2
Dest N7:34
0 LEAD, 1LAG 2 STAND
EQU
Equal
Source A N7:24
Source B 1
0 LEAD, 1LAG 2 STAND
MOV
Move
Source 2
Dest N7:14


0 LEAD, 1LAG 2 STAND
P104 A PRIORITY
MOV
Move
Source 0
Dest N7:34
0 LEAD, 1LAG 2 STAND
P103 A PRIORITY
EQU
Equal
Source A N7:24
Source B 2
0 LEAD, 1LAG 2 STAND
P102 A PRIORITY
MOV
Move
Source 0
Dest N7:14
0 LEAD, 1LAG 2 STAND
P104 A PRIORITY
MOV
Move
Source 1
Dest N7:34
COPY N7:14
MOV
Move
Source N7:14
Dest N7:240
COPY N7:34
MOV
Move
Source N7:34
Dest N7:242



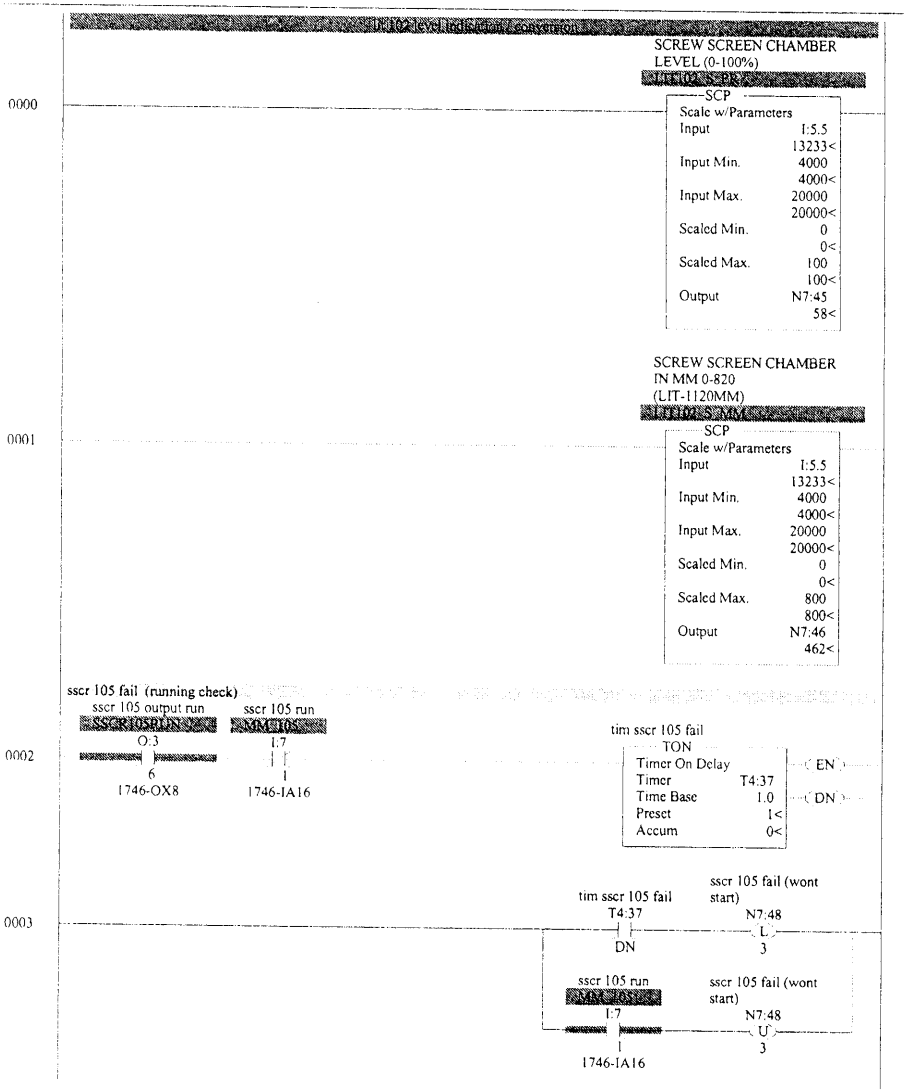


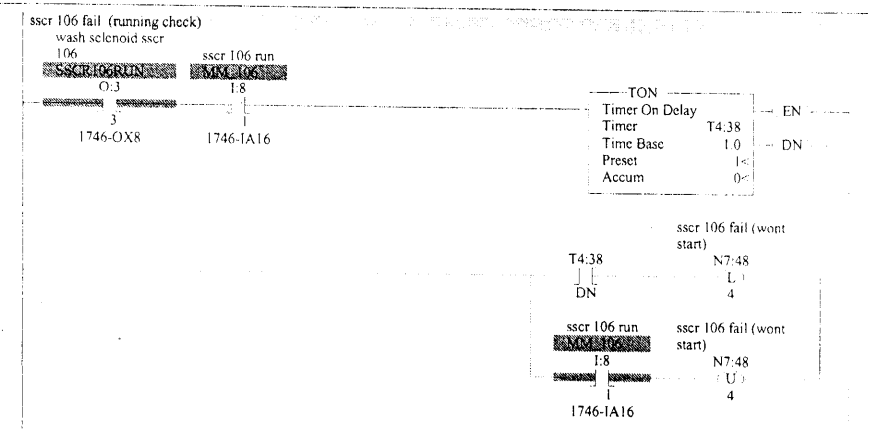

0038
0 LEAD, 1LAG 2 STAND
P104 A PRIORITY
NEQ
Not Equal
Source A N7:34
Source B N7:242
COPY N7:34
MOV
Move
Source N7:34
Dest N7:242
0 LEAD, 1LAG 2 STAND
P104 A PRIORITY
EQU
Equal
Source A N7:34
Source B 0
0 LEAD, 1LAG 2 STAND
P102 A PRIORITY
MOV
Move
Source 1
Dest N7:14
0 LEAD, 1LAG 2 STAND
P103 A PRIORITY
MOV
Move
Source 2
Dest N7:24
0 LEAD, 1LAG 2 STAND
P104 A PRIORITY
EQU
Equal
Source A N7:34
Source B 1
0 LEAD, 1LAG 2 STAND
P102 A PRIORITY
MOV
Move
Source 2
Dest N7:14


0 LEAD, 1LAG 2 STAND
MOV
Move
Source 0
Dest N7:24
0 LEAD, 1LAG 2 STAND
EQU
Equal
Source A N7:34
Source B 2
0 LEAD, 1LAG 2 STAND
MOV
Move
Source 0
Dest N7:14
0 LEAD, 1LAG 2 STAND
MOV
Move
Source 1
Dest N7:24
MOV
Move
Source N7:14
Dest N7:240
MOV
Move
Source N7:24
Dest N7:241
0039
END



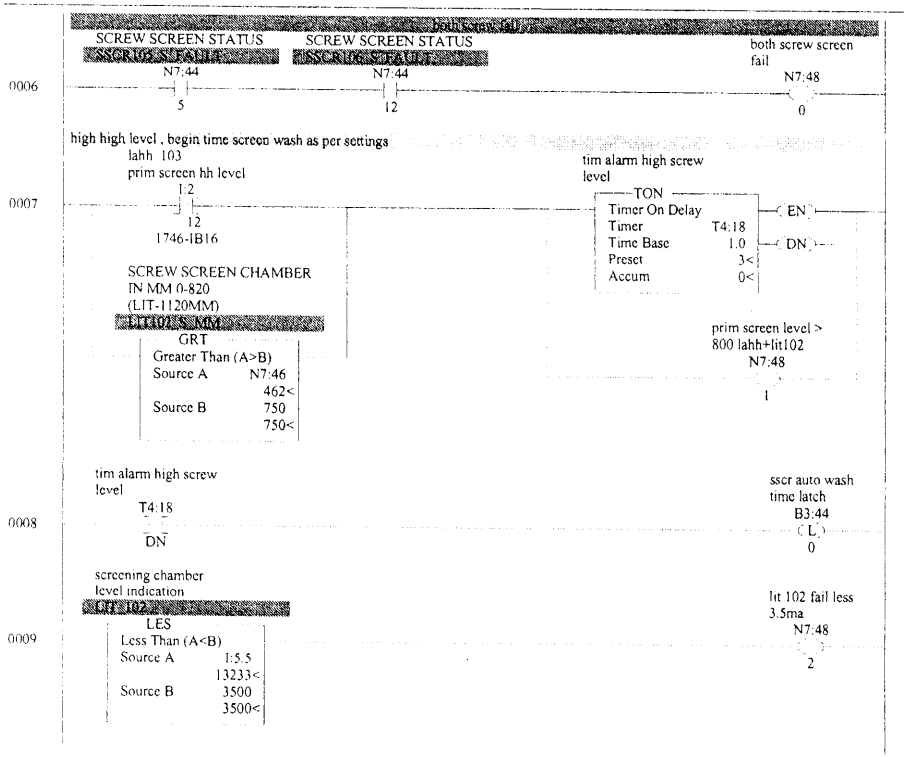



SCREW SCREEN CHAMBER
LEVEL (0-100%)
SCP
Scale w/Parameters
Input I:5.5
13233<
Input Min. 4000
4000<
Input Max. 20000
20000<
Scaled Min. 0
0<
Scaled Max. 100
100<
Output N7:45
58<
0000
SCREW SCREEN CHAMBER
IN MM 0-820
(LIT-1120MM)
SCP
Scale w/Parameters
Input I:5.5
13233<
Input Min. 4000
4000<
Input Max. 20000
20000<
Scaled Min. 0
0<
Scaled Max. 800
800<
Output N7:46
462<
0001
sscr 105 fail (running check)
sscr 105 output run
O:3
6
1746-OX8
sscr 105 run
I:7
1
1746-IA16
0002
tim sscr 105 fail
TON
Timer On Delay
Timer T4:37
Time Base 1.0
Preset 1<
Accum 0<
EN
DN
0003
tim sscr 105 fail
T4:37
DN
sscr 105 fail (wont start)
N7:48
L
3
sscr 105 run
I:7
1
1746-IA16
sscr 105 fail (wont start)
N7:48
U
3

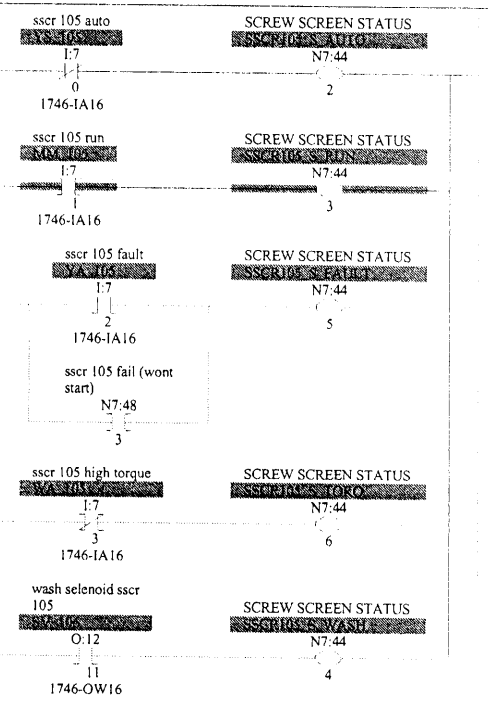

sscr 106 fail (running check)
wash selenoid sscr 106
SSCR106RUN
O:3
3
1746-OX8
sscr 106 run
MM106T
I:8
1746-IA16
0004
TON
Timer On Delay
Timer T4:38
Time Base 1.0
Preset 1<
Accum 0<
EN
DN
0005
T4:38
DN
sscr 106 fail (wont start)
N7:48
L
4
sscr 106 run
MM106T
I:8
1746-IA16
sscr 106 fail (wont start)
N7:48
U
4






both screw fail
SCREW SCREEN STATUS
SSCR103FAULT
N7:44
5
SCREW SCREEN STATUS
SSCR106FAULT
N7:44
12
both screw screen fail
N7:48
0
0006
high high level , begin time screen wash as per settings
lahh 103
prim screen hh level
I:2
12
1746-IB16
0007
tim alarm high screw level
TON
Timer On Delay
Timer T4:18
Time Base 1.0
Preset 3<
Accum 0<
EN
DN
SCREW SCREEN CHAMBER
IN MM 0-820
(LIT-1120MM)
LIT102SMM
GRT
Greater Than (A>B)
Source A N7:46
462<
Source B 750
750<
prim screen level > 800 lahh+lit102
N7:48
1
tim alarm high screw level
T4:18
DN
0008
sscr auto wash time latch
B3:44
L
0
screening chamber level indication
LIT102SMM
LES
Less Than (A<B)
Source A I:5.5
13233<
Source B 3500
3500<
0009
lit 102 fail less 3.5ma
N7:48
2

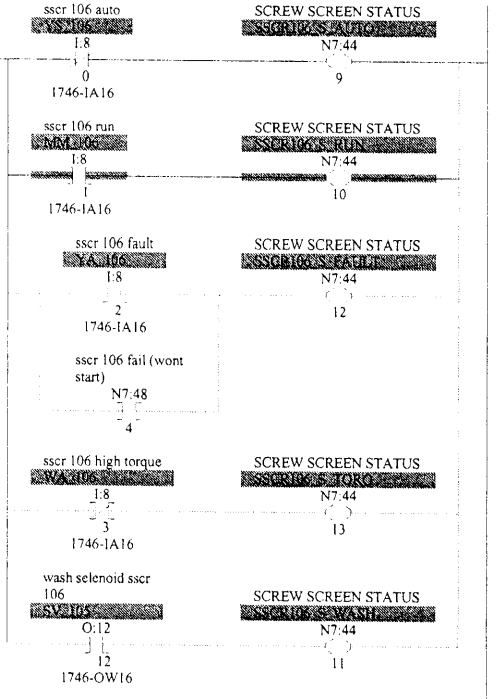
0010

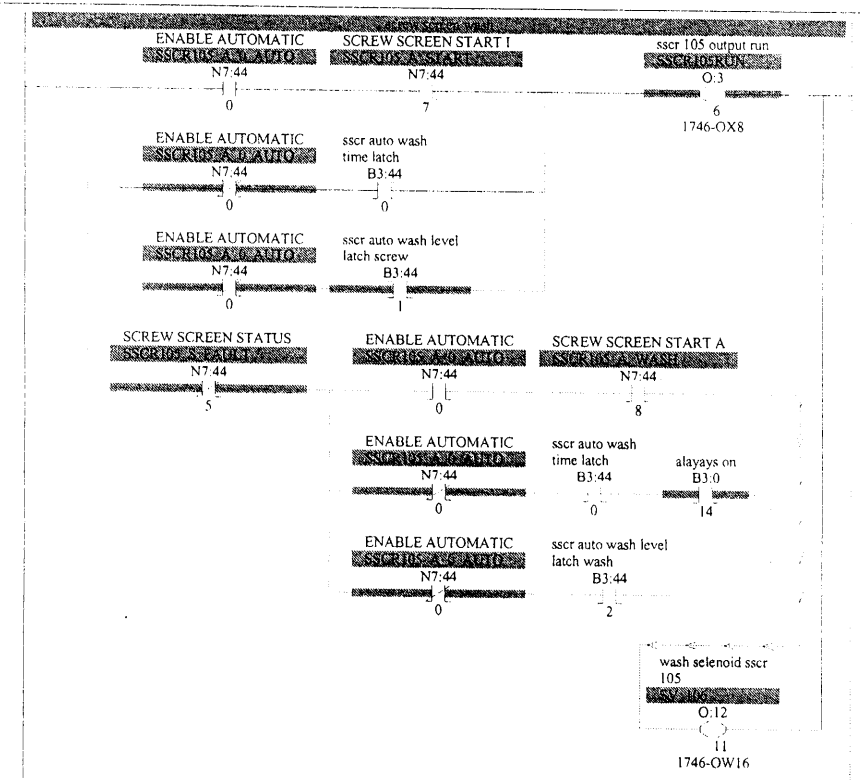

sscr 105 auto
I:7
0
1746-IA16
SCREW SCREEN STATUS
N7:44
2
sscr 105 run
I:7
1
1746-IA16
SCREW SCREEN STATUS
N7:44
3
sscr 105 fault
I:7
2
1746-IA16
SCREW SCREEN STATUS
N7:44
5
sscr 105 fail (wont start)
N7:48
3
sscr 105 high torque
I:7
3
1746-IA16
SCREW SCREEN STATUS
N7:44
6
wash selenoid sscr 105
O:12
11
1746-OW16
SCREW SCREEN STATUS
N7:44
4





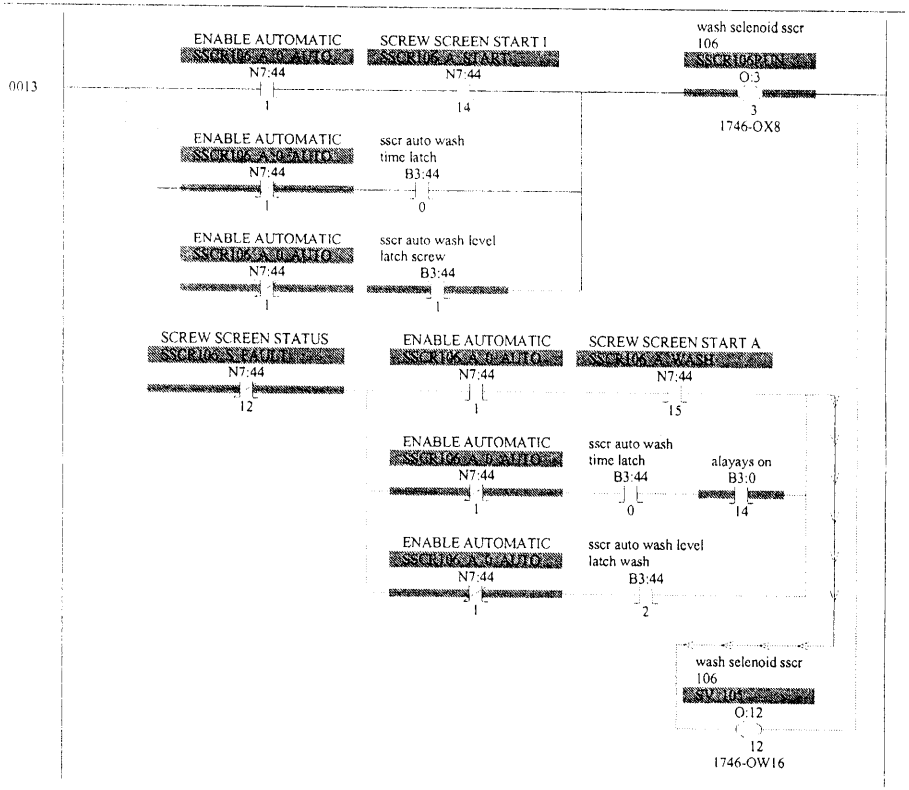
0011

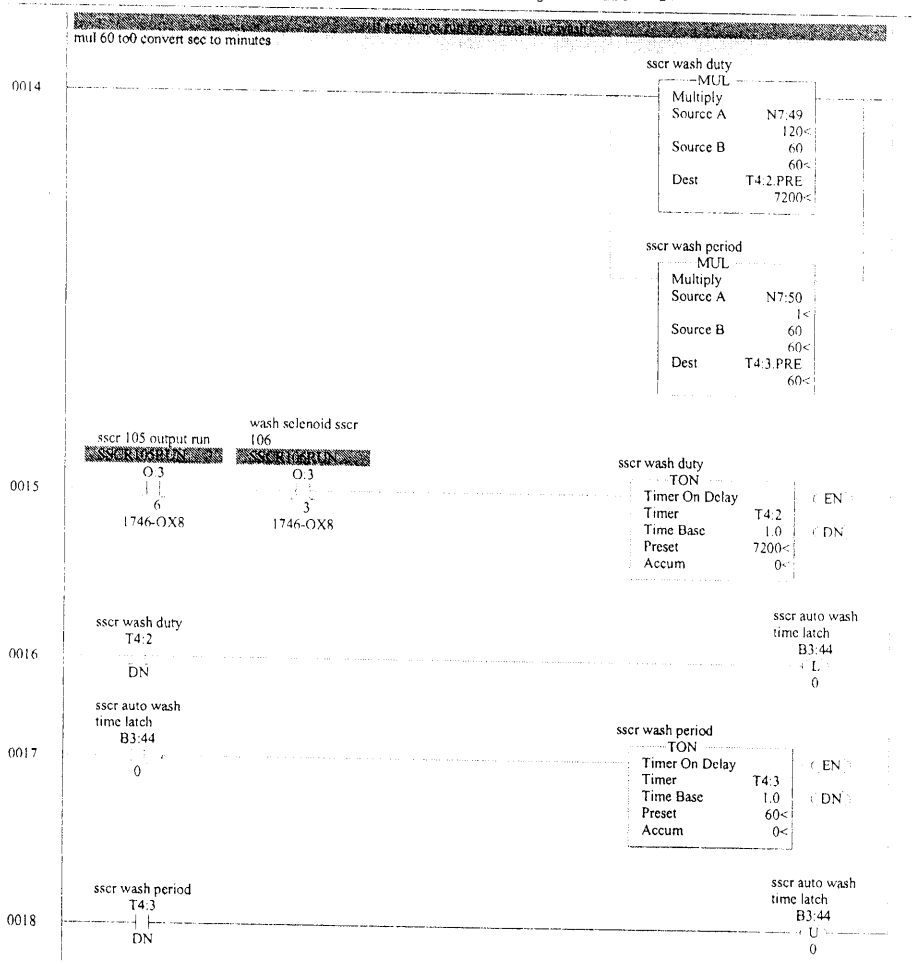

sscr 106 auto
I:8
0
1746-IA16
SCREW SCREEN STATUS
N7:44
9
sscr 106 run
I:8
1
1746-IA16
SCREW SCREEN STATUS
N7:44
10
sscr 106 fault
I:8
2
1746-IA16
SCREW SCREEN STATUS
N7:44
12
sscr 106 fail (wont start)
N7:48
4
sscr 106 high torque
I:8
3
1746-IA16
SCREW SCREEN STATUS
N7:44
13
wash selenoid sscr 106
O:12
12
1746-OW16
SCREW SCREEN STATUS
N7:44
11


0012
ENABLE AUTOMATIC
SSCR105:A:0.AUTO
N7:44
0
SCREW SCREEN START I
SSCR105:A:START
N7:44
7
sscr 105 output run
SSCR105RUN
O:3
6
1746-OX8
ENABLE AUTOMATIC
SSCR105:A:0.AUTO
N7:44
0
sscr auto wash
time latch
B3:44
0
ENABLE AUTOMATIC
SSCR105:A:0.AUTO
N7:44
0
sscr auto wash level
latch screw
B3:44
1
SCREW SCREEN STATUS
SSCR105:S:FAULT
N7:44
5
ENABLE AUTOMATIC
SSCR105:A:0.AUTO
N7:44
0
SCREW SCREEN START A
SSCR105:A:WASH
N7:44
8
ENABLE AUTOMATIC
SSCR105:A:0.AUTO
N7:44
0
sscr auto wash
time latch
B3:44
0
alayays on
B3:0
14
ENABLE AUTOMATIC
SSCR105:A:0.AUTO
N7:44
0
sscr auto wash level
latch wash
B3:44
2
wash selenoid sscr
105
SV105
O:12
11
1746-OW16



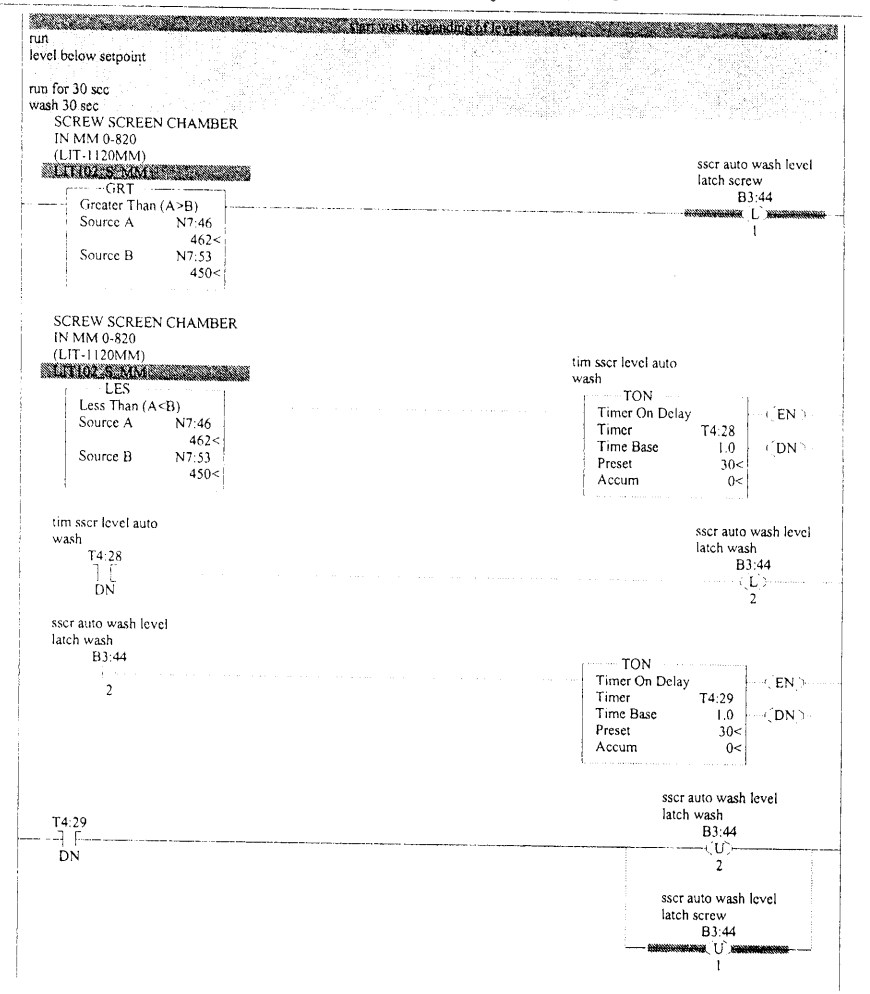



0013
ENABLE AUTOMATIC
SSCR106:A:0.AUTO
N7:44
1
SCREW SCREEN START I
SSCR106:A:START
N7:44
14
wash selenoid sscr
106
SSCR106RUN
O:3
3
1746-OX8
ENABLE AUTOMATIC
SSCR106:A:0.AUTO
N7:44
1
sscr auto wash
time latch
B3:44
0
ENABLE AUTOMATIC
SSCR106:A:0.AUTO
N7:44
1
sscr auto wash level
latch screw
B3:44
1
SCREW SCREEN STATUS
SSCR106:S:FAULT
N7:44
12
ENABLE AUTOMATIC
SSCR106:A:0.AUTO
N7:44
1
SCREW SCREEN START A
SSCR106:A:WASH
N7:44
15
ENABLE AUTOMATIC
SSCR106:A:0.AUTO
N7:44
1
sscr auto wash
time latch
B3:44
0
alayays on
B3:0
14
ENABLE AUTOMATIC
SSCR106:A:0.AUTO
N7:44
1
sscr auto wash level
latch wash
B3:44
2
wash selenoid sscr
106
SV106
O:12
12
1746-OW16


mul 60 to0 convert sec to minutes
0014
sscr wash duty
MUL
Multiply
Source A N7:49 120<
Source B 60 60<
Dest T4:2.PRE 7200<
sscr wash period
MUL
Multiply
Source A N7:50 1<
Source B 60 60<
Dest T4:3.PRE 60<
0015
sscr 105 output run
SSCR105RUN
O:3 6 1746-OX8
wash selenoid sscr 106
SSCR106RUN
O:3 3 1746-OX8
sscr wash duty
TON
Timer On Delay
Timer T4:2
Time Base 1.0
Preset 7200<
Accum 0<
EN
DN
0016
sscr wash duty T4:2 DN
sscr auto wash time latch B3:44 L 0
0017
sscr auto wash time latch B3:44 0
sscr wash period
TON
Timer On Delay
Timer T4:3
Time Base 1.0
Preset 60<
Accum 0<
EN
DN
0018
sscr wash period T4:3 DN
sscr auto wash time latch B3:44 U 0



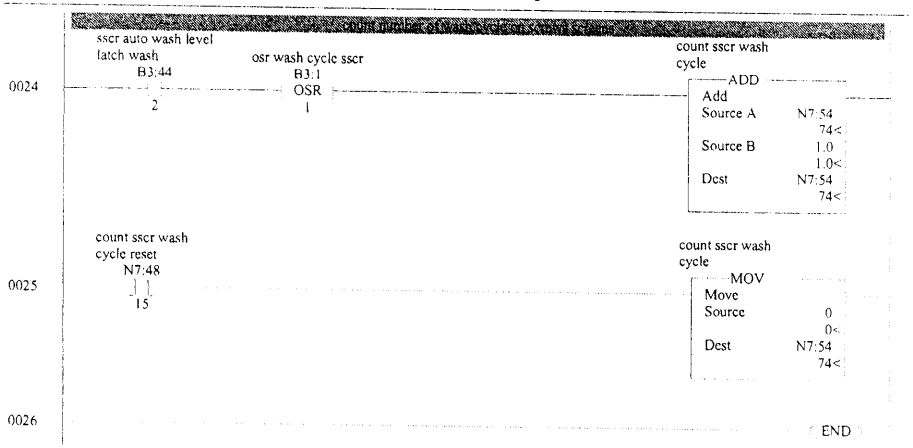



start wash depending of level
run
level below setpoint
run for 30 sec
wash 30 sec
0019
SCREW SCREEN CHAMBER
IN MM 0-820
(LIT-1120MM)
LIT102:S:MM
GRT
Greater Than (A>B)
Source A N7:46 462<
Source B N7:53 450<
sscr auto wash level latch screw B3:44 L 1
0020
SCREW SCREEN CHAMBER
IN MM 0-820
(LIT-1120MM)
LIT102:S:MM
LES
Less Than (A<B)
Source A N7:46 462<
Source B N7:53 450<
tim sscr level auto wash
TON
Timer On Delay
Timer T4:28
Time Base 1.0
Preset 30<
Accum 0<
EN
DN
0021
tim sscr level auto wash T4:28 DN
sscr auto wash level latch wash B3:44 L 2
0022
sscr auto wash level latch wash B3:44 2
TON
Timer On Delay
Timer T4:29
Time Base 1.0
Preset 30<
Accum 0<
EN
DN
0023
T4:29 DN
sscr auto wash level latch wash B3:44 U 2
sscr auto wash level latch screw B3:44 U 1



15.1

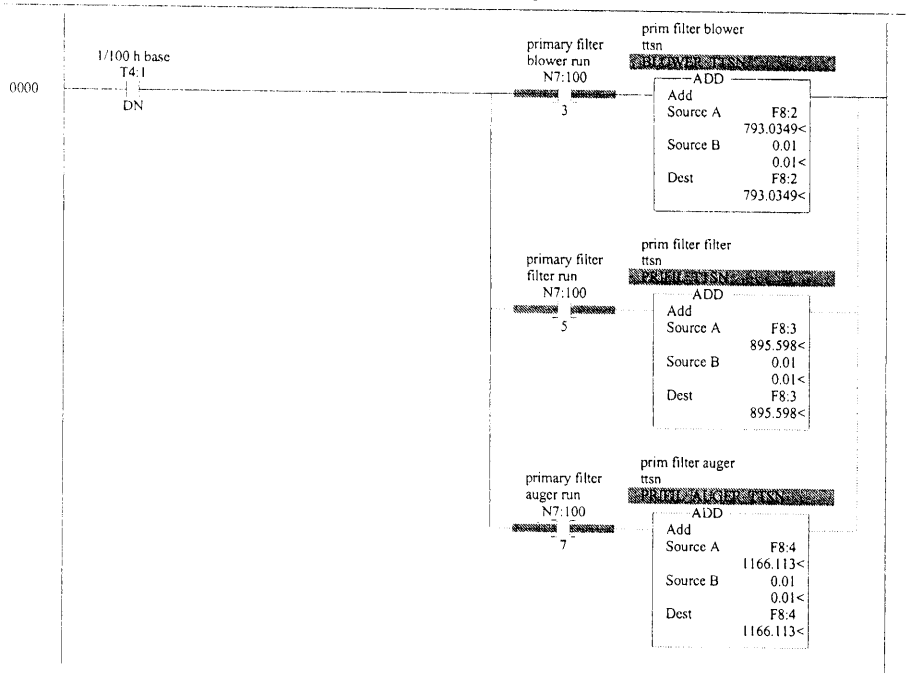
LAD 6 - PRIM SCRN --- Total Rungs in File = 27








LAD 7 - PRIM FILT --- Total Rungs in File = 44



4 - 20ma 0.1 bar full scale
0mm - 1020mm

set to -200 == 820 to permit -200 mm re3ading (lower level)

minimum speed on speed scale

0001

Time Base
S:4
6

osr few
B3:0
OSR
1

primary filter level
scaled in mm
PRIM_LVL.MM

SCP
Scale w/Parameters

| | |
|---|---|
| Input | I:5.7 |
| | 10362< |
| Input Min. | 4000 |
| | 4000< |
| Input Max. | 20000 |
| | 20000< |
| Scaled Min. | -200 |
| | -200< |
| Scaled Max. | 820 |
| | 820< |
| Output | N7:114 |
| | 206< |

calculated belt
speed function of
level via mmi
PRIM_CALCSPD

SCP
Scale w/Parameters

| | |
|---|---|
| Input | N7:114 |
| | 206< |
| Input Min. | N7:107 |
| | 200< |
| Input Max. | 300 |
| | 300< |
| Scaled Min. | 10 |
| | 10< |
| Scaled Max. | 100 |
| | 100< |
| Output | N7:113 |
| | 15< |





0002

calculated belt
speed function of
level via mmi
PRIM_CALCSPD

GRT
Greater Than (A>B)

| | |
|---|---|
| Source A | N7:113 |
| | 15< |
| Source B | 100 |
| | 100< |

calculated belt
speed function of
level via mmi
PRIM_CALCSPD

MOV
Move

| | |
|---|---|
| Source | 100 |
| | 100< |
| Dest | N7:113 |
| | 15< |

calculated belt
speed function of
level via mmi
PRIM_CALCSPD

LES
Less Than (A<B)

| | |
|---|---|
| Source A | N7:113 |
| | 15< |
| Source B | 10 |
| | 10< |

calculated belt
speed function of
level via mmi
PRIM_CALCSPD

MOV
Move

| | |
|---|---|
| Source | 10 |
| | 10< |
| Dest | N7:113 |
| | 15< |

sensor 0- 1 bar 14.7 psi 1000 Mb

0003

Time Base S:4 6

osr prifil B3:0 OSR 13

primary filter compressor pressure PRIFIL_COMP_PRESS

SCP

| Scale w/Parameters | |
|---|---|
| Input | I:14.0 |
| | 10438< |
| Input Min. | 4000 |
| | 4000< |
| Input Max. | 20000 |
| | 20000< |
| Scaled Min. | 0 |
| | 0< |
| Scaled Max. | 1000 |
| | 1000< |
| Output | N7:115 |
| | 402< |





begin belt at n7:107
speed proportional n7:107 - 300 mm
stop belt at n7:108 for stop

0004

primary filter level scaled in mm PRIFIL_LEVEL_MM

GRT
Greater Than (A>B)

| | |
|---|---|
| Source A | N7:114 |
| | 206< |
| Source B | N7:107 |
| | 200< |

prim filter belt ask run PRIFIL_BELTRUN N7:100 L 15

dewatering conveyor enable N7:100 L 2

primary filter level scaled in mm PRIFIL_LEVEL_MM

LES
Less Than (A<B)

| | |
|---|---|
| Source A | N7:114 |
| | 206< |
| Source B | N7:108 |
| | 70< |

prim filter belt ask run PRIFIL_BELTRUN N7:100 U 15

0005

lshh 104 latch for time delay (lift station emerg pump run) B3:0 8

start high speed flush PRIFIL_HSFLUSH N7:101 L 10

start wash depending of level ex: 300mm

0006

wash cycle start level PRIFIL_WASHREQLVL

GRT
Greater Than (A>B)

| | |
|---|---|
| Source A | N7:109 |
| | 305< |
| Source B | N7:114 |
| | 206< |

osr prim fil B3:2 OSR 3

start high speed flush PRIFIL_HSFLUSH N7:101 L 10

0007

filter belt speed
0 hand
1 auto (auto reset 2 minutes)
N7:101
0

primary filter belt speed
SCP
Scale w/Parameters
Input N7:112 61<
Input Min. 0 0<
Input Max. 100 100<
Scaled Min. 6242 6242<
Scaled Max. 31208 31208<
Output O:13.0 8988<

manual belt set speed from mmi
B3:0
OSR
12

MOV
Move
Source N7:113 15<
Dest N7:112 61<

filter belt speed
0 hand
1 auto (auto reset 2 minutes)
N7:101
0

primary filter belt speed
SCP
Scale w/Parameters
Input N7:113 15<
Input Min. 0 0<
Input Max. 100 100<
Scaled Min. 6242 6242<
Scaled Max. 31208 31208<
Output O:13.0 8988<

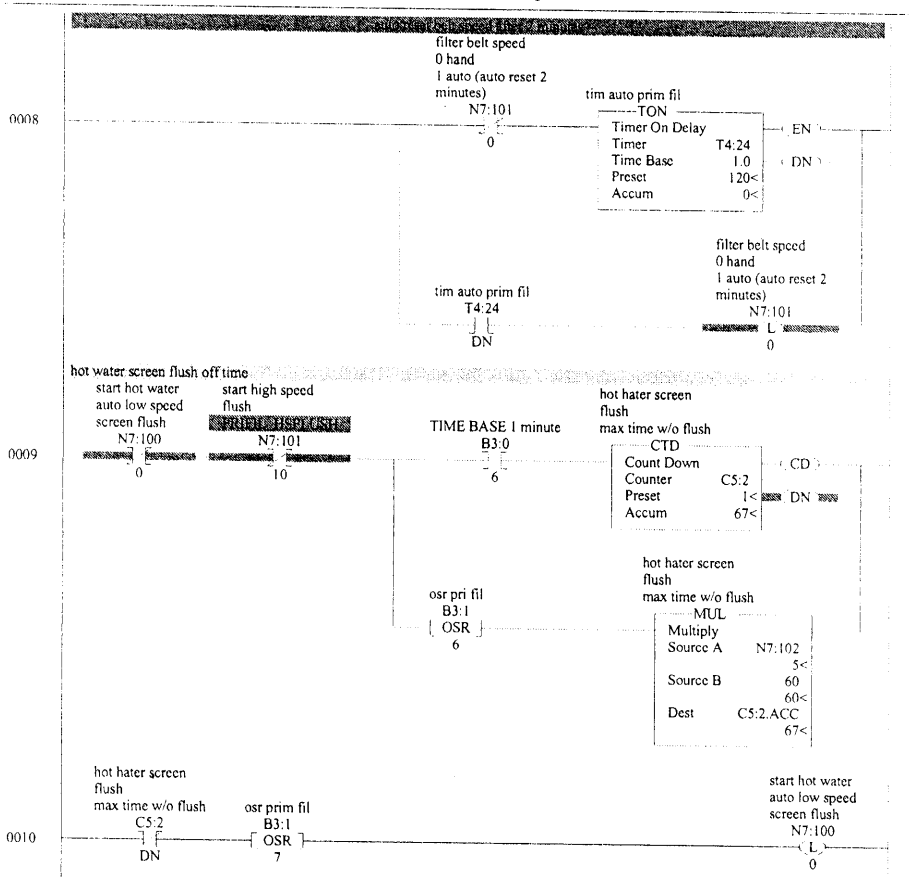




start high speed flush
N7:101
10

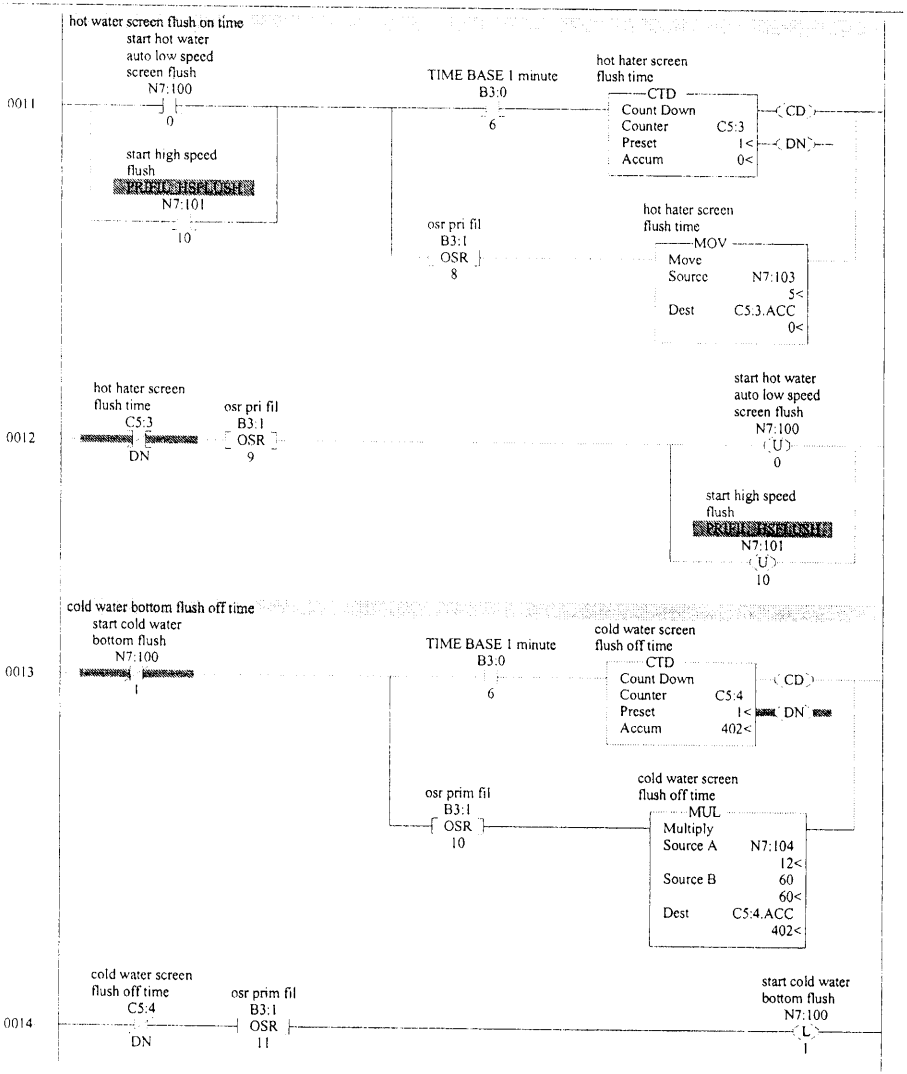
start hot water auto low speed screen flush
N7:100
0

primary filter belt speed
SCP
Scale w/Parameters
Input N7:111 47<
Input Min. 0 0<
Input Max. 100 100<
Scaled Min. 6242 6242<
Scaled Max. 31208 31208<
Output O:13.0 8988<


filter belt speed
0 hand
1 auto (auto reset 2
minutes)
N7:101
0
tim auto prim fil
TON
Timer On Delay
Timer T4:24
Time Base 1.0
Preset 120<
Accum 0<
EN
DN
0008
tim auto prim fil
T4:24
DN
filter belt speed
0 hand
1 auto (auto reset 2
minutes)
N7:101
L
0
hot water screen flush off time
start hot water
auto low speed
screen flush
N7:100
0
start high speed
flush
PRIFIL.HSPLOSH
N7:101
10
TIME BASE 1 minute
B3:0
6
hot hater screen
flush
max time w/o flush
CTD
Count Down
Counter C5:2
Preset 1<
Accum 67<
CD
DN
0009
osr pri fil
B3:1
OSR
6
hot hater screen
flush
max time w/o flush
MUL
Multiply
Source A N7:102
5<
Source B 60
60<
Dest C5:2.ACC
67<
hot hater screen
flush
max time w/o flush
C5:2
DN
osr prim fil
B3:1
OSR
7
0010
start hot water
auto low speed
screen flush
N7:100
L
0

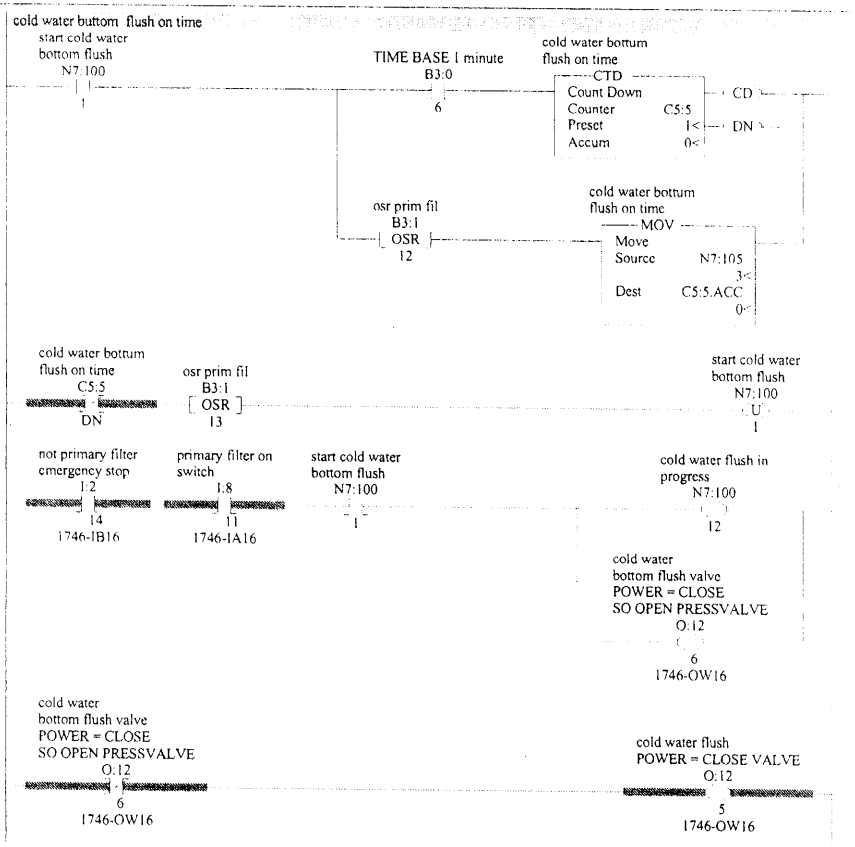





hot water screen flush on time
start hot water
auto low speed
screen flush
N7:100
0
start high speed
flush
PRIFIL.HSPLOSH
N7:101
10
TIME BASE 1 minute
B3:0
6
hot hater screen
flush time
CTD
Count Down
Counter C5:3
Preset 1<
Accum 0<
CD
DN
0011
osr pri fil
B3:1
OSR
8
hot hater screen
flush time
MOV
Move
Source N7:103
5<
Dest C5:3.ACC
0<
hot hater screen
flush time
C5:3
DN
osr pri fil
B3:1
OSR
9
0012
start hot water
auto low speed
screen flush
N7:100
U
0
start high speed
flush
PRIFIL.HSPLOSH
N7:101
U
10
cold water bottom flush off time
start cold water
bottom flush
N7:100
1
TIME BASE 1 minute
B3:0
6
cold water screen
flush off time
CTD
Count Down
Counter C5:4
Preset 1<
Accum 402<
CD
DN
0013
osr prim fil
B3:1
OSR
10
cold water screen
flush off time
MUL
Multiply
Source A N7:104
12<
Source B 60
60<
Dest C5:4.ACC
402<
cold water screen
flush off time
C5:4
DN
osr prim fil
B3:1
OSR
11
0014
start cold water
bottom flush
N7:100
L
1

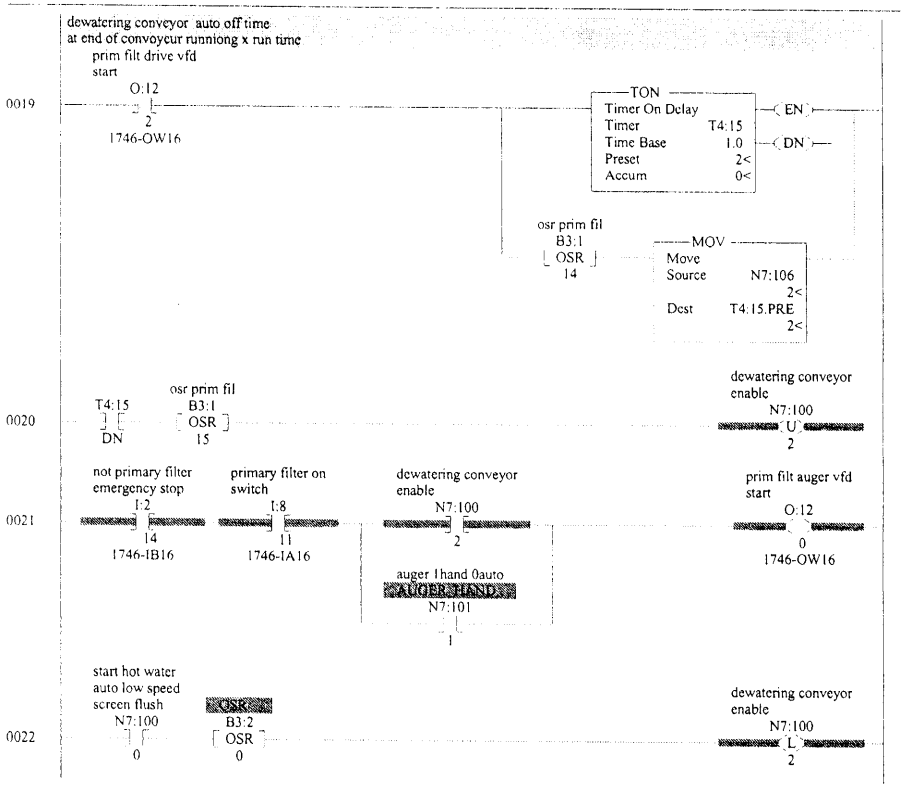


151


cold water buttom flush on time
start cold water bottom flush
N7:100
1
0015
TIME BASE 1 minute
B3:0
6
cold water bottum flush on time
CTD
Count Down
Counter C5:5
Preset 1<
Accum 0<
CD
DN
osr prim fil
B3:1
OSR
12
cold water bottum flush on time
MOV
Move
Source N7:105
3<
Dest C5:5.ACC
0<
cold water bottum flush on time
C5:5
DN
0016
osr prim fil
B3:1
OSR
13
start cold water bottom flush
N7:100
U
1
not primary filter emergency stop
I:2
14
1746-IB16
0017
primary filter on switch
I:8
11
1746-IA16
start cold water bottom flush
N7:100
1
cold water flush in progress
N7:100
12
cold water bottom flush valve
POWER = CLOSE
SO OPEN PRESSVALVE
O:12
6
1746-OW16
cold water bottom flush valve
POWER = CLOSE
SO OPEN PRESSVALVE
O:12
6
1746-OW16
0018
cold water flush
POWER = CLOSE VALVE
O:12
5
1746-OW16






dewatering conveyor auto off time
at end of convoyeur runniong x run time
prim filt drive vfd
start
O:12
2
1746-OW16
0019
TON
Timer On Delay
Timer T4:15
Time Base 1.0
Preset 2<
Accum 0<
EN
DN
osr prim fil
B3:1
OSR
14
MOV
Move
Source N7:106
2<
Dest T4:15.PRE
2<
T4:15
DN
osr prim fil
B3:1
OSR
15
0020
dewatering conveyor enable
N7:100
U
2
not primary filter emergency stop
I:2
14
1746-IB16
primary filter on switch
I:8
11
1746-IA16
dewatering conveyor enable
N7:100
2
auger 1hand 0auto
AUGER_HAND
N7:101
1
0021
prim filt auger vfd start
O:12
0
1746-OW16
start hot water auto low speed screen flush
N7:100
0
OSR
B3:2
OSR
0
0022
dewatering conveyor enable
N7:100
L
2

0023

not primary filter emergency stop
1:2
14
1746-IB16

primary filter on switch
1:8
11
1746-IA16

primary filter fail lamp
O:12
10
1746-OW16

primary filter run lamp
O:12
9
1746-OW16

primfil unit on
PRIMFIL_ON
N7:100
14

prim filter belt ask run
PRIFIL_BELTRUN
N7:100
15

start hot water auto low speed screen flush
N7:100
0

start high speed flush
PRIFIL_HISPEEDFLUSH
N7:101
10

filter belt speed
0 hand
1 auto (auto reset 2 minutes)
N7:101
0





prim filt drive vfd start
O:12
2
1746-OW16

prim blower fan start
O:12
8
1746-OW16

prim filter vfd run
1:1
10
1746-IB16

primary filter filter alarm vfd fail
N7:100
6

primary filter blower fan alarm
N7:100
10

prim blower start
O:12
7
1746-OW16

start hot water auto low speed screen flush
N7:100
0

hot water flush in progress
N7:100
11

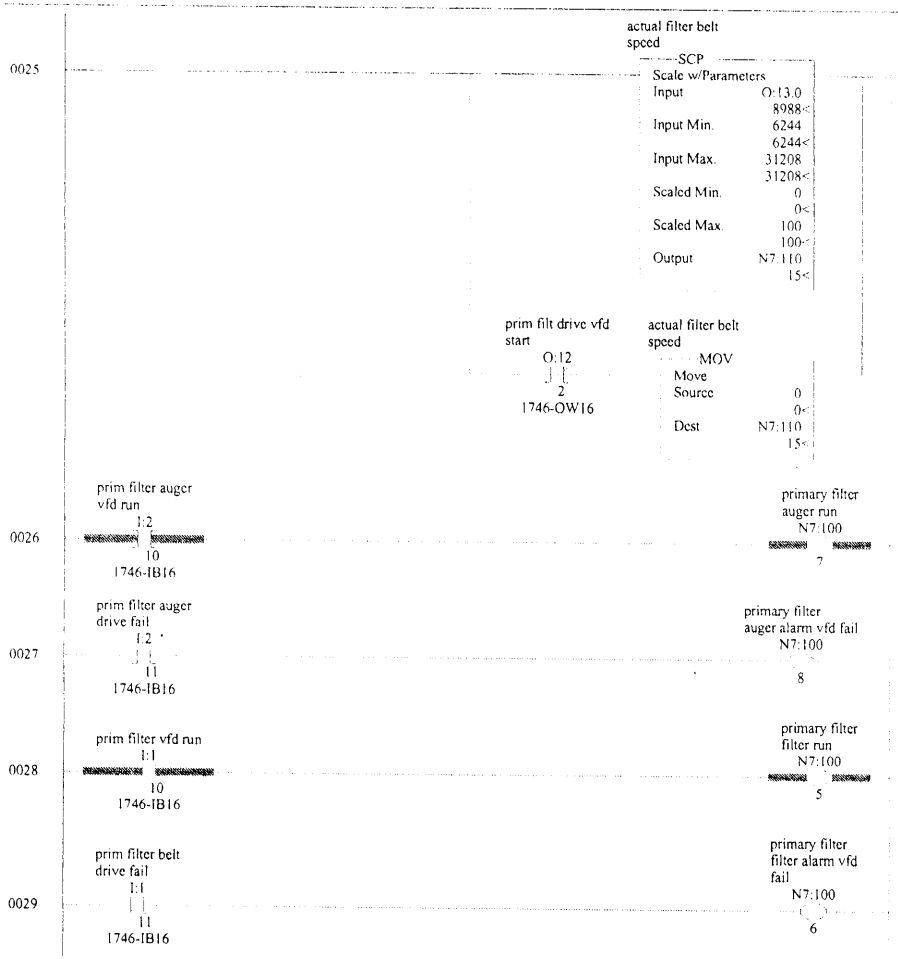
start high speed flush
PRIFIL_HISPEEDFLUSH
N7:101
10

O:12/4 REVERS not hot water flush
B3:2
2

0024

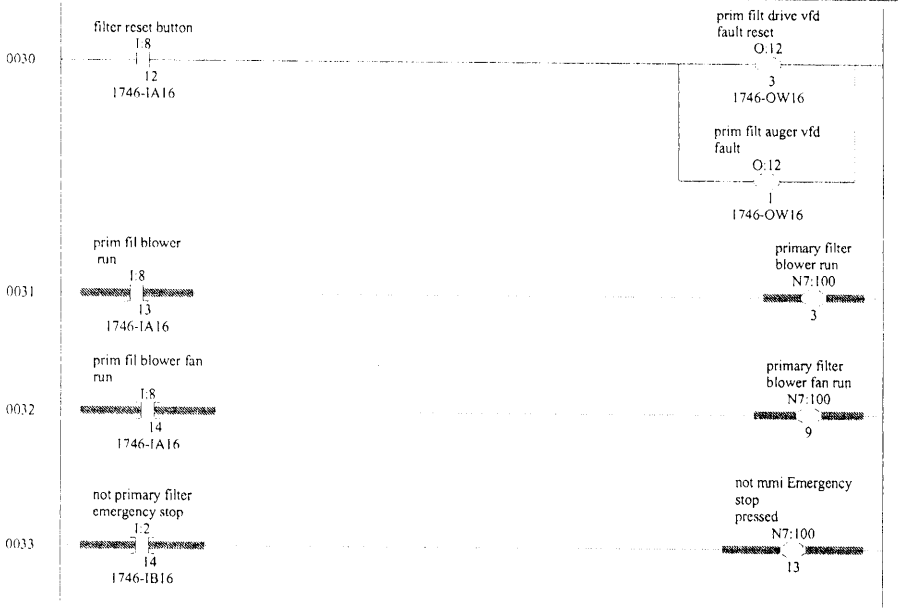
O:12/4 REVERS not hot water flush
B3:2
2

hot water flush
O:12
4
1746-OW16


0025
actual filter belt speed
SCP
Scale w/Parameters
Input O:13.0 8988<
Input Min. 6244 6244<
Input Max. 31208 31208<
Scaled Min. 0 0<
Scaled Max. 100 100<
Output N7:110 15<
prim filt drive vfd start
O:12
2
1746-OW16
actual filter belt speed
MOV
Move
Source 0 0<
Dest N7:110 15<
0026
prim filter auger vfd run
I:2
10
1746-IB16
primary filter auger run
N7:100
7
0027
prim filter auger drive fail
I:2
11
1746-IB16
primary filter auger alarm vfd fail
N7:100
8
0028
prim filter vfd run
I:1
10
1746-IB16
primary filter filter run
N7:100
5
0029
prim filter belt drive fail
I:1
11
1746-IB16
primary filter filter alarm vfd fail
N7:100
6






0030
filter reset button
I:8
12
1746-IA16
prim filt drive vfd fault reset
O:12
3
1746-OW16
prim filt auger vfd fault
O:12
1
1746-OW16
0031
prim fil blower run
I:8
13
1746-IA16
primary filter blower run
N7:100
3
0032
prim fil blower fan run
I:8
14
1746-IA16
primary filter blower fan run
N7:100
9
0033
not primary filter emergency stop
I:2
14
1746-IB16
not mmi Emergency stop pressed
N7:100
13

primary filter blower fan fault

0034

prim fil blower fan run
I:8
14
1746-IA16

prim blower fan start
O:12
8
1746-OW16

tim prifil blower fan fail
TON
Timer On Delay
Timer T4:30
Time Base 1.0
Preset 1<
Accum 0<
EN
DN

0035

tim prifil blower fan fail
T4:30
DN

primary filter blower fan alarm
N7:100
L
10

0036

prim fil blower fan run
I:8
14
1746-IA16

primary filter blower fan alarm
N7:100
U
10





primary filter blower fault

0037

prim fil blower run
I:8
13
1746-IA16

prim blower start
O:12
7
1746-OW16

prim filter blower fail
TON
Timer On Delay
Timer T4:31
Time Base 1.0
Preset 1<
Accum 0<
EN
DN

0038

prim filter blower fail
T4:31
DN

blower fail
N7:100
L
4

0039

prim fil blower run
I:8
13
1746-IA16

blower fail
N7:100
U
4

0040

filter reset button
I:8
12
1746-IA16

B3:1
OSR
3

blower fail
N7:100
U
4

primary filter blower fan alarm
N7:100
U
10

count flush cycle and reset

0041
hot water flush in progress N7:100/11
osr prifil count wash B3:2/OSR 5
prifil_wash_count ADD
Add
Source A N7:116 0<
Source B 1 1<
Dest N7:116 0<

0042
prifil_wash reset N7:101/2
prifil_wash_count MOV
Move
Source 0 0<
Dest N7:116 0<

0043
END



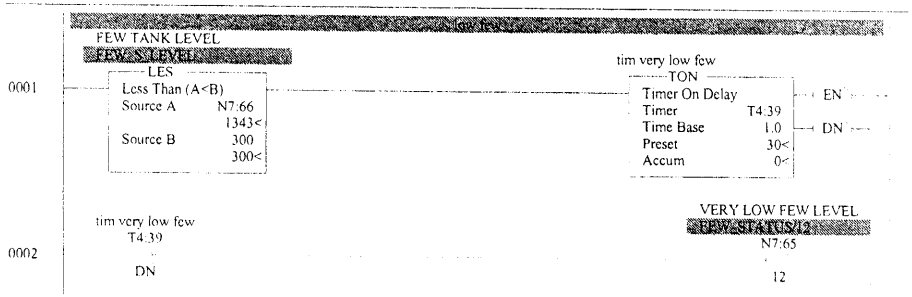


fe1002 level indication conversion

conversion
full sacle 20 ma , 4 ma -> zero
kpa 200
pa 200000
psi 29.00754755
in h20 803.0161286
mh2o 20.39660967
mm h2o 20396.60967

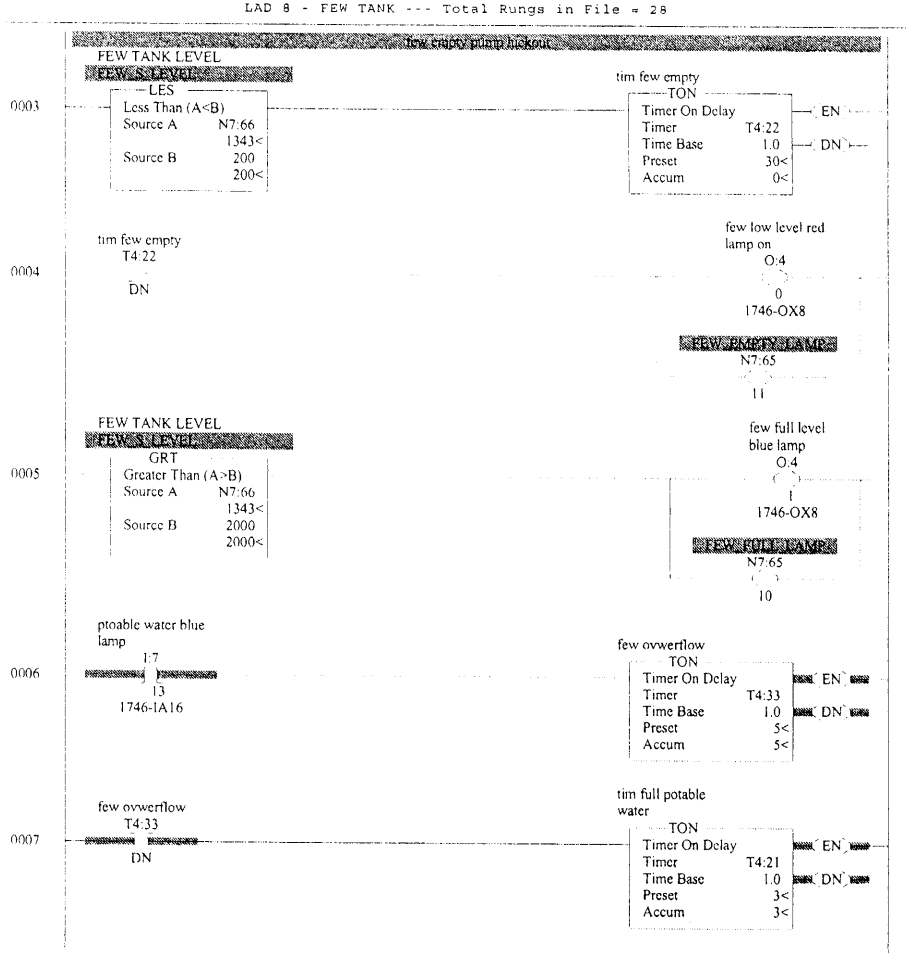
ACTUAL DEEPNES OF FEW TANK 2.6M 2600MM
OVERFLOW 2200MM

0000
Time Base S:4/8
B3:0/OSR 7
FEW TANK LEVEL
FEW_S_LEVEL
SCP
Scale w/Parameters
Input I:5.6 4946<
Input Min. 4000 4000<
Input Max. 20000 20000<
Scaled Min. 150 150<
Scaled Max. 20396 20396<
Output N7:66 1343<

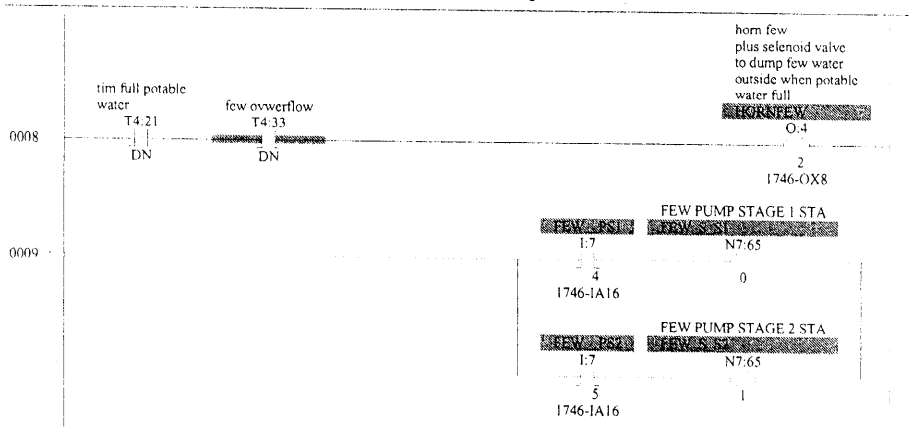

low few
FEW TANK LEVEL
FEW.S:1.LEVEL
0001
LES
Less Than (A<B)
Source A N7:66
1343<
Source B 300
300<
tim very low few
TON
Timer On Delay
Timer T4:39
Time Base 1.0
Preset 30<
Accum 0<
EN
DN
tim very low few
T4:39
DN
0002
VERY LOW FEW LEVEL
FEW.STATUS:12
N7:65
12






few empty pump lockout
FEW TANK LEVEL
FEW.S:1.LEVEL
0003
LES
Less Than (A<B)
Source A N7:66
1343<
Source B 200
200<
tim few empty
TON
Timer On Delay
Timer T4:22
Time Base 1.0
Preset 30<
Accum 0<
EN
DN
tim few empty
T4:22
DN
0004
few low level red lamp on
O:4
0
1746-OX8
FEW.EMPTY_LAMP
N7:65
11
FEW TANK LEVEL
FEW.S:1.LEVEL
0005
GRT
Greater Than (A>B)
Source A N7:66
1343<
Source B 2000
2000<
few full level blue lamp
O:4
1
1746-OX8
FEW.FULL_LAMP
N7:65
10
ptoable water blue lamp
I:7
13
1746-IA16
0006
few ovwerflow
TON
Timer On Delay
Timer T4:33
Time Base 1.0
Preset 5<
Accum 5<
EN
DN
few ovwerflow
T4:33
DN
0007
tim full potable water
TON
Timer On Delay
Timer T4:21
Time Base 1.0
Preset 3<
Accum 3<
EN
DN

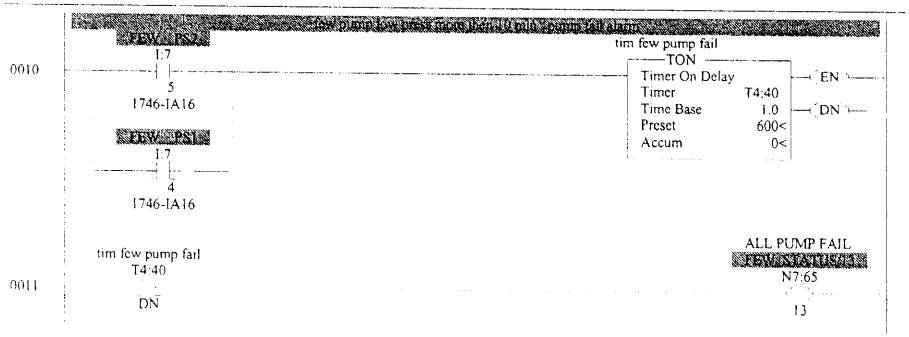
LAD 8 - FEW TANK --- Total Rungs in File = 28

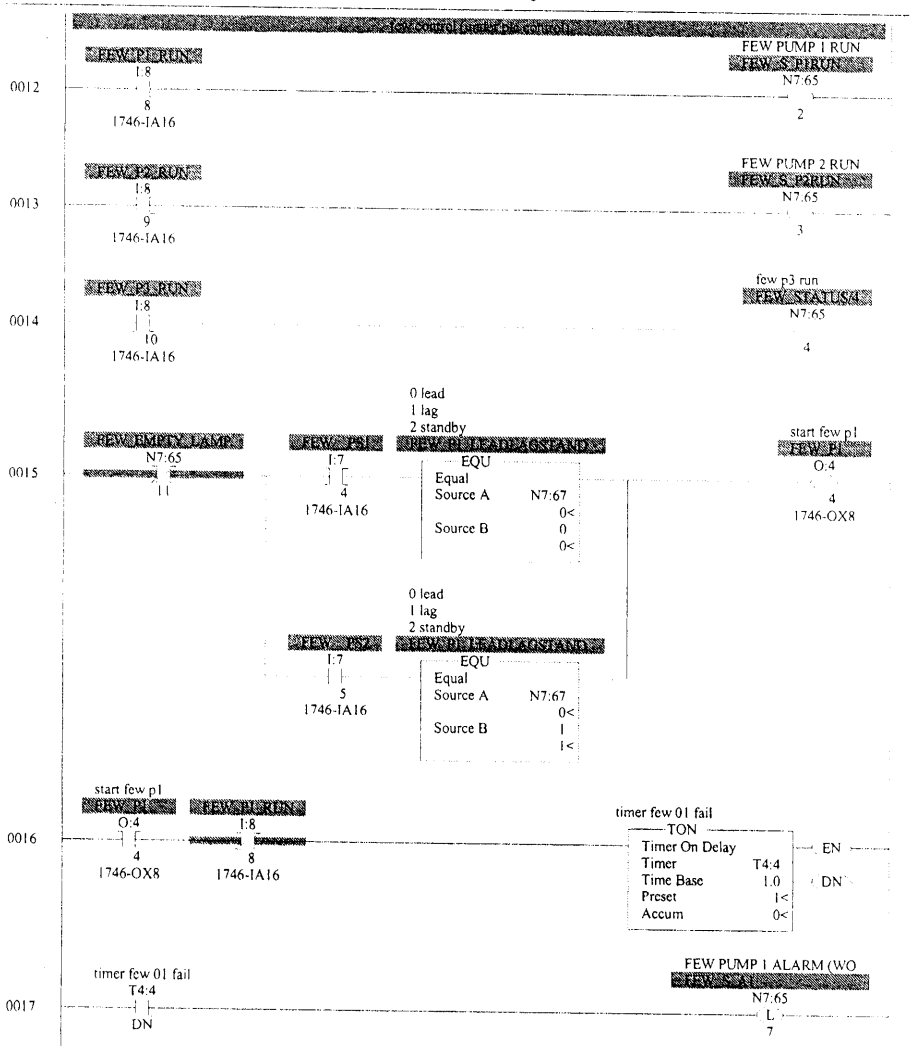






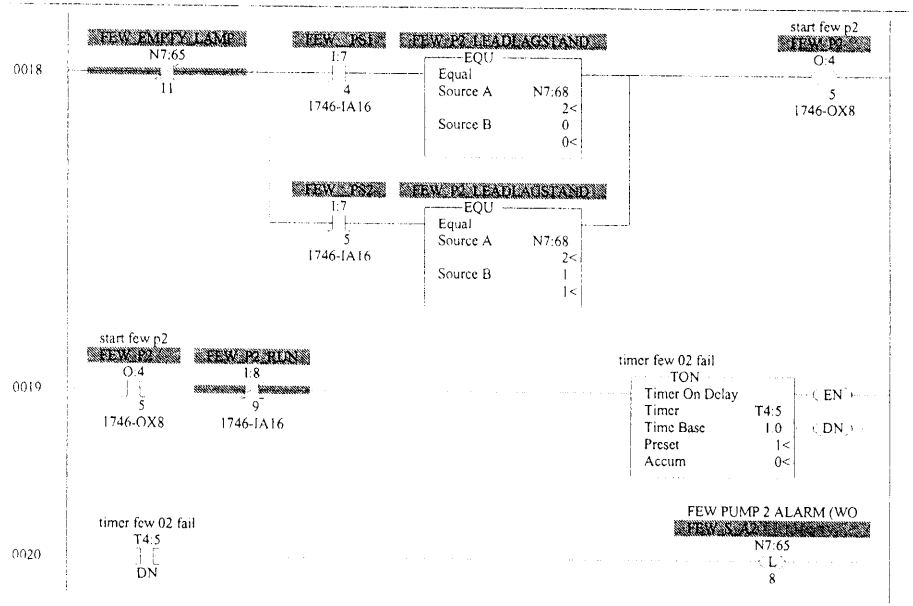

LAD 8 - FEW TANK --- Total Rungs in File = 28

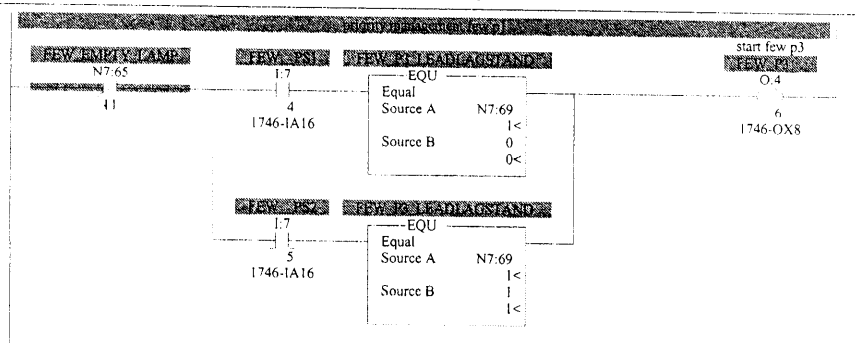



0012
FEW.P1.RUN
I:8
8
1746-IA16
FEW PUMP 1 RUN
FEW.S.P1RUN
N7:65
2
0013
FEW.P2.RUN
I:8
9
1746-IA16
FEW PUMP 2 RUN
FEW.S.P2RUN
N7:65
3
0014
FEW.P3.RUN
I:8
10
1746-IA16
few p3 run
FEW.STATUS4
N7:65
4
0015
FEW.EMPTY.LAMP
N7:65
11
FEW.FS1
I:7
4
1746-IA16
0 lead
1 lag
2 standby
FEW.P1.LEADLAGSTAND
EQU
Equal
Source A N7:67
0<
Source B 0
0<
start few p1
FEW.P1
O:4
4
1746-OX8
FEW.FS2
I:7
5
1746-IA16
FEW.P2.LEADLAGSTAND
EQU
Equal
Source A N7:67
0<
Source B 1
1<
0016
start few p1
FEW.P1
O:4
4
1746-OX8
FEW.P1RUN
I:8
8
1746-IA16
timer few 01 fail
TON
Timer On Delay
Timer T4:4
Time Base 1.0
Preset 1<
Accum 0<
EN
DN
0017
timer few 01 fail
T4:4
DN
FEW PUMP 1 ALARM (WO
FEW.S.A1
N7:65
L
7



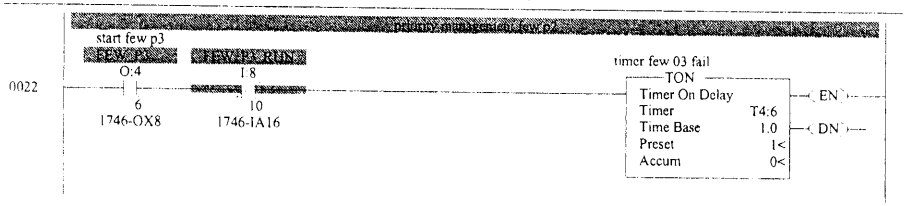


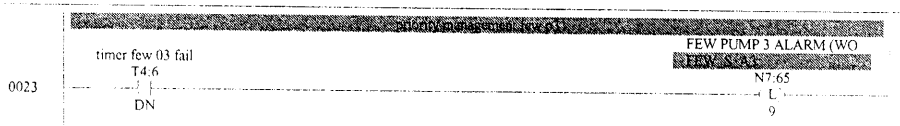

0018
FEW.EMPTY.LAMP
N7:65
11
FEW.FS1
I:7
4
1746-IA16
FEW.P2.LEADLAGSTAND
EQU
Equal
Source A N7:68
2<
Source B 0
0<
start few p2
FEW.P2
O:4
5
1746-OX8
FEW.FS2
I:7
5
1746-IA16
FEW.P2.LEADLAGSTAND
EQU
Equal
Source A N7:68
2<
Source B 1
1<
0019
start few p2
FEW.P2
O:4
5
1746-OX8
FEW.P2.RUN
I:8
9
1746-IA16
timer few 02 fail
TON
Timer On Delay
Timer T4:5
Time Base 1.0
Preset 1<
Accum 0<
EN
DN
0020
timer few 02 fail
T4:5
DN
FEW PUMP 2 ALARM (WO
FEW.S.A2
N7:65
L
8


0021
FEW_EMPTY_LAMP
N7:65
11
FEW_PS1
1:7
4
1746-IA16
FEW_P3_LEADLAGSTAND
EQU
Equal
Source A
N7:69
1<
Source B
0
0<
start few p3
FEW_P3
O:4
6
1746-OX8
FEW_PS2
1:7
5
1746-IA16
FEW_P3_LEADLAGSTAND
EQU
Equal
Source A
N7:69
1<
Source B
1
1<





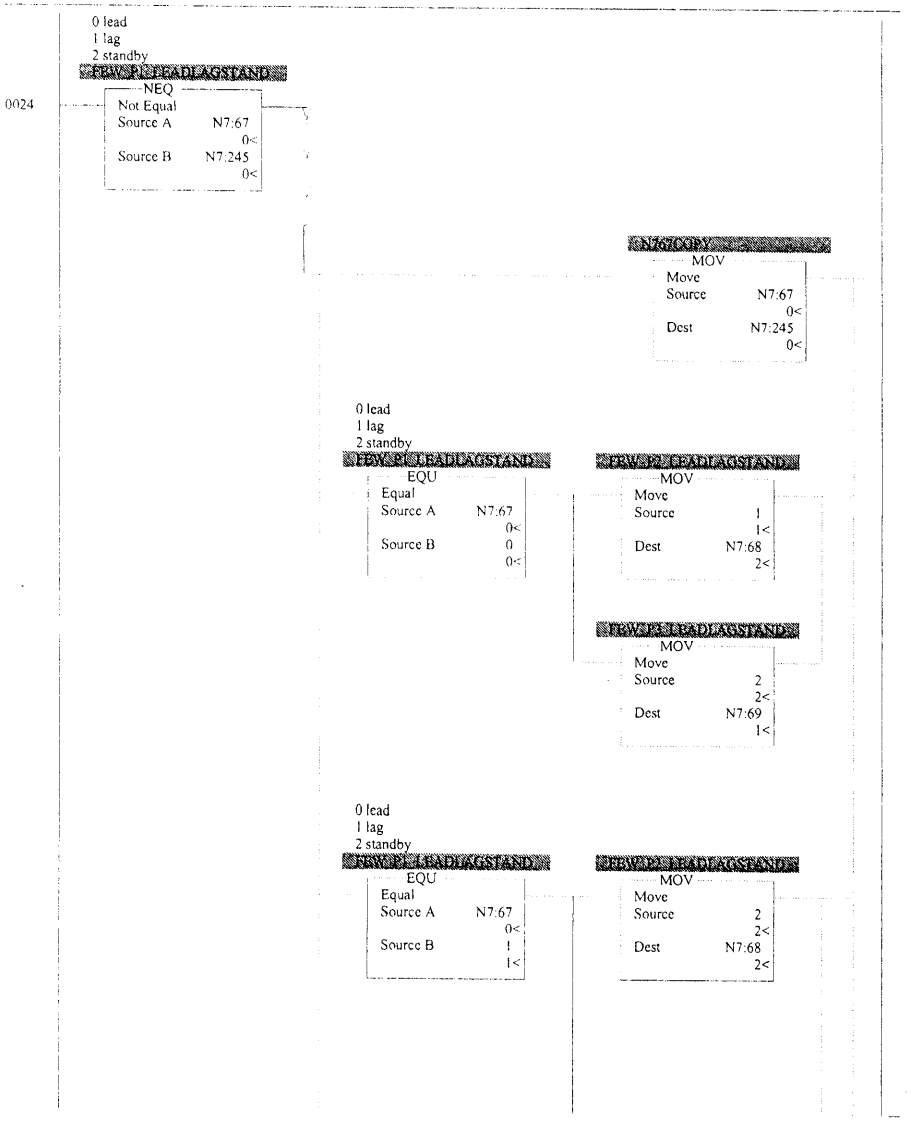

0022
start few p3
FEW_P3
O:4
6
1746-OX8
FEW_P3_RUN
I:8
10
1746-IA16
timer few 03 fail
TON
Timer On Delay
Timer
T4:6
Time Base
1.0
Preset
1<
Accum
0<
EN
DN


timer few 03 fail
T4:6
DN
FEW PUMP 3 ALARM (WO
N7:65
L
9

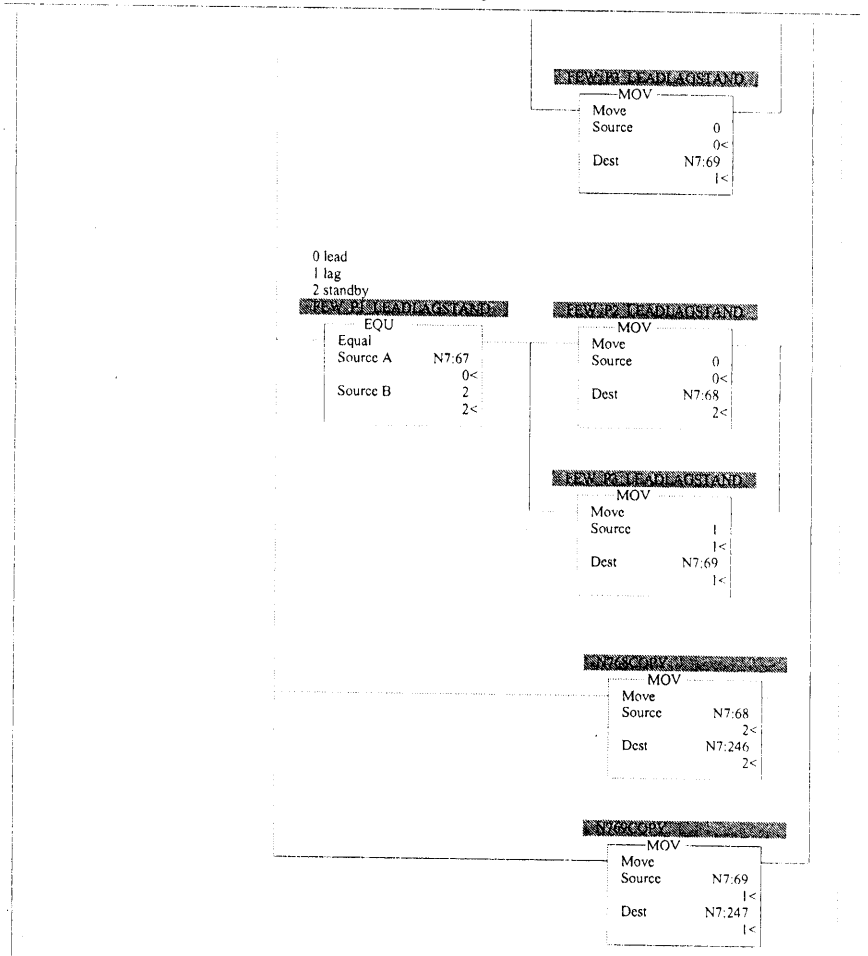
0023





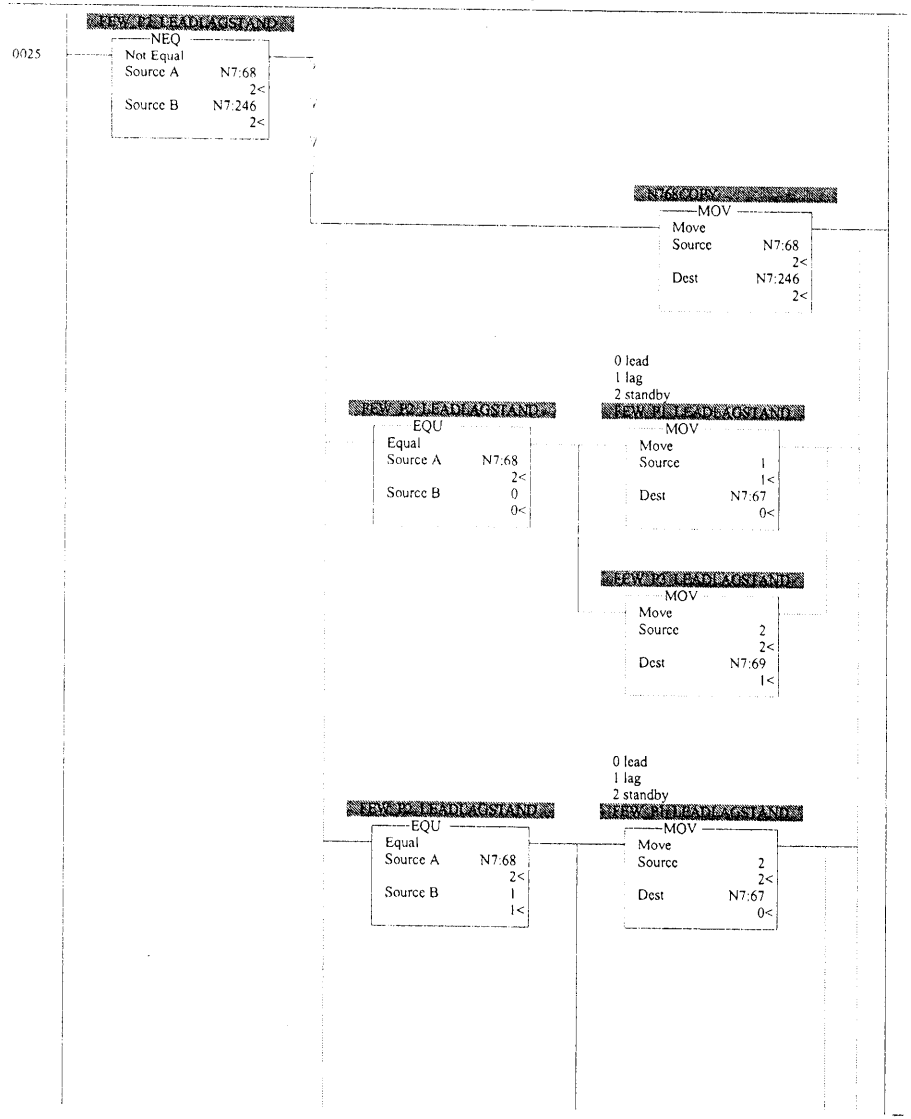

0 lead
1 lag
2 standby
NEQ
Not Equal
Source A N7:67 0<
Source B N7:245 0<
MOV
Move
Source N7:67 0<
Dest N7:245 0<
0 lead
1 lag
2 standby
EQU
Equal
Source A N7:67 0<
Source B 0 0<
MOV
Move
Source 1 1<
Dest N7:68 2<
MOV
Move
Source 2 2<
Dest N7:69 1<
0 lead
1 lag
2 standby
EQU
Equal
Source A N7:67 0<
Source B 1 1<
MOV
Move
Source 2 2<
Dest N7:68 2<

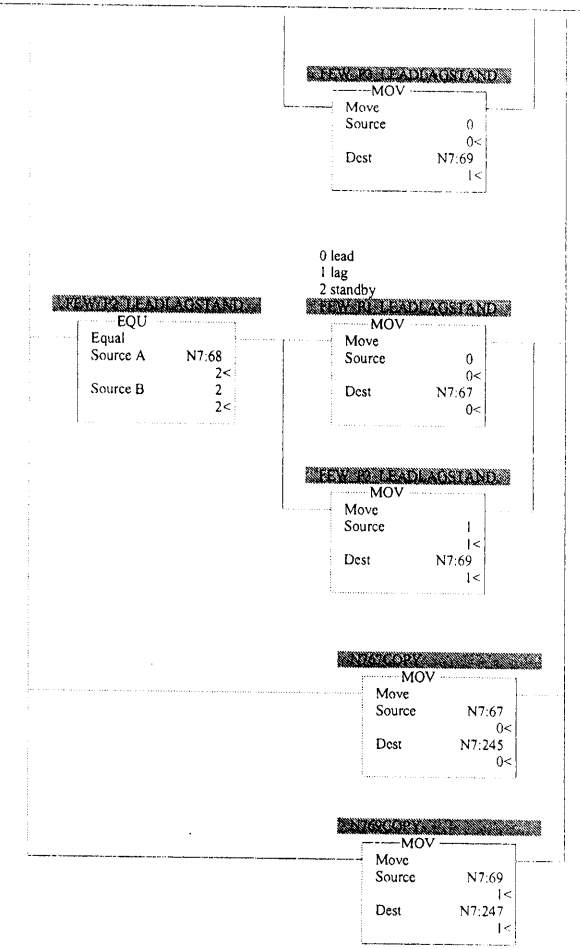
0024


MOV
Move
Source 0
0<
Dest N7:69
1<
0 lead
1 lag
2 standby
EQU
Equal
Source A N7:67
0<
Source B 2
2<
MOV
Move
Source 0
0<
Dest N7:68
2<
MOV
Move
Source 1
1<
Dest N7:69
1<
MOV
Move
Source N7:68
2<
Dest N7:246
2<
MOV
Move
Source N7:69
1<
Dest N7:247
1<



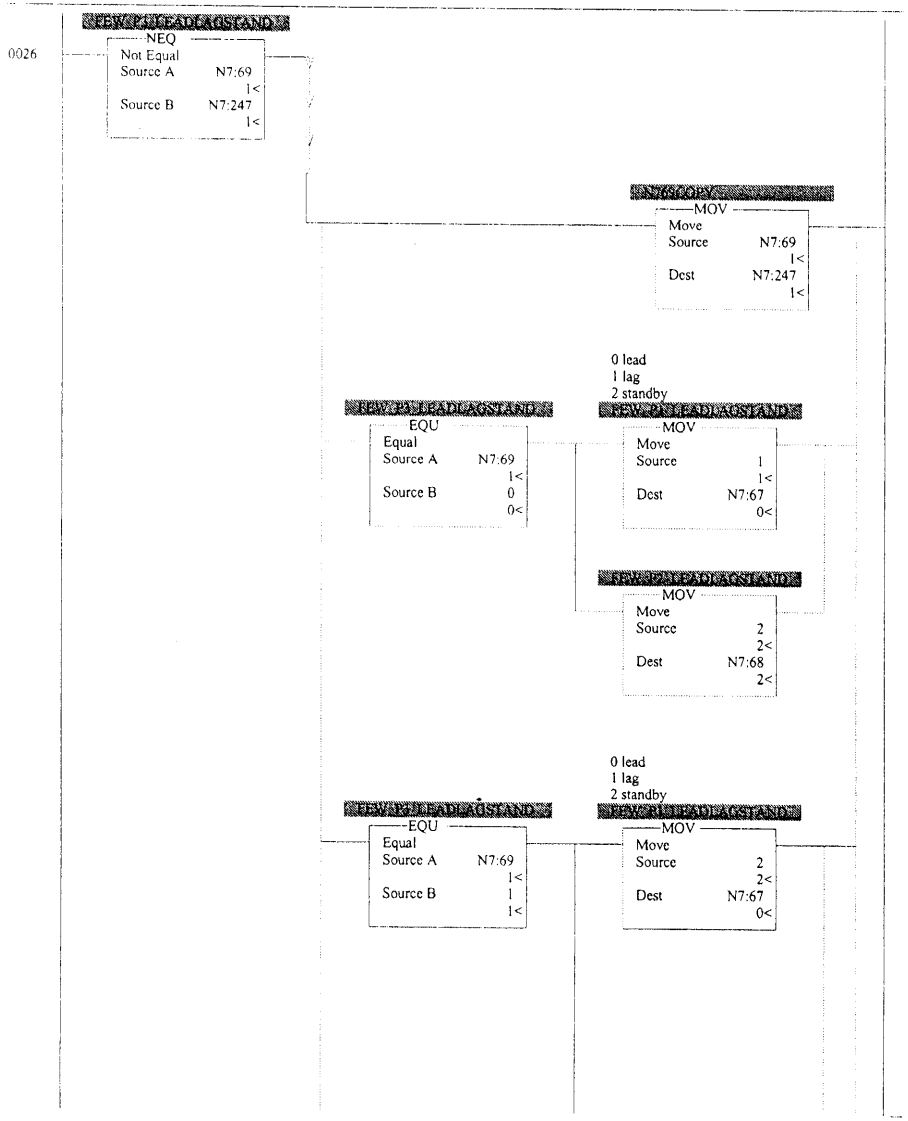



0025
NEQ
Not Equal
Source A N7:68
2<
Source B N7:246
2<
MOV
Move
Source N7:68
2<
Dest N7:246
2<
0 lead
1 lag
2 standby
EQU
Equal
Source A N7:68
2<
Source B 0
0<
MOV
Move
Source 1
1<
Dest N7:67
0<
MOV
Move
Source 2
2<
Dest N7:69
1<
0 lead
1 lag
2 standby
EQU
Equal
Source A N7:68
2<
Source B 1
1<
MOV
Move
Source 2
2<
Dest N7:67
0<

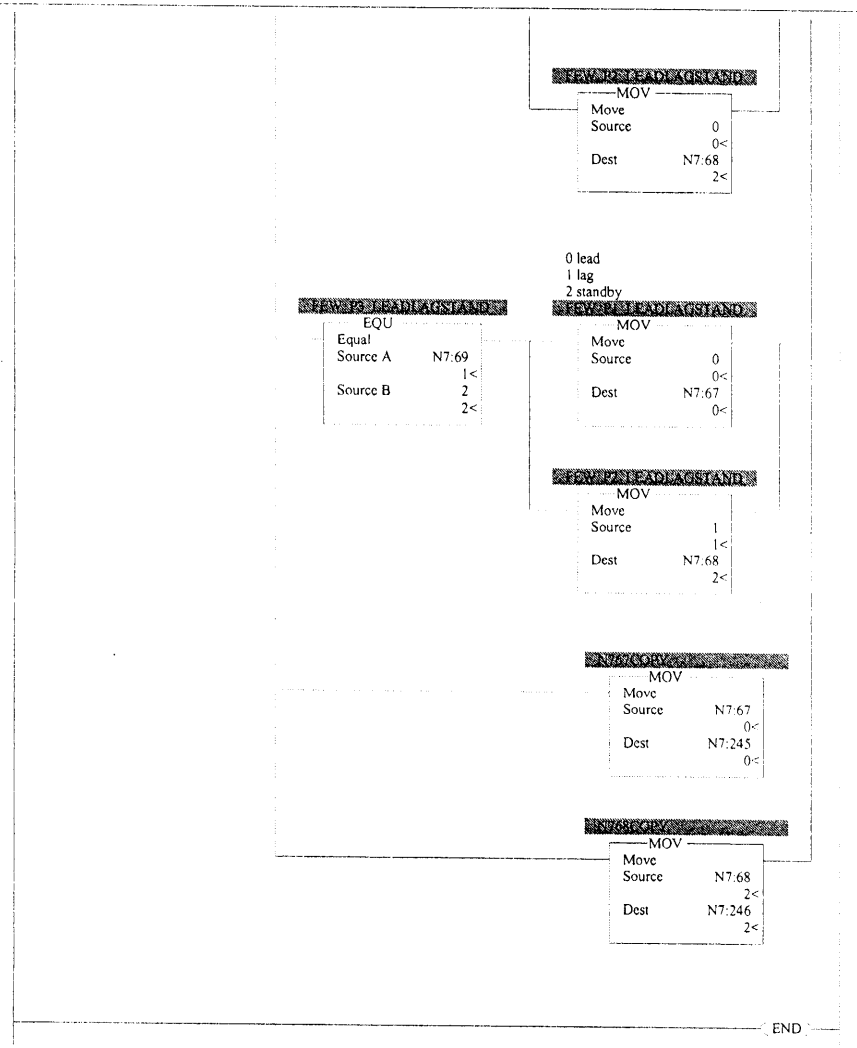

MOV
Move
Source 0
0<
Dest N7:69
1<
0 lead
1 lag
2 standby
EQU
Equal
Source A N7:68
2<
Source B 2
2<
MOV
Move
Source 0
0<
Dest N7:67
0<
MOV
Move
Source 1
1<
Dest N7:69
1<
MOV
Move
Source N7:67
0<
Dest N7:245
0<
MOV
Move
Source N7:69
1<
Dest N7:247
1<






0026
NEQ
Not Equal
Source A N7:69
1<
Source B N7:247
1<
MOV
Move
Source N7:69
1<
Dest N7:247
1<
0 lead
1 lag
2 standby
EQU
Equal
Source A N7:69
1<
Source B 0
0<
MOV
Move
Source 1
1<
Dest N7:67
0<
MOV
Move
Source 2
2<
Dest N7:68
2<
0 lead
1 lag
2 standby
EQU
Equal
Source A N7:69
1<
Source B 1
1<
MOV
Move
Source 2
2<
Dest N7:67
0<

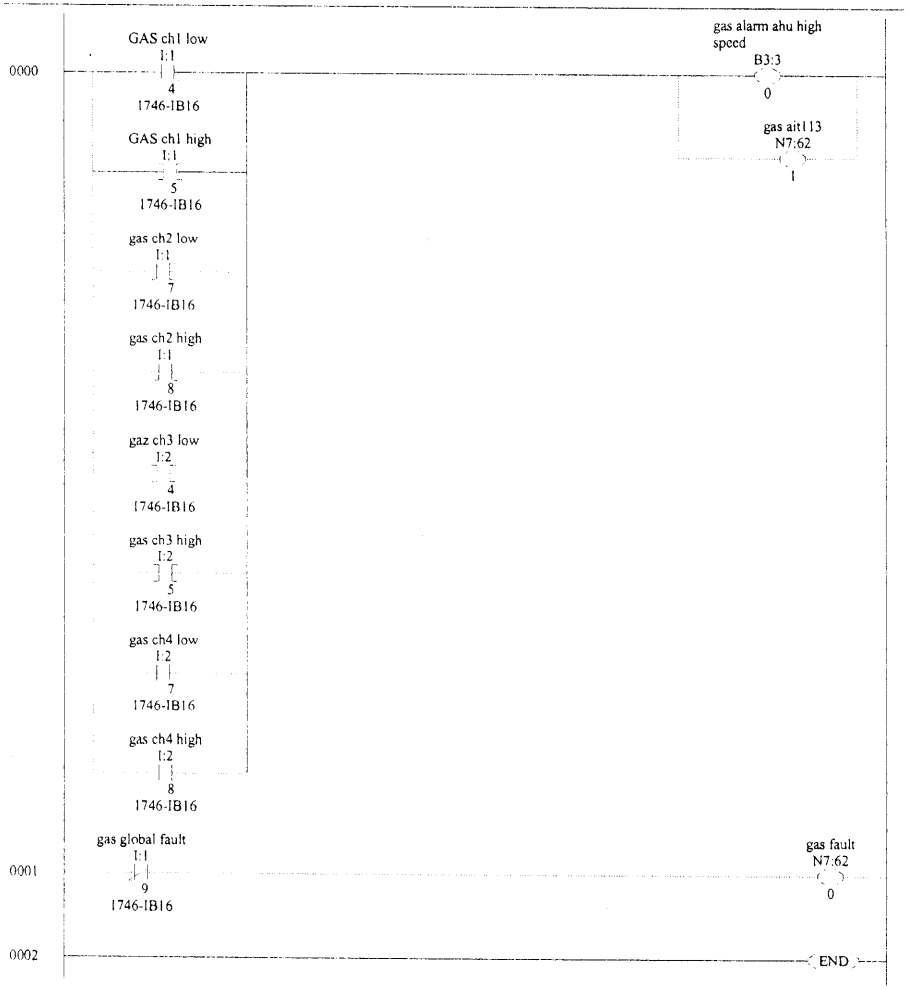
LAD 8 - FEW TANK --- Total Rungs in File = 28





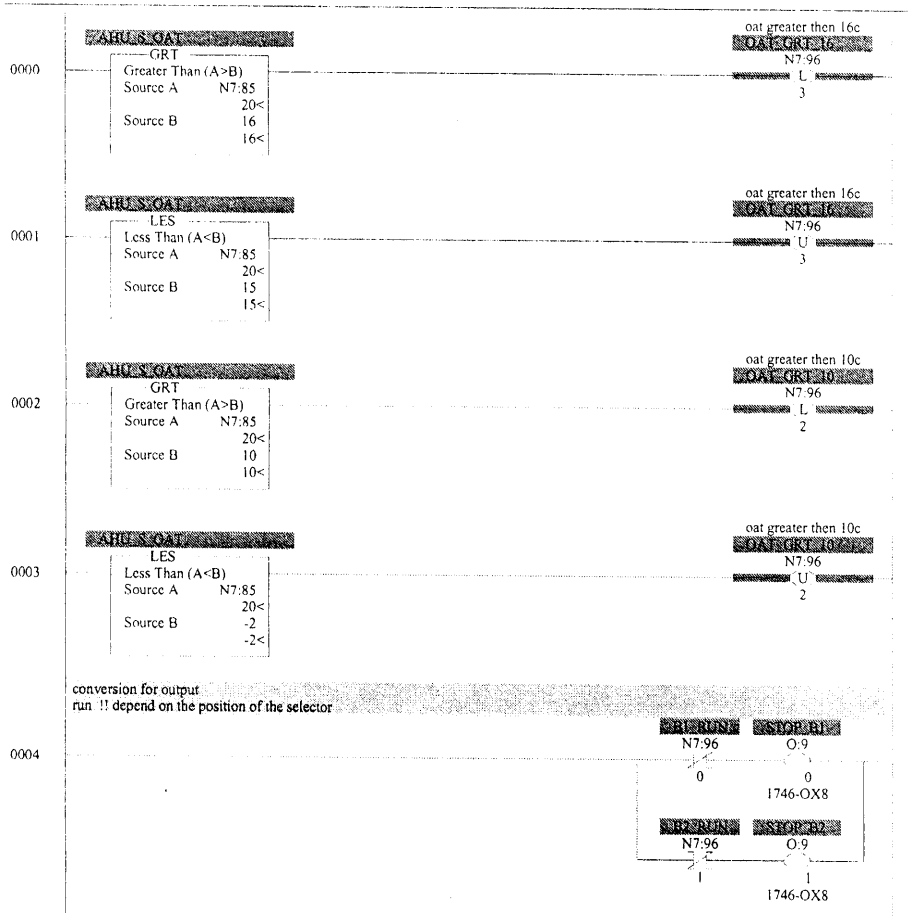



LAD 9 - GAS ALARM --- Total Rungs in File = 3



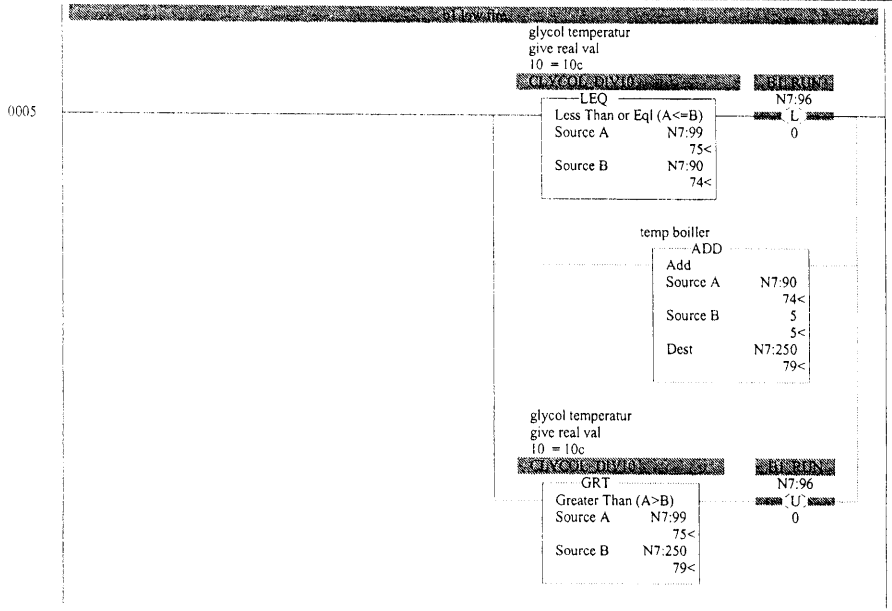


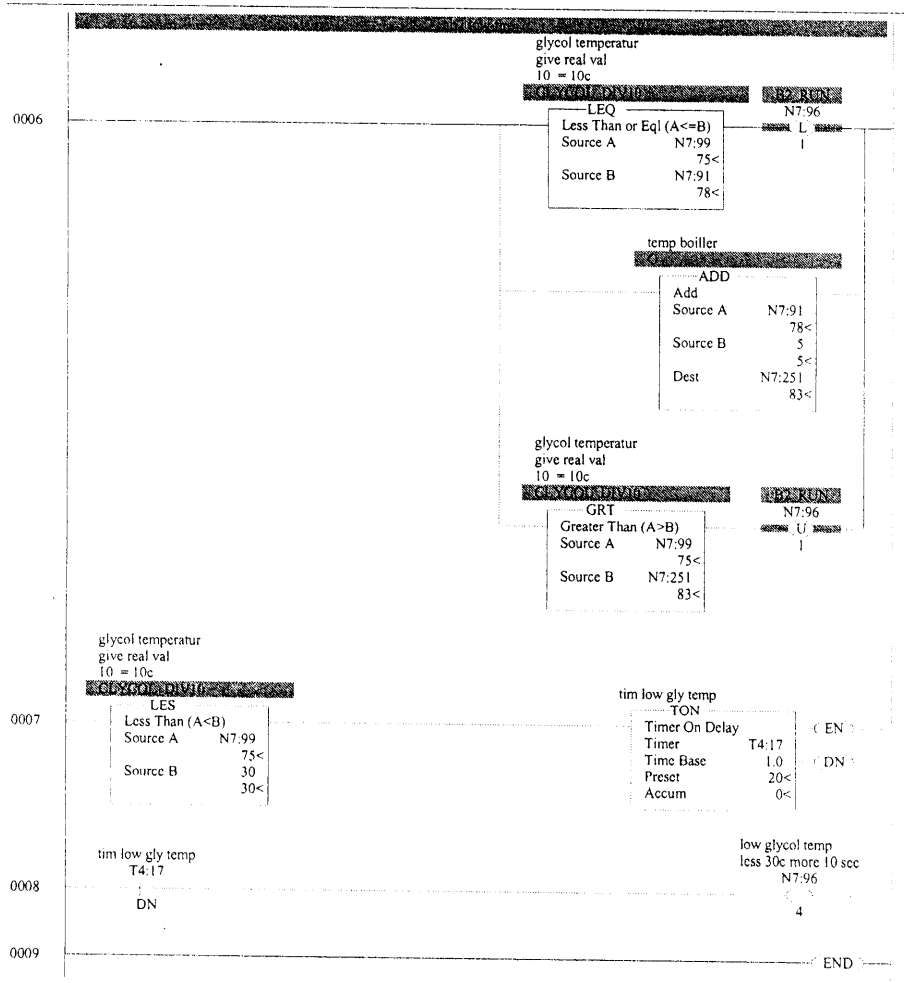

151


0000
AHU_S_OAT
GRT
Greater Than (A>B)
Source A N7:85 20<
Source B 16 16<
oat greater then 16c
OAT_GRT_16c
N7:96
L
3
0001
AHU_S_OAT
LES
Less Than (A<B)
Source A N7:85 20<
Source B 15 15<
oat greater then 16c
OAT_GRT_16c
N7:96
U
3
0002
AHU_S_OAT
GRT
Greater Than (A>B)
Source A N7:85 20<
Source B 10 10<
oat greater then 10c
OAT_GRT_10c
N7:96
L
2
0003
AHU_S_OAT
LES
Less Than (A<B)
Source A N7:85 20<
Source B -2 -2<
oat greater then 10c
OAT_GRT_10c
N7:96
U
2
conversion for output
run !! depend on the position of the selector
0004
B1_RUN
N7:96
0
STOP_B1
O:9
0
1746-OX8
B2_RUN
N7:96
1
STOP_B2
O:9
1
1746-OX8



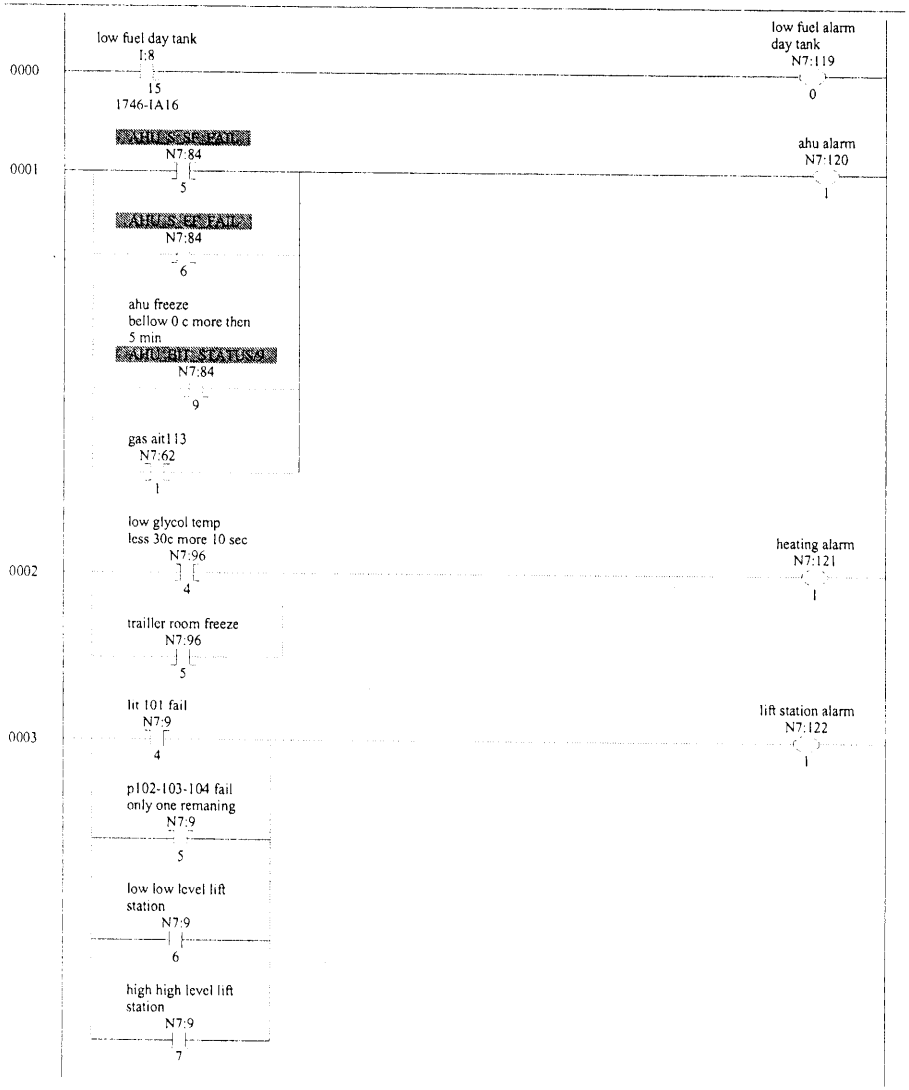



0005
glycol temperatur
give real val
10 = 10c
B1_RUN
N7:96
L
0
LEQ
Less Than or Eql (A<=B)
Source A N7:99 75<
Source B N7:90 74<
temp boiller
ADD
Add
Source A N7:90 74<
Source B 5 5<
Dest N7:250 79<
glycol temperatur
give real val
10 = 10c
B1_RUN
N7:96
U
0
GRT
Greater Than (A>B)
Source A N7:99 75<
Source B N7:250 79<


glycol temperatur
give real val
10 = 10c
B2_RUN
N7:96
0006
LEQ
Less Than or Eql (A<=B)
Source A N7:99 75<
Source B N7:91 78<
temp boiller
ADD
Add
Source A N7:91 78<
Source B 5 5<
Dest N7:251 83<
glycol temperatur
give real val
10 = 10c
B2_RUN
N7:96
GRT
Greater Than (A>B)
Source A N7:99 75<
Source B N7:251 83<
glycol temperatur
give real val
10 = 10c
0007
LES
Less Than (A<B)
Source A N7:99 75<
Source B 30 30<
tim low gly temp
TON
Timer On Delay
Timer T4:17
Time Base 1.0
Preset 20<
Accum 0<
EN
DN
tim low gly temp
T4:17
0008
DN
low glycol temp
less 30c more 10 sec
N7:96
4
0009
END






low fuel day tank
I:8
15
1746-IA16
low fuel alarm
day tank
N7:119
0
0000
AHU_S_SC_FAIL
N7:84
5
ahu alarm
N7:120
1
0001
AHU_S_SC_FAIL
N7:84
6
ahu freeze
bellow 0 c more then
5 min
AHU_HIT_STATUS_C
N7:84
9
gas ait113
N7:62
1
low glycol temp
less 30c more 10 sec
N7:96
4
heating alarm
N7:121
1
0002
trailler room freeze
N7:96
5
lit 101 fail
N7:9
4
lift station alarm
N7:122
1
0003
p102-103-104 fail
only one remaning
N7:9
5
low low level lift
station
N7:9
6
high high level lift
station
N7:9
7

0004

both screw screen fail
N7:48
0

prim screen alarm
N7:123
1

prim screen level > 800 lahh+lit102
N7:48
1

lit 102 fail less 3.5ma
N7:48
2

0005

primary filter filter alarm vfd fail
N7:100
6

prim filter alarm
N7:124
1

primary filter auger alarm vfd fail
N7:100
8

primary filter fail lamp
O:12
10
1746-OW16

primary filter blower fan alarm
N7:100
10

0006

FEW GLOBAL ALARM
N7:65
11

Few global Alarm
N7:125
1

VERY LOW FEW LEVEL
N7:65
12

ALL PUMP FAIL
N7:65
13





0007

ahu alarm
N7:120
1

global ahu enable
N7:120
0

tim building alarm lag
TON
Timer On Delay
Timer T4:43
Time Base 1.0
Preset 60<
Accum 0<
EN
DN

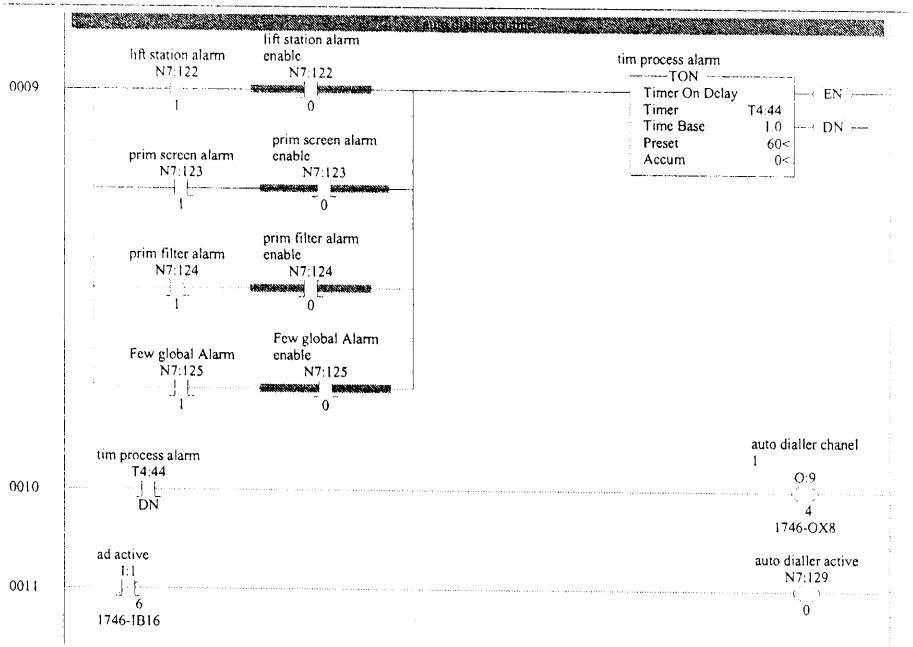
heating alarm
N7:121
1

heating alarm enable
N7:121
0

0008

tim building alarm lag
T4:43
DN

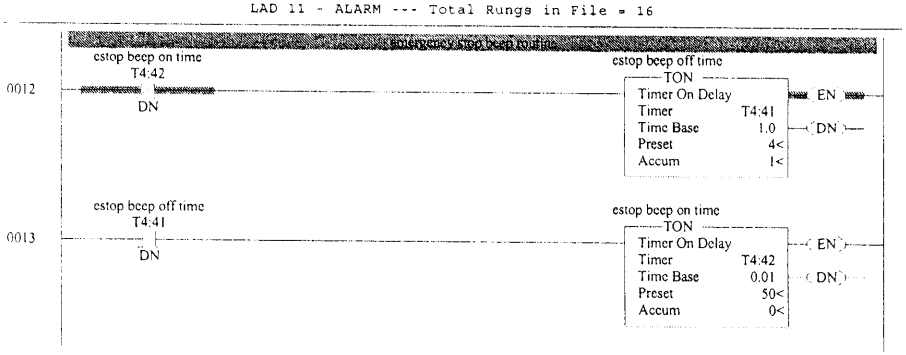
auto dialler chanel 2
O:9
5
1746-OX8



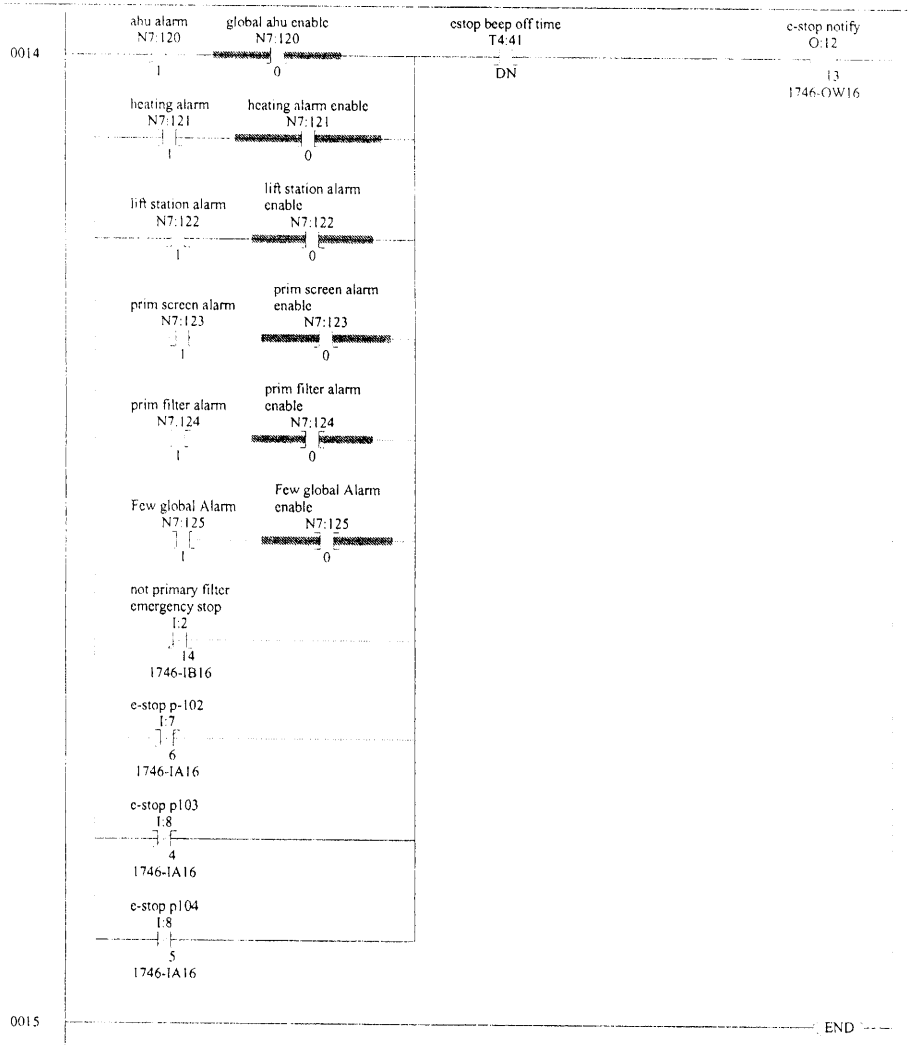



YFB-WWTP-JULLY12-06.RSS

LAD 11 - ALARM --- Total Rungs in File = 16



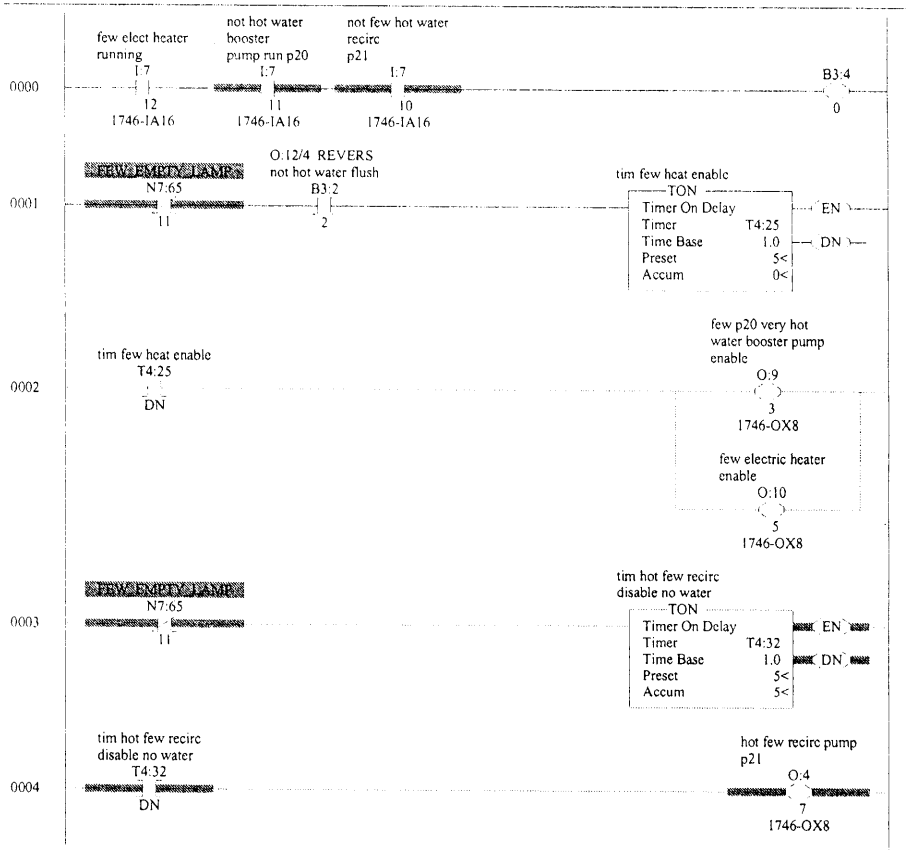
LAD 11 - ALARM --- Total Rungs in File = 16

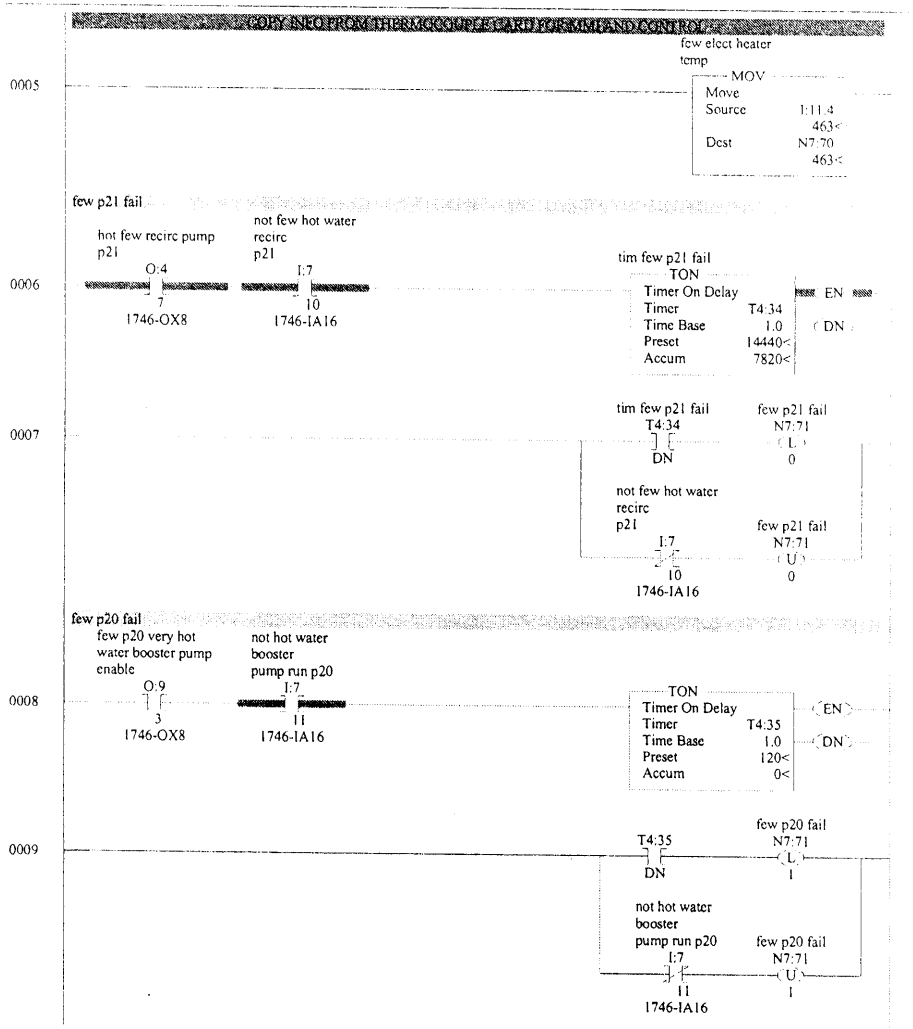






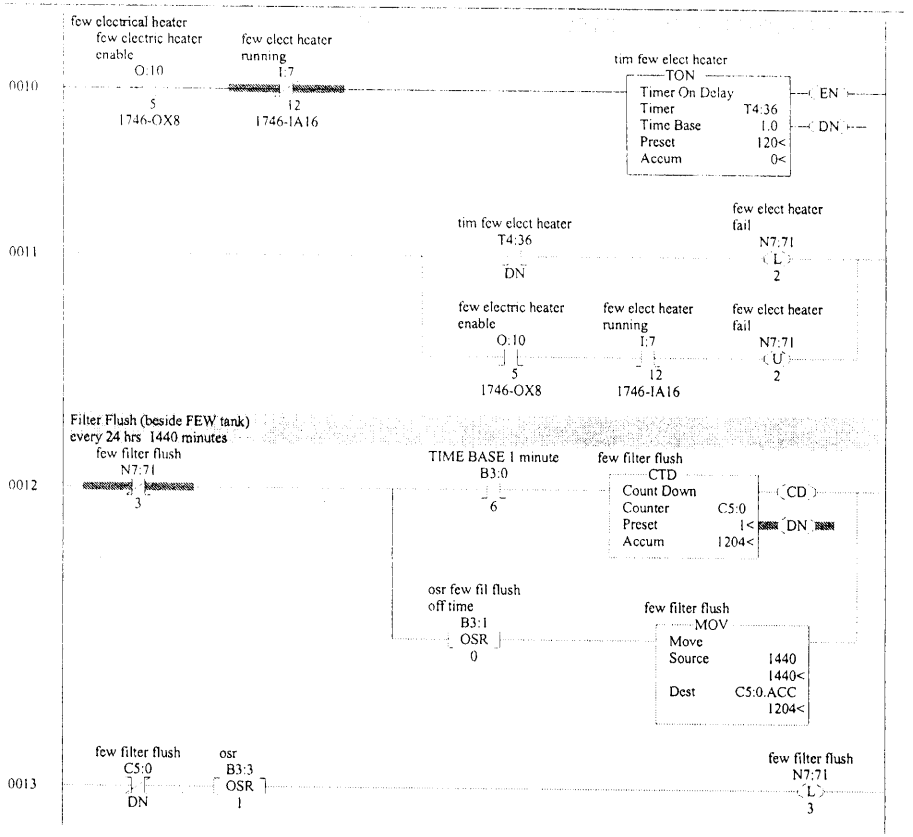

LAD 12 - FEW HEAT --- Total Rungs in File = 18



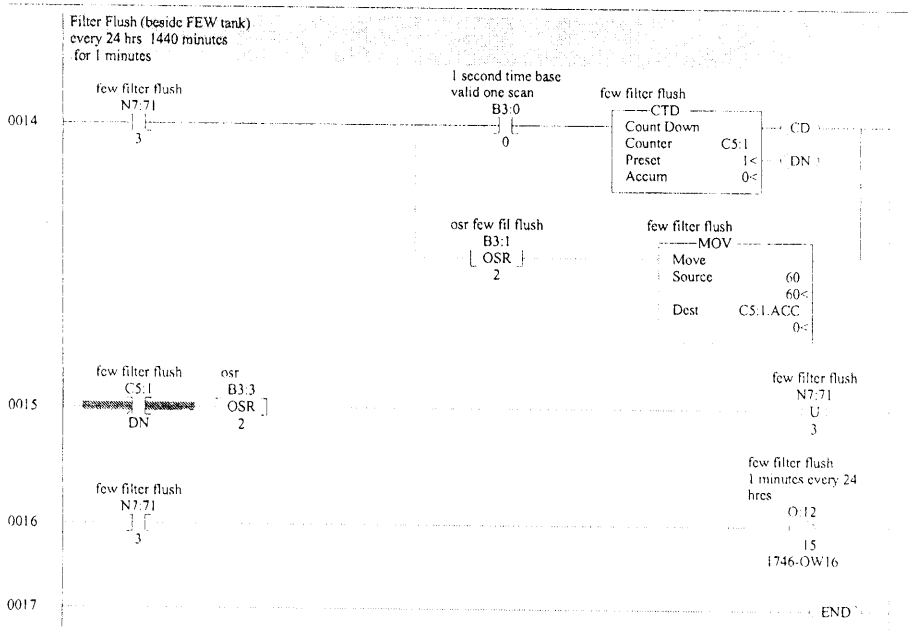

COPY INFO FROM THERMOCOUPLE CARD FOR MM AND CONTROL
0005
few elect heater temp
MOV
Move
Source I:11.4 463<
Dest N7:70 463<
few p21 fail
0006
hot few recirc pump p21
O:4
7
1746-OX8
not few hot water recirc p21
I:7
10
1746-IA16
tim few p21 fail
TON
Timer On Delay
Timer T4:34
Time Base 1.0
Preset 14440<
Accum 7820<
EN
DN
0007
tim few p21 fail
T4:34
DN
few p21 fail
N7:71
L
0
not few hot water recirc p21
I:7
10
1746-IA16
few p21 fail
N7:71
U
0
few p20 fail
0008
few p20 very hot water booster pump enable
O:9
3
1746-OX8
not hot water booster pump run p20
I:7
11
1746-IA16
TON
Timer On Delay
Timer T4:35
Time Base 1.0
Preset 120<
Accum 0<
EN
DN
0009
T4:35
DN
few p20 fail
N7:71
L
1
not hot water booster pump run p20
I:7
11
1746-IA16
few p20 fail
N7:71
U
1






0010
few electrical heater
few electric heater enable
O:10
5
1746-OX8
few elect heater running
I:7
12
1746-IA16
tim few elect heater
TON
Timer On Delay
Timer T4:36
Time Base 1.0
Preset 120<
Accum 0<
EN
DN
0011
tim few elect heater
T4:36
DN
few elect heater fail
N7:71
L
2
few electric heater enable
O:10
5
1746-OX8
few elect heater running
I:7
12
1746-IA16
few elect heater fail
N7:71
U
2
Filter Flush (beside FEW tank)
every 24 hrs 1440 minutes
0012
few filter flush
N7:71
3
TIME BASE 1 minute
B3:0
6
few filter flush
CTD
Count Down
Counter C5:0
Preset 1<
Accum 1204<
CD
DN
osr few fil flush off time
B3:1
OSR
0
few filter flush
MOV
Move
Source 1440 1440<
Dest C5:0.ACC 1204<
0013
few filter flush
C5:0
DN
osr
B3:3
OSR
1
few filter flush
N7:71
L
3

LAD 12 - FEW HEAT --- Total Rungs in File = 18








Data File O0 (bin) -- OUTPUT

| Offset | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O:3.0 | | | | | | | | | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1746-OX8 - 8-Output Isolated Relay |
| O:4.0 | | | | | | | | | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-OX8 - 8-Output Isolated Relay |
| O:5.0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:5.1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:5.2 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:5.3 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:5.4 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:5.5 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:5.6 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:5.7 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:5.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:5.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:5.10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:5.11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:6.0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1746-NO4I - Analog 4 Ch. Current Output |
| O:6.1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1746-NO4I - Analog 4 Ch. Current Output |
| O:6.2 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1746-NO4I - Analog 4 Ch. Current Output |
| O:6.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NO4I - Analog 4 Ch. Current Output |
| O:9.0 | | | | | | | | | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-OX8 - 8-Output Isolated Relay |
| O:10.0 | | | | | | | | | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1746-OX8 - 8-Output Isolated Relay |
| O:11.0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1746-NT8 - Analog 8 Ch Thermocouple Inp |
| O:11.1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1746-NT8 - Analog 8 Ch Thermocouple Inp |
| O:11.2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1746-NT8 - Analog 8 Ch Thermocouple Inp |
| O:11.3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1746-NT8 - Analog 8 Ch Thermocouple Inp |
| O:11.4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1746-NT8 - Analog 8 Ch Thermocouple Inp |
| O:11.5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1746-NT8 - Analog 8 Ch Thermocouple Inp |
| O:11.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NT8 - Analog 8 Ch Thermocouple Inp |
| O:11.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NT8 - Analog 8 Ch Thermocouple Inp |
| O:12.0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1746-OW16 - 16-Output (RLY) 240 VAC |
| O:13.0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1746-NO4I - Analog 4 Ch. Current Output |
| O:13.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NO4I - Analog 4 Ch. Current Output |
| O:13.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NO4I - Analog 4 Ch. Current Output |
| O:13.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NO4I - Analog 4 Ch. Current Output |
| O:14.0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:14.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:14.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:14.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:14.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:14.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:14.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:14.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:14.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:14.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:14.10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| O:14.11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |

Data File I1 (bin) -- INPUT

| Offset | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I:1.0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1746-IB16 - 16-Input (SINK) 24 VDC |
| I:2.0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1746-IB16 - 16-Input (SINK) 24 VDC |
| I:5.0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:5.1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:5.2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:5.3 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:5.4 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:5.5 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:5.6 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:5.7 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:5.8 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:5.9 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:5.10 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:5.11 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:5.12 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:5.13 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:5.14 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:5.15 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:7.0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1746-IA16 - 16-Input 100/120 VAC |
| I:8.0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1746-IA16 - 16-Input 100/120 VAC |
| I:11.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1746-NT8 - Analog 8 Ch Thermocouple Inp |
| I:11.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1746-NT8 - Analog 8 Ch Thermocouple Inp |
| I:11.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1746-NT8 - Analog 8 Ch Thermocouple Inp |
| I:11.3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1746-NT8 - Analog 8 Ch Thermocouple Inp |
| I:11.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1746-NT8 - Analog 8 Ch Thermocouple Inp |
| I:11.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1746-NT8 - Analog 8 Ch Thermocouple Inp |
| I:11.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NT8 - Analog 8 Ch Thermocouple Inp |
| I:11.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NT8 - Analog 8 Ch Thermocouple Inp |
| I:14.0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:14.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:14.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:14.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:14.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:14.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:14.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:14.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:14.8 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:14.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:14.10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:14.11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:14.12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:14.13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:14.14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |
| I:14.15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1746-NI8 - Analog 8 Channel Input - Cl |





Data File S2 (hex) -- STATUS

First Pass S:1/15 = No
Index Register S:24 = 0
Free Running Clock S:4 = 1111-1010-1100-0101
Index Across Data Files S:2/3 = No
CIF Addressing Mode S:2/8 = 0
Online Edits S:33/11 - S:33/12 = No online edits exist

Day of the Week S:53
DD / M
Date S:39-37 = 13 /
HH : MM
Time S:40-42 = 13 :

OS Catalog Number S:57 = 501
OS Series S:58 = C
OS FRS S:59 = 6
Processor Catalog Number S:60 = 551
Processor Series S:61 = B
Processor FRN S:62 = 4
Ethernet Daughterboard Series S:9 = 2
Ethernet Daughterboard FRN S:10 = 50

User Program Type S:63 = 2049
User Program Functionality Index S:64 =
User RAM Size S:66 = 16
OS Memory Size S:66 = 512

Maximum (x10 ms) S:22 = 2
Average (x10 ms) S:23 = 1
Current (x10 ms) S:3 (low byte) = 1
Watchdog (x10 ms) S:3 (high byte) = 10
Last 1ms Scan Time S:35 = 9
Scan Toggle Bit S:33/9 = 0
Time Base Selection S:33/13 = 0

Math Overflow Selected S:2/14 = 0
Overflow Trap S:5/0 = 0
Carry S:0/0 = 0
Overflow S:0/1 = 0
Zero Bit S:0/2 = 0
Sign Bit S:0/3 = 0
Floating Point Flag Disable S:34/2 = 0

Math Register (lo word) S:13 = 60
Math Register (high word) S:14-S:13
Math Register (32 Bit) S:14-S:13 =

Processor Mode S:1/0- S:1/4 = Remote Run
Comms Active S:1/7 = 1
Incoming Cmd Pending S:2/5 = 0
Msg Reply Pending S:2/6 = 0
DH485 Gateway Disable Bit S:34/0 = 0
DF1 Gateway Enable Bit S:34/5 = 0

Outgoing Msg Cmd Pending S:2/7 = 0
Comms Servicing Sel S:2/15 = 1
Msg Servicing Sel S:33/7 = 0

Suspend Code S:7 = 0
Suspend File S:8 = 0
Compiled For Single Step S:2/4 = Yes

Test Single Step Breakpoint
Rung # S:18 = 0
File # S:19 = 0

Fault/Powerdown
Fault/Powerdown (Rung #) S:20 = 0
(File #) S:21 = 0

Test Single Step
Rung # S:16 = 0
File # S:17 = 2

Fault Override At Power Up S:1/8 = 0
Startup Protection Fault S:1/9 = 0
Major Error Halt S:1/13 = 0
Overflow Trap S:5/0 = 0
Control Register Error S:5/2 = 0
Major Error Executing User
Fault Rtn. S:5/3 = 0
M0/M1 Referenced On Disabled
Slot S:5/4 = 0
Battery Low S:5/11 = 0
Fault/Powerdown (Rung #) S:20 = 0
(File #) S:21 = 0

ASCII String Manipulation error S:5
Fault Routine S:29 = 0
Major Error S:6 = 0h

Error Description:

Setpoint (x10ms) S:30 = 0
File Number S:31 = 0
10 uS Time Stamp S:43 = 0
Pending Bit S:2/0 = 0
Enable Bit S:2/1 = 1

Resolution Select Bit S:2/10 = 0
Executing Bit S:2/2 = 0
Overflow Bit S:5/10 = 0
Lost S:36/9 = 0
Interrrupt Latency Control S:33/8 =





Forces Enabled S:1/5 = No
Forces Installed S:1/6 = No

Data File B3 (bin) -- BINARY

| Offset | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | (Symbol) Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B3:0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | |
| B3:1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | |
| B3:2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | |
| B3:3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | |
| B3:4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | |
| B3:5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:33 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:36 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:37 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:39 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:41 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:42 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:43 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| B3:44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | |





Data File T4 -- TIMER

| Offset | EN | TT | DN | BASE | PRE | ACC | (Symbol) Description |
|---|---|---|---|---|---|---|---|
| T4:0 | 1 | 1 | 0 | 1.0 sec | 18 | 13 | 1/100 hhs base |
| T4:1 | 0 | 0 | 0 | 1.0 sec | 18 | 0 | 1/100 h base |
| T4:2 | 0 | 0 | 0 | 1.0 sec | 7200 | 0 | sscr wash duty |
| T4:3 | 0 | 0 | 0 | 1.0 sec | 60 | 0 | sscr wash period |
| T4:4 | 0 | 0 | 0 | 1.0 sec | 1 | 0 | timer few 01 fail |
| T4:5 | 0 | 0 | 0 | 1.0 sec | 1 | 0 | timer few 02 fail |
| T4:6 | 0 | 0 | 0 | 1.0 sec | 1 | 0 | timer few 03 fail |
| T4:7 | 0 | 0 | 0 | .01 sec | 50 | 50 | tim ahu on |
| T4:8 | 0 | 0 | 0 | .01 sec | 50 | 0 | tim ahu |
| T4:9 | 0 | 0 | 0 | .01 sec | 50 | 0 | ahu ls |
| T4:10 | 1 | 0 | 1 | 1.0 sec | 30 | 30 | tim 1 minute |
| T4:11 | 1 | 1 | 0 | 1.0 sec | 30 | 11 | tim 1 minute |
| T4:12 | 0 | 0 | 0 | 1.0 sec | 439 | 0 | tim ahu defrost |
| T4:13 | 0 | 0 | 0 | 1.0 sec | 1 | 0 | ahu sf fail |
| T4:14 | 0 | 0 | 0 | 1.0 sec | 1 | 0 | ahu ef fail |
| T4:15 | 0 | 0 | 0 | 1.0 sec | 2 | 0 | |
| T4:16 | 0 | 0 | 0 | 1.0 sec | 300 | 0 | tim ahu freeze |
| T4:17 | 0 | 0 | 0 | 1.0 sec | 20 | 0 | tim low gly temp |
| T4:18 | 0 | 0 | 0 | 1.0 sec | 3 | 0 | tim alarm high screw level |
| T4:19 | 0 | 0 | 0 | 1.0 sec | 2 | 0 | |
| T4:20 | 0 | 0 | 0 | 1.0 sec | 600 | 0 | ahu pre defrost time |
| T4:21 | 1 | 0 | 1 | 1.0 sec | 3 | 3 | tim full potable water |
| T4:22 | 0 | 0 | 0 | 1.0 sec | 30 | 0 | tim few empty |
| T4:23 | 0 | 0 | 0 | 1.0 sec | 120 | 0 | tim lshh104 |
| T4:24 | 0 | 0 | 0 | 1.0 sec | 120 | 0 | tim auto prim fil |
| T4:25 | 0 | 0 | 0 | 1.0 sec | 5 | 0 | tim few heat enable |
| T4:26 | 1 | 1 | 0 | .01 sec | 50 | 10 | tim 1 sec time base |
| T4:27 | 0 | 0 | 0 | .01 sec | 50 | 0 | tim 1 sec time base |
| T4:28 | 0 | 0 | 0 | 1.0 sec | 30 | 0 | tim sscr level auto wash |
| T4:29 | 0 | 0 | 0 | 1.0 sec | 30 | 0 | |
| T4:30 | 0 | 0 | 0 | 1.0 sec | 1 | 0 | tim prifil blower fan fail |
| T4:31 | 0 | 0 | 0 | 1.0 sec | 1 | 0 | prim filter blower fail |
| T4:32 | 1 | 0 | 1 | 1.0 sec | 5 | 5 | tim hot few recirc disable no water |
| T4:33 | 1 | 0 | 1 | 1.0 sec | 5 | 5 | few ovwerflow |
| T4:34 | 1 | 1 | 0 | 1.0 sec | 14440 | 7820 | tim few p21 fail |
| T4:35 | 0 | 0 | 0 | 1.0 sec | 120 | 0 | |
| T4:36 | 0 | 0 | 0 | 1.0 sec | 120 | 0 | tim few elect heater |
| T4:37 | 0 | 0 | 0 | 1.0 sec | 1 | 0 | tim sscr 105 fail |
| T4:38 | 0 | 0 | 0 | 1.0 sec | 1 | 0 | |
| T4:39 | 0 | 0 | 0 | 1.0 sec | 30 | 0 | tim very low few |
| T4:40 | 0 | 0 | 0 | 1.0 sec | 600 | 0 | tim few pump fail |
| T4:41 | 1 | 1 | 0 | 1.0 sec | 4 | 1 | estop beep off time |
| T4:42 | 0 | 0 | 0 | .01 sec | 50 | 0 | estop beep on time |
| T4:43 | 0 | 0 | 0 | 1.0 sec | 60 | 0 | tim building alarm lag |
| T4:44 | 0 | 0 | 0 | 1.0 sec | 60 | 0 | tim process alarm |

Data File C5 -- COUNTER

| Offset | CU | CD | DN | OV | UN | UA | PRE | ACC | (Symbol) Description |
|---|---|---|---|---|---|---|---|---|---|
| C5:0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1204 | few filter flush |
| C5:1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | few filter flush |
| C5:2 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 67 | hot hater screen flush max time w/o flush |
| C5:3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | hot hater screen flush time |
| C5:4 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 402 | cold water screen flush off time |
| C5:5 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | cold water bottum flush on time |





Data File R6 -- CONTROL

| Offset | EN | EU | DN | EM | ER | UL | IN | FD | LEN | POS | (Symbol) Description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| R6:0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

Data File N7 (dec) -- INTEGER

| Offset | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| N7:0 | 409 | -812 | 9 | 2 | 83 | 3400 | 3200 | 600 | 400 | 1 |
| N7:10 | 19 | 82 | 89 | 83 | 0 | 0 | 0 | 0 | 2 | 0 |
| N7:20 | 17 | 0 | 0 | 0 | 1 | 10 | 0 | 0 | 100 | 0 |
| N7:30 | 17 | 0 | 87 | 0 | 2 | 0 | 0 | 30 | 4888 | 364 |
| N7:40 | 0 | 41 | 1483 | 2190 | 1032 | 58 | 462 | 75 | 0 | 120 |
| N7:50 | 1 | 0 | 300 | 450 | 74 | 0 | 0 | 0 | 0 | 0 |
| N7:60 | 0 | 0 | 0 | 0 | 0 | 0 | 1343 | 0 | 2 | 1 |
| N7:70 | 463 | 48 | 0 | 0 | 0 | 748 | 199 | 0 | 600 | 0 |
| N7:80 | 207 | 15 | 206 | 3 | 10 | 20 | 1 | 1 | -40 | 439 |
| N7:90 | 74 | 78 | 59 | 41 | 0 | 0 | 15 | 206 | 50 | 75 |
| N7:100 | -7508 | 1 | 5 | 5 | 12 | 3 | 2 | 200 | 70 | 305 |
| N7:110 | 15 | 47 | 61 | 15 | 206 | 402 | 0 | 0 | 0 | 0 |
| N7:120 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| N7:130 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N7:140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N7:150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N7:160 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N7:170 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N7:180 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N7:190 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N7:200 | 0 | 8263 | 0 | 400 | 0 | 0 | 0 | 0 | 0 | 0 |
| N7:210 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N7:220 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N7:230 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N7:240 | 0 | 1 | 2 | 0 | 0 | 0 | 2 | 1 | 0 | 0 |
| N7:250 | 79 | 83 | 64 | 46 | | | | | | |





Data File F8 -- FLOAT

| Offset | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| F8:0 | 4.19 | -0.8666297 | 793.0349 | 895.598 | 1166.113 |
| F8:5 | 699.2209 | 304.6961 | 361.0611 | 459.7974 | 442.6807 |
| F8:10 | 34.72018 | 6.700058 | 70.7067 | 3024.63 | 3024.63 |
| F8:15 | 958.9944 | 1133.425 | 11.18016 | 0 | 0 |
| F8:20 | 0.03646667 | 385.7378 | | | |

Data File N10 (dec) -- ROUTINGTAB

| Offset | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| N10:0 | -16216 | 201 | -16216 | 202 | 0 | 0 | 0 | 0 | 0 | 0 |
| N10:10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N10:20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N10:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N10:40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N10:50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N10:60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N10:70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N10:80 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N10:90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N10:100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N10:110 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N10:120 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |



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Data File N11 (dec) -- STRING -- mmi

| Offset | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| N11:0 | 3845 | 3845 | 3845 | 3845 | 3845 | 3845 | 3845 | 3845 | 0 | 0 |
| N11:10 | 0 | 0 | -32767 | -32767 | -32767 | -32767 | -32767 | -32767 | 0 | 0 |
| N11:20 | 3077 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N11:30 | 0 | 0 | | | | | | | | |

Data File N20 (dec) -- CH1 Diag

| Offset | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| N20:0 | 0 | 0 | 437 | -23522 | 437 | -23527 | 0 | 0 | 0 | 0 |
| N20:10 | 0 | 0 | 0 | 0 | -22299 | 6872 | 9166 | -31899 | 365 | 6195 |
| N20:20 | 453 | 2604 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 471 | 0 | 178 |
| N20:40 | 0 | 1041 | 0 | 0 | 2 | 0 | -17378 | -25279 | -16216 | 200 |
| N20:50 | 2 | 2 | 0 | 16 | 2 | 0 | 0 | 0 | 0 | 0 |
| N20:60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:80 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:110 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:120 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:130 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:160 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:170 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:180 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:190 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:210 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:220 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:230 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:240 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N20:250 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |





Data File N21 (dec) -- PID LEN 23

| Offset | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| N21:0 | -32735 | 0 | 7680 | 1 | 1 | 0 | 0 | 0 | 0 | 200 |
| N21:10 | 0 | 0 | 0 | 1023 | 8263 | -583 | 0 | 13 | -28517 | 2 |
| N21:20 | 1136 | 15677 | 7680 | | | | | | | |

Address (Symbol) = Value [Description]





```
O:3/0         - {P102START}
                OTE - File #5 LIFTSTATIO - 17
O:3/1         - {P104START}
                OTE - File #5 LIFTSTATIO - 27
O:3/3         - {SSCR106RUN} wash selenoid sscr 106
                OTE - File #6 PRIM SCRN - 13
                XIC - File #6 PRIM SCRN - 4
                XIO - File #6 PRIM SCRN - 15
O:3/4         - {P103START}
                OTE - File #5 LIFTSTATIO - 22
O:3/6         - {SSCR105RUN} sscr 105 output run
                OTE - File #6 PRIM SCRN - 12
                XIC - File #6 PRIM SCRN - 2
                XIO - File #6 PRIM SCRN - 15
O:3/7         - {LEAKALARMSESET} MINICAS LEEK ALARM RESET
                OTE - File #5 LIFTSTATIO - 35
O:4/0         - few low level red lamp on
                OTE - File #8 FEW TANK - 4
O:4/1         - few full level blue lamp
                OTE - File #8 FEW TANK - 5
O:4/2         - {HORNFEW} horn few plus selenoid valve to dump few water outside when potable
                OTE - File #8 FEW TANK - 8
O:4/4         - {FEW_P1} start few p1
                OTE - File #8 FEW TANK - 15
                XIC - File #8 FEW TANK - 16
O:4/5         - {FEW_P2} start few p2
                OTE - File #8 FEW TANK - 18
                XIC - File #8 FEW TANK - 19
O:4/6         - {FEW_P3} start few p3
                OTE - File #8 FEW TANK - 21
                XIC - File #8 FEW TANK - 22
O:4/7         - hot few recirc pump p21
                OTE - File #12 FEW HEAT - 4
                XIC - File #12 FEW HEAT - 6
O:5.0         - COP - File #2 MAIN - 2
FILE O:5.0 LEN:12 - COP - File #2 MAIN - 2
O:6.0         - {SC_102} raw waste water speed set point analog out 4-20ma int 6242-31208
                MOV - File #5 LIFTSTATIO - 15
                SCP - File #5 LIFTSTATIO - 15
O:6.1         - {SC_104} raw waste water speed set point
                MOV - File #5 LIFTSTATIO - 25
                SCP - File #5 LIFTSTATIO - 24, 25
O:6.2         - {SC_103} raw waste water speed set point
                MOV - File #5 LIFTSTATIO - 20
                SCP - File #5 LIFTSTATIO - 20
O:6.3         - ahu-3 coil control valve
                SCP - File #4 AHU - 6
O:9/0         - {STOP_B1}
                OTE - File #10 BOILLERS - 4
O:9/1         - {STOP_B2}
                OTE - File #10 BOILLERS - 4
O:9/3         - few p20 very hot water booster pump enable
                OTE - File #12 FEW HEAT - 2
                XIC - File #12 FEW HEAT - 8
O:9/4         - auto dialler chanel 1
                OTE - File #11 ALARM - 10
O:9/5         - auto dialler chanel 2
                OTE - File #11 ALARM - 8
O:9/6         - ahu unit on lamp
                OTE - File #4 AHU - 15
                XIC - File #4 AHU - 28
O:9/7         - defrost damper
                OTE - File #4 AHU - 27
O:10/0        - ahu3 sf run low
                OTE - File #4 AHU - 18
                XIC - File #4 AHU - 19, 20
O:10/1        - ahu3 sf run high
```

```
                OTE - File #4 AHU - 18
                XIC - File #4 AHU - 19, 20
O:10/2        - ahu3 ef run low
                OTE - File #4 AHU - 18
                XIC - File #4 AHU - 21, 22
O:10/3        - ahu3 ef run high
                OTE - File #4 AHU - 18
                XIC - File #4 AHU - 21, 22
O:10/4        - fresh air intake outdoor air damper
                OTE - File #4 AHU - 16
O:10/5        - few electric heater enable
                OTE - File #12 FEW HEAT - 2
                XIC - File #12 FEW HEAT - 10, 11
O:10/6        - exhaust air damper
                OTE - File #4 AHU - 16
O:11.0        - COP - File #2 MAIN - 1
FILE O:11.0 LEN:8 - COP - File #2 MAIN - 1
O:12/0        - prim filt auger vfd start
                OTE - File #7 PRIM FILT - 21
O:12/1        - prim filt auger vfd fault
                OTE - File #7 PRIM FILT - 30
O:12/2        - prim filt drive vfd start
                OTE - File #7 PRIM FILT - 23
                XIO - File #7 PRIM FILT - 19, 25
O:12/3        - prim filt drive vfd fault reset
                OTE - File #7 PRIM FILT - 30
O:12/4        - hot water flush
                OTE - File #7 PRIM FILT - 24
O:12/5        - cold water flush POWER = CLOSE VALVE
                OTE - File #7 PRIM FILT - 18
O:12/6        - cold water bottom flush valve POWER = CLOSE SO OPEN PRESSVALVE
                OTE - File #7 PRIM FILT - 17
                XIO - File #7 PRIM FILT - 18
O:12/7        - prim blower start
                OTE - File #7 PRIM FILT - 23
                XIC - File #7 PRIM FILT - 37
O:12/8        - prim blower fan start
                OTE - File #7 PRIM FILT - 23
                XIC - File #7 PRIM FILT - 34
O:12/9        - primary filter run lamp
                OTE - File #7 PRIM FILT - 23
O:12/10       - primary filter fail lamp
                OTE - File #11 ALARM - 5
                XIO - File #7 PRIM FILT - 23
O:12/11       - {SV_106} wash selenoid sscr 105
                OTE - File #6 PRIM SCRN - 12
                XIC - File #6 PRIM SCRN - 10
O:12/12       - {SV_105} wash selenoid sscr 106
                OTE - File #6 PRIM SCRN - 13
                XIC - File #6 PRIM SCRN - 11
O:12/13       - e-stop notify
                OTE - File #11 ALARM - 14
O:12/15       - few filter flush 1 minutes every 24 hres
                OTE - File #12 FEW HEAT - 16
O:13.0        - {PRIMFIL_BELT_SPD} primary filter belt speed
                SCP - File #7 PRIM FILT - 7, 25
O:14.0        - COP - File #2 MAIN - 0
FILE O:14.0 LEN:12 - COP - File #2 MAIN - 0
I:1/0         - {P102_AUTO} raw sewer
                XIC - File #5 LIFTSTATIO - 14
I:1/1         - {P102_RUN} raw sewer
                XIC - File #3 TIME BASE - 10
                      File #5 LIFTSTATIO - 14
I:1/2         - {P102_FAULT} raw sewer
                XIC - File #5 LIFTSTATIO - 14
I:1/3         - {P102_LEAK} raw sewer
                XIO - File #5 LIFTSTATIO - 14
```





```
I:1/4         - GAS ch1 low
                XIC - File #9 GAS ALARM - 0
I:1/5         - GAS ch1 high
                XIC - File #9 GAS ALARM - 0
I:1/6         - ad active
                XIO - File #11 ALARM - 11
I:1/7         - gas ch2 low
                XIC - File #9 GAS ALARM - 0
I:1/8         - gas ch2 high
                XIC - File #9 GAS ALARM - 0
I:1/9         - gas global fault
                XIO - File #9 GAS ALARM - 1
I:1/10        - prim filter vfd run
                XIC - File #7 PRIM FILT - 23, 28
I:1/11        - prim filter belt drive fail
                XIC - File #7 PRIM FILT - 29
I:1/12        - {P103_AUTO}
                XIC - File #5 LIFTSTATIO - 19
I:1/13        - {P103_RUN}
                XIC - File #3 TIME BASE - 10
                      File #5 LIFTSTATIO - 19
I:1/14        - {P103_FAULT}
                XIC - File #5 LIFTSTATIO - 19
I:1/15        - {P103_LEAK}
                XIO - File #5 LIFTSTATIO - 19
I:2/0         - {P104_AUTO}
                XIC - File #5 LIFTSTATIO - 23
I:2/1         - {P104_RUN}
                XIC - File #3 TIME BASE - 10
                      File #5 LIFTSTATIO - 23
I:2/2         - {P104_FAULT}
                XIC - File #5 LIFTSTATIO - 23
I:2/3         - {P104_LEAK}
                XIO - File #5 LIFTSTATIO - 23
I:2/4         - gaz ch3 low
                XIC - File #9 GAS ALARM - 0
I:2/5         - gas ch3 high
                XIC - File #9 GAS ALARM - 0
I:2/7         - gas ch4 low
                XIC - File #9 GAS ALARM - 0
I:2/8         - gas ch4 high
                XIC - File #9 GAS ALARM - 0
I:2/10        - prim filter auger vfd run
                XIC - File #7 PRIM FILT - 26
I:2/11        - prim filter auger drive fail
                XIC - File #7 PRIM FILT - 27
I:2/12        - lahh  103 prim screen hh level
                XIO - File #6 PRIM SCRN - 7
I:2/13        - lshh 104 lift station hh level
                XIO - File #5 LIFTSTATIO - 9, 11
I:2/14        - not primary filter emergency stop
                XIC - File #7 PRIM FILT - 17, 21, 23, 33
                XIO - File #11 ALARM - 14
I:5.0         - {SI_102} p-102 raw wastewater speed indication
                SCP - File #5 LIFTSTATIO - 16
I:5.1         - {SI_104} p-104 raw wastewater speed indication
                SCP - File #5 LIFTSTATIO - 26
I:5.2         - {FI_101} raw waste water flow indication
                SCP - File #5 LIFTSTATIO - 3
I:5.3         - {SI_103} p 103 raw waste water speed indication
                SCP - File #5 LIFTSTATIO - 21
I:5.4         - {LI_101} lit 101 waste water lift station level indication
                SCP - File #5 LIFTSTATIO - 0, 1
                LES - File #5 LIFTSTATIO - 2
I:5.5         - {LIT_102} screening chamber level indication
                SCP - File #6 PRIM SCRN - 0, 1
                LES - File #6 PRIM SCRN - 9
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```
I:5.6       - {LI_501} lit 501 (few) final effluent water tank level indication
              SCP - File #8 FEW TANK - 0
I:5.7       - primary filter level
              SCP - File #7 PRIM FILT - 1
I:7/0       - {YS_105} sscr 105 auto
              XIO - File #6 PRIM SCRN - 10
I:7/1       - {MM_105} sscr 105 run
              XIC - File #3 TIME BASE - 10
                    File #6 PRIM SCRN - 3, 10
              XIO - File #6 PRIM SCRN - 2
I:7/2       - {YA_105} sscr 105 fault
              XIC - File #6 PRIM SCRN - 10
I:7/3       - {WA_105_} sscr 105 high torque
              XIO - File #6 PRIM SCRN - 10
I:7/4       - {FEW__PS1}
              XIC - File #8 FEW TANK - 9, 10, 15, 18, 21
I:7/5       - {FEW__PS2}
              XIC - File #8 FEW TANK - 9, 10, 15, 18, 21
I:7/6       - e-stop p-102
              XIC - File #5 LIFTSTATIO - 14
              XIO - File #11 ALARM - 14
I:7/7       - {AHU_AUTO} auto
              XIC - File #4 AHU - 7, 27
I:7/8       - {AHU_HIGH_SPEED} high speed
              XIC - File #4 AHU - 8, 10, 14
              XIO - File #4 AHU - 12
I:7/9       - {AHU_LOW_SPEED} low speed
              XIC - File #4 AHU - 8, 12, 14
              XIO - File #4 AHU - 10
I:7/10      - not few hot water recirc p21
              XIC - File #3 TIME BASE - 10
                    File #12 FEW HEAT - 0, 6
              XIO - File #12 FEW HEAT - 7
I:7/11      - not hot water booster pump run p20
              XIC - File #3 TIME BASE - 10
                    File #12 FEW HEAT - 0, 8
              XIO - File #12 FEW HEAT - 9
I:7/12      - few elect heater running
              XIC - File #3 TIME BASE - 10
                    File #12 FEW HEAT - 0, 11
              XIO - File #12 FEW HEAT - 10
I:7/13      - ptoable water blue lamp
              XIC - File #8 FEW TANK - 6
I:7/14      - {BLDGLAMP1} bldg lamp on
              XIC - File #4 AHU - 17
I:7/15      - {BLDGLAMP2} building lamp on
              XIC - File #4 AHU - 17
I:8/0       - {YS_106} sscr 106 auto
              XIO - File #6 PRIM SCRN - 11
I:8/1       - {MM_106} sscr 106 run
              XIC - File #3 TIME BASE - 10
                    File #6 PRIM SCRN - 5, 11
              XIO - File #6 PRIM SCRN - 4
I:8/2       - {YA_106} sscr 106 fault
              XIC - File #6 PRIM SCRN - 11
I:8/3       - {WA_106} sscr 106 high torque
              XIO - File #6 PRIM SCRN - 11
I:8/4       - e-stop p103
              XIC - File #5 LIFTSTATIO - 19
              XIO - File #11 ALARM - 14
I:8/5       - e-stop p104
              XIC - File #5 LIFTSTATIO - 23
              XIO - File #11 ALARM - 14
I:8/6       - mcc ahu3 sf not running
              XIC - File #4 AHU - 19, 20
              XIO - File #4 AHU - 0, 15, 16, 19
I:8/7       - mcc ahu3 ef not running
```





```
              XIC - File #4 AHU - 21, 22
              XIO - File #4 AHU - 0, 15, 16, 21
I:8/8       - {FEW_P1_RUN}
              XIC - File #8 FEW TANK - 12
              XIO - File #8 FEW TANK - 16
I:8/9       - {FEW_P2_RUN}
              XIC - File #8 FEW TANK - 13
              XIO - File #8 FEW TANK - 19
I:8/10      - {FEW_P3_RUN}
              XIC - File #8 FEW TANK - 14
              XIO - File #8 FEW TANK - 22
I:8/11      - primary filter on switch
              XIC - File #7 PRIM FILT - 17, 21, 23
I:8/12      - filter reset button
              XIC - File #7 PRIM FILT - 30, 40
I:8/13      - prim fil blower  run
              XIC - File #7 PRIM FILT - 31, 39
              XIO - File #7 PRIM FILT - 37
I:8/14      - prim fil blower fan run
              XIC - File #7 PRIM FILT - 32, 36
              XIO - File #7 PRIM FILT - 34
I:8/15      - low fuel day tank
              XIC - File #11 ALARM - 0
I:11.0      - {AHU3_SAT} ahu3 supply air temperature
              MOV - File #4 AHU - 1
I:11.1      - {AHU3_EAT} ahu3 exhaust air temperature
              MOV - File #4 AHU - 1
I:11.2      - {AHU3_OAT} ahu3 outside air temperature
              MOV - File #4 AHU - 1
I:11.3      - MOV - File #4 AHU - 1
I:11.4      - few elect heater temp
              MOV - File #12 FEW HEAT - 5
I:11.5      - trailler room temperature
              MOV - File #4 AHU - 1
I:14.0      - primary compressor pressur
              SCP - File #7 PRIM FILT - 3
S:1/15      - First Pass
              XIC - File #2 MAIN - 0, 1, 2
S:4/0       - XIC - File #3 TIME BASE - 15
S:4/5       - XIC - File #3 TIME BASE - 13
S:4/6       - XIC - File #7 PRIM FILT - 1, 3
S:4/8       - XIC - File #3 TIME BASE - 11
                    File #8 FEW TANK - 0
S:5/0       - Overflow Trap
              OTU - File #2 MAIN - 13
B3:0/0      - 1 second time base valid one scan
              OTE - File #3 TIME BASE - 7
              XIC - File #5 LIFTSTATIO - 5
                    File #12 FEW HEAT - 14
B3:0/1      - osr few
              OSR - File #7 PRIM FILT - 1
B3:0/2      - OSR - File #3 TIME BASE - 15
B3:0/3      - XIC - File #2 MAIN - 13
                    File #3 TIME BASE - 12, 14, 16
B3:0/4      - OSR - File #3 TIME BASE - 13
B3:0/5      - OSR - File #3 TIME BASE - 11
B3:0/6      - TIME BASE 1 minute
              OTE - File #3 TIME BASE - 4
              XIC - File #7 PRIM FILT - 9, 11, 13, 15
                    File #12 FEW HEAT - 12
B3:0/7      - OSR - File #8 FEW TANK - 0
B3:0/8      - lshh 104 latch for time delay (lift station emerg pump run)
              OTL - File #5 LIFTSTATIO - 11
              OTU - File #5 LIFTSTATIO - 13
              XIC - File #5 LIFTSTATIO - 12, 15, 17, 20, 22, 25, 27, 30
                    File #7 PRIM FILT - 5
B3:0/9      - OSR - File #5 LIFTSTATIO - 15
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B3:0/10      - OSR - File #5 LIFTSTATIO - 20
B3:0/11      - OSR - File #5 LIFTSTATIO - 25
B3:0/12      - OSR - File #7 PRIM FILT - 7
B3:0/13      - osr prifil
               OSR - File #7 PRIM FILT - 3
B3:0/14      - alayays on
               OTE - File #3 TIME BASE - 8
               XIC - File #6 PRIM SCRN - 12, 13
               XIO - File #3 TIME BASE - 9
B3:0/15      - alaways off
               OTE - File #3 TIME BASE - 9
B3:1/0       - osr few fil flush off time
               OSR - File #12 FEW HEAT - 12
B3:1/1       - osr wash cycle sscr
               OSR - File #6 PRIM SCRN - 24
B3:1/2       - osr few fil flush
               OSR - File #12 FEW HEAT - 14
B3:1/3       - OSR - File #7 PRIM FILT - 40
B3:1/4       - osr ahu
               OSR - File #4 AHU - 11
B3:1/5       - osr ahu
               OSR - File #4 AHU - 13
B3:1/6       - osr pri fil
               OSR - File #7 PRIM FILT - 9
B3:1/7       - osr prim fil
               OSR - File #7 PRIM FILT - 10
B3:1/8       - osr pri fil
               OSR - File #7 PRIM FILT - 11
B3:1/9       - osr pri fil
               OSR - File #7 PRIM FILT - 12
B3:1/10      - osr prim fil
               OSR - File #7 PRIM FILT - 13
B3:1/11      - osr prim fil
               OSR - File #7 PRIM FILT - 14
B3:1/12      - osr prim fil
               OSR - File #7 PRIM FILT - 15
B3:1/13      - osr prim fil
               OSR - File #7 PRIM FILT - 16
B3:1/14      - osr prim fil
               OSR - File #7 PRIM FILT - 19
B3:1/15      - osr prim fil
               OSR - File #7 PRIM FILT - 20
B3:2/0       - {OSR}
               OSR - File #7 PRIM FILT - 22
B3:2/1       - OSR - File #3 TIME BASE - 4
B3:2/2       - O:12/4  REVERS not hot water flush
               OTE - File #7 PRIM FILT - 23
               XIC - File #12 FEW HEAT - 1
               XIO - File #7 PRIM FILT - 24
B3:2/3       - osr prim fil
               OSR - File #7 PRIM FILT - 6
B3:2/4       - OSR - File #3 TIME BASE - 7
B3:2/5       - osr prifil count wash
               OSR - File #7 PRIM FILT - 41
B3:3/0       - gas alarm ahu high speed
               OTE - File #9 GAS ALARM - 0
               XIC - File #4 AHU - 17
B3:3/1       - osr
               OSR - File #12 FEW HEAT - 13
B3:3/2       - osr
               OSR - File #12 FEW HEAT - 15
B3:4/0       - OTE - File #12 FEW HEAT - 0
B3:44/0      - sscr auto wash time latch
               OTL - File #6 PRIM SCRN - 8, 16
               OTU - File #6 PRIM SCRN - 18
               XIC - File #6 PRIM SCRN - 12, 13, 17
B3:44/1      - sscr auto wash level latch screw
```





```
               OTL - File #6 PRIM SCRN - 19
               OTU - File #6 PRIM SCRN - 23
               XIC - File #6 PRIM SCRN - 12, 13
B3:44/2      - sscr auto wash level latch wash
               OTL - File #6 PRIM SCRN - 21
               OTU - File #6 PRIM SCRN - 23
               XIC - File #6 PRIM SCRN - 12, 13, 22, 24
T4:0         - 1/100 hhs base
               TON - File #3 TIME BASE - 0
T4:0/DN      - XIC - File #3 TIME BASE - 1
T4:1         - 1/100 h base
               TON - File #3 TIME BASE - 1
T4:1/DN      - XIC - File #3 TIME BASE - 10
                     File #4 AHU - 0
                     File #7 PRIM FILT - 0
               XIO - File #3 TIME BASE - 0
T4:2         - sscr wash duty
               TON - File #6 PRIM SCRN - 15
T4:2/DN      - XIC - File #6 PRIM SCRN - 16
T4:2.PRE     - MUL - File #6 PRIM SCRN - 14
T4:3         - sscr wash period
               TON - File #6 PRIM SCRN - 17
T4:3/DN      - XIC - File #6 PRIM SCRN - 18
T4:3.PRE     - MUL - File #6 PRIM SCRN - 14
T4:4         - timer few 01 fail
               TON - File #8 FEW TANK - 16
T4:4/DN      - XIC - File #8 FEW TANK - 17
T4:5         - timer few 02 fail
               TON - File #8 FEW TANK - 19
T4:5/DN      - XIC - File #8 FEW TANK - 20
T4:6         - timer few 03 fail
               TON - File #8 FEW TANK - 22
T4:6/DN      - XIC - File #8 FEW TANK - 23
T4:7         - tim ahu on
               TOF - File #4 AHU - 8
T4:7/DN      - XIC - File #4 AHU - 9
T4:8         - tim ahu
               TON - File #4 AHU - 10
T4:8/DN      - XIC - File #4 AHU - 11
T4:9         - ahu ls
               TON - File #4 AHU - 12
T4:9/DN      - XIC - File #4 AHU - 13
T4:10        - tim 1 minute
               TON - File #3 TIME BASE - 2
T4:10/DN     - tim 1 minute
               XIC - File #3 TIME BASE - 3, 4
T4:11        - tim 1 minute
               TON - File #3 TIME BASE - 3
T4:11/DN     - XIO - File #3 TIME BASE - 2
T4:12        - tim ahu defrost
               TON - File #4 AHU - 23
T4:12/DN     - XIC - File #4 AHU - 26
T4:12.PRE    - MOV - File #4 AHU - 23
T4:13        - ahu sf fail
               TON - File #4 AHU - 20
T4:13/DN     - XIC - File #4 AHU - 20
T4:14        - ahu ef fail
               TON - File #4 AHU - 22
T4:14/DN     - XIC - File #4 AHU - 22
T4:15        - TON - File #7 PRIM FILT - 19
T4:15/DN     - XIC - File #7 PRIM FILT - 20
T4:15.PRE    - MOV - File #7 PRIM FILT - 19
T4:16        - tim ahu freeze
               TON - File #4 AHU - 28
T4:16/DN     - XIC - File #4 AHU - 29
T4:17        - tim low gly temp
               TON - File #10 BOILLERS - 7
```

| | | |
|---|---|---|
| T4:17/DN | - XIC | File #10 BOILLERS - 8 |
| T4:18 | - tim | alarm high screw level |
| | TON | File #6 PRIM SCRN - 7 |
| T4:18/DN | - XIC | File #6 PRIM SCRN - 8 |
| T4:19 | - TON | File #5 LIFTSTATIO - 9 |
| T4:19/DN | - XIC | File #5 LIFTSTATIO - 10 |
| T4:20 | - ahu | pre defrost time |
| | TON | File #4 AHU - 24 |
| T4:20/DN | - XIC | File #4 AHU - 25 |
| T4:20.PRE | - MOV | File #4 AHU - 24 |
| T4:21 | - tim | full potable water |
| | TON | File #8 FEW TANK - 7 |
| T4:21/DN | - XIO | File #8 FEW TANK - 8 |
| T4:22 | - tim | few empty |
| | TON | File #8 FEW TANK - 3 |
| T4:22/DN | - XIC | File #8 FEW TANK - 4 |
| T4:23 | - tim | lshh104 |
| | TON | File #5 LIFTSTATIO - 12 |
| T4:23/DN | - XIC | File #5 LIFTSTATIO - 13 |
| T4:24 | - tim | auto prim fil |
| | TON | File #7 PRIM FILT - 8 |
| T4:24/DN | - XIC | File #7 PRIM FILT - 8 |
| T4:25 | - tim | few heat enable |
| | TON | File #12 FEW HEAT - 1 |
| T4:25/DN | - XIC | File #12 FEW HEAT - 2 |
| T4:26 | - tim | 1 sec time base |
| | TON | File #3 TIME BASE - 5 |
| T4:26/DN | - XIC | File #3 TIME BASE - 6, 7 |
| T4:27 | - tim | 1 sec time base |
| | TON | File #3 TIME BASE - 6 |
| T4:27/DN | - XIO | File #3 TIME BASE - 5 |
| T4:28 | - tim | sscr level auto wash |
| | TON | File #6 PRIM SCRN - 20 |
| T4:28/DN | - XIC | File #6 PRIM SCRN - 21 |
| T4:29 | - TON | File #6 PRIM SCRN - 22 |
| T4:29/DN | - XIC | File #6 PRIM SCRN - 23 |
| T4:30 | - tim | prifil blower fan fail |
| | TON | File #7 PRIM FILT - 34 |
| T4:30/DN | - XIC | File #7 PRIM FILT - 35 |
| T4:31 | - prim | filter blower fail |
| | TON | File #7 PRIM FILT - 37 |
| T4:31/DN | - XIC | File #7 PRIM FILT - 38 |
| T4:32 | - tim | hot few recirc disable no water |
| | TON | File #12 FEW HEAT - 3 |
| T4:32/DN | - XIC | File #12 FEW HEAT - 4 |
| T4:33 | - few | ovwerflow |
| | TON | File #8 FEW TANK - 6 |
| T4:33/DN | - XIC | File #8 FEW TANK - 7, 8 |
| T4:34 | - tim | few p21 fail |
| | TON | File #12 FEW HEAT - 6 |
| T4:34/DN | - XIC | File #12 FEW HEAT - 7 |
| T4:35 | - TON | File #12 FEW HEAT - 8 |
| T4:35/DN | - XIC | File #12 FEW HEAT - 9 |
| T4:36 | - tim | few elect heater |
| | TON | File #12 FEW HEAT - 10 |
| T4:36/DN | - XIC | File #12 FEW HEAT - 11 |
| T4:37 | - tim | sscr 105 fail |
| | TON | File #6 PRIM SCRN - 2 |
| T4:37/DN | - XIC | File #6 PRIM SCRN - 3 |
| T4:38 | - TON | File #6 PRIM SCRN - 4 |
| T4:38/DN | - XIC | File #6 PRIM SCRN - 5 |
| T4:39 | - tim | very low few |
| | TON | File #8 FEW TANK - 1 |
| T4:39/DN | - XIC | File #8 FEW TANK - 2 |
| T4:40 | - tim | few pump fail |
| | TON | File #8 FEW TANK - 10 |
| T4:40/DN | - XIC | File #8 FEW TANK - 11 |





| | | |
|---|---|---|
| T4:41 | - estop | beep off time |
| | TON | File #11 ALARM - 12 |
| T4:41/DN | - XIC | File #11 ALARM - 13, 14 |
| T4:42 | - estop | beep on time |
| | TON | File #11 ALARM - 13 |
| T4:42/DN | - XIO | File #11 ALARM - 12 |
| T4:43 | - tim | building alarm lag |
| | TON | File #11 ALARM - 7 |
| T4:43/DN | - XIC | File #11 ALARM - 8 |
| T4:44 | - tim | process alarm |
| | TON | File #11 ALARM - 9 |
| T4:44/DN | - XIC | File #11 ALARM - 10 |
| C5:0 | - few | filter flush |
| | CTD | File #12 FEW HEAT - 12 |
| C5:0/DN | - XIO | File #12 FEW HEAT - 13 |
| C5:0.ACC | - MOV | File #12 FEW HEAT - 12 |
| C5:1 | - few | filter flush |
| | CTD | File #12 FEW HEAT - 14 |
| C5:1/DN | - XIO | File #12 FEW HEAT - 15 |
| C5:1.ACC | - MOV | File #12 FEW HEAT - 14 |
| C5:2 | - hot | hater screen flush max time w/o flush |
| | CTD | File #7 PRIM FILT - 9 |
| C5:2/DN | - XIO | File #7 PRIM FILT - 10 |
| C5:2.ACC | - MUL | File #7 PRIM FILT - 9 |
| C5:3 | - hot | hater screen flush time |
| | CTD | File #7 PRIM FILT - 11 |
| C5:3/DN | - XIO | File #7 PRIM FILT - 12 |
| C5:3.ACC | - MOV | File #7 PRIM FILT - 11 |
| C5:4 | - cold | water screen flush off time |
| | CTD | File #7 PRIM FILT - 13 |
| C5:4/DN | - XIO | File #7 PRIM FILT - 14 |
| C5:4.ACC | - MUL | File #7 PRIM FILT - 13 |
| C5:5 | - cold | water bottum flush on time |
| | CTD | File #7 PRIM FILT - 15 |
| C5:5/DN | - XIO | File #7 PRIM FILT - 16 |
| C5:5.ACC | - cold | water bottum flush on time |
| | MOV | File #7 PRIM FILT - 15 |
| N7:0 | - {SIM_SIN} | |
| | MOV | File #3 TIME BASE - 16 |
| | ADD | File #3 TIME BASE - 15 |
| | DIV | File #3 TIME BASE - 17 |
| | GRT | File #3 TIME BASE - 16 |
| N7:1 | - {SIM_SIN_OUT} | |
| | MUL | File #3 TIME BASE - 19 |
| N7:2 | - {SIM_FAST_RAMP} | |
| | MOV | File #3 TIME BASE - 14 |
| | ADD | File #3 TIME BASE - 13 |
| | GRT | File #3 TIME BASE - 14 |
| N7:3 | - MOV | File #3 TIME BASE - 12 |
| | ADD | File #3 TIME BASE - 11 |
| | GRT | File #3 TIME BASE - 12 |
| N7:4 | - {TEMPRAW1} | math temp raw |
| | MOV | File #5 LIFTSTATIO - 31, 33, 34 |
| | SCP | File #5 LIFTSTATIO - 31 |
| | GRT | File #5 LIFTSTATIO - 31 |
| | LES | File #5 LIFTSTATIO - 31 |
| N7:5 | - {RAWLAGSTART} | lag start |
| | MOV | File #5 LIFTSTATIO - 29 |
| N7:6 | - {RAWLEADSTART} | lead start |
| | MOV | File #5 LIFTSTATIO - 29 |
| | SCP | File #5 LIFTSTATIO - 31 |
| N7:7 | - {RAWLAGSTOP} | lag stop |
| | MOV | File #5 LIFTSTATIO - 29 |
| | SCP | File #5 LIFTSTATIO - 31 |
| | LES | File #5 LIFTSTATIO - 30 |
| N7:8 | - {RAWLEADSTOP} | lead stop |
| | MOV | File #5 LIFTSTATIO - 29 |

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                LES - File #5 LIFTSTATIO - 30
N7:9/0          - {RAWLEADLATCH}
                OTL - File #5 LIFTSTATIO - 30
                OTU - File #5 LIFTSTATIO - 30
                XIC - File #5 LIFTSTATIO - 33
N7:9/1          - {RAWLAGLATCH}
                OTL - File #5 LIFTSTATIO - 30
                OTU - File #5 LIFTSTATIO - 30
                XIC - File #5 LIFTSTATIO - 34
N7:9/2          - fit total teset fit102 flow totaliser reset
                XIC - File #5 LIFTSTATIO - 6
N7:9/4          - lit 101 fail
                OTE - File #5 LIFTSTATIO - 2
                XIC - File #11 ALARM - 3
N7:9/5          - p102-103-104 fail only one remaning
                OTE - File #5 LIFTSTATIO - 7
                XIC - File #11 ALARM - 3
N7:9/6          - low low level lift station
                OTE - File #5 LIFTSTATIO - 8
                XIC - File #11 ALARM - 3
N7:9/7          - high high level lift station
                OTE - File #5 LIFTSTATIO - 10
                XIC - File #11 ALARM - 3
N7:10/0         - {P102_S_AUTO} s status UNDER PLC CONTROL
                OTE - File #5 LIFTSTATIO - 14
N7:10/1         - {P102_S_RUNNING} s status
                OTE - File #5 LIFTSTATIO - 14
N7:10/2         - {P102_S_FAULT} s status
                OTE - File #5 LIFTSTATIO - 14
                XIC - File #5 LIFTSTATIO - 7
                XIO - File #5 LIFTSTATIO - 19, 23
N7:10/3         - {P102_S_LEEK} s status
                OTE - File #5 LIFTSTATIO - 14
N7:10/4         - {P102_A_0HAND} a -> action pv->plc 1AUTO 0HAND
                XIC - File #5 LIFTSTATIO - 15, 17
                XIO - File #5 LIFTSTATIO - 15, 17
N7:10/5         - {MINICASRESET} LEEK ALARM RESET
                XIC - File #5 LIFTSTATIO - 35
N7:11           - {P102_S_SPEED} s status (CURRENT)(0-100%)
                SCP - File #5 LIFTSTATIO - 16
                GEQ - File #5 LIFTSTATIO - 17
N7:12           - {P102_A_SPEED} a action (set point) (0-100%)
                MOV - File #5 LIFTSTATIO - 15
                SCP - File #5 LIFTSTATIO - 15
                GRT - File #5 LIFTSTATIO - 17
N7:13           - {P102_E_SPEED} E EXPECTED (AUTO)(0-100%)
                MOV - File #5 LIFTSTATIO - 15, 32, 33, 34
                SCP - File #5 LIFTSTATIO - 15
                GEQ - File #5 LIFTSTATIO - 17
N7:14           - {P102_A_PRIORITY} 0 LEAD, 1LAG 2 STAND
                MOV - File #5 LIFTSTATIO - 14, 18, 36, 37, 38
                EQU - File #5 LIFTSTATIO - 17, 33, 34, 36
                NEQ - File #5 LIFTSTATIO - 36
N7:20/0         - {P103_S_AUTO} s status s status 1UNDER PLC CONTROL
                OTE - File #5 LIFTSTATIO - 19
N7:20/1         - {P103_S_RUNNING} s status
                OTE - File #5 LIFTSTATIO - 19
N7:20/2         - {P103_S_FAULT} s status
                OTE - File #5 LIFTSTATIO - 19
                XIC - File #5 LIFTSTATIO - 7
                XIO - File #5 LIFTSTATIO - 14, 23
N7:20/3         - {P103_S_LEEK} s status
                OTE - File #5 LIFTSTATIO - 19
N7:20/4         - {P103_A_0HAND} a -> action pv->plc
                XIC - File #5 LIFTSTATIO - 20, 22
                XIO - File #5 LIFTSTATIO - 20, 22
N7:21           - {P103_S_SPEED} s status (CURRENT)
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                SCP - File #5 LIFTSTATIO - 21
                GEQ - File #5 LIFTSTATIO - 22
N7:22           - {P103_A_SPEED} a action (set point)
                MOV - File #5 LIFTSTATIO - 20
                SCP - File #5 LIFTSTATIO - 20
                GRT - File #5 LIFTSTATIO - 22
N7:23           - {P103_E_SPEED} E EXPECTED (AUTO)
                MOV - File #5 LIFTSTATIO - 20, 32, 33, 34
                SCP - File #5 LIFTSTATIO - 20
                GEQ - File #5 LIFTSTATIO - 22
N7:24           - {P103_A_PRIORITY} 0 LEAD, 1LAG 2 STAND
                MOV - File #5 LIFTSTATIO - 19, 36, 37, 38
                EQU - File #5 LIFTSTATIO - 22, 33, 34, 37
                NEQ - File #5 LIFTSTATIO - 37
N7:30/0         - {P104_S_AUTO} S status 1UNDER PLC CONTROL
                OTE - File #5 LIFTSTATIO - 23
N7:30/1         - {P104_S_RUNNING} s status
                OTE - File #5 LIFTSTATIO - 23
N7:30/2         - {P104_S_FAULT} s status
                OTE - File #5 LIFTSTATIO - 23
                XIC - File #5 LIFTSTATIO - 7
                XIO - File #5 LIFTSTATIO - 14, 19
N7:30/3         - {P104_S_LEEK} s status
                OTE - File #5 LIFTSTATIO - 23
N7:30/4         - {P104_A_0HAND} a -> action pv->plc
                XIC - File #5 LIFTSTATIO - 25, 27
                XIO - File #5 LIFTSTATIO - 25, 27
N7:31           - {P104_S_SPEED} s status (CURRENT)
                SCP - File #5 LIFTSTATIO - 26
                GEQ - File #5 LIFTSTATIO - 27
N7:32           - {P104_A_SPEED} a action (set point)
                MOV - File #5 LIFTSTATIO - 25
                SCP - File #5 LIFTSTATIO - 24, 25
                GRT - File #5 LIFTSTATIO - 27
N7:33           - {P104_E_SPEED} E EXPECTED (AUTO)
                MOV - File #5 LIFTSTATIO - 25, 32, 33, 34
                SCP - File #5 LIFTSTATIO - 25
                GEQ - File #5 LIFTSTATIO - 27
N7:34           - {P104_A_PRIORITY} 0 LEAD, 1LAG 2 STAND
                MOV - File #5 LIFTSTATIO - 23, 28, 36, 37, 38
                EQU - File #5 LIFTSTATIO - 27, 33, 34, 38
                NEQ - File #5 LIFTSTATIO - 38
N7:41           - {LIT101_S_PR} RAW SEWER LIFT STATION LEVEL IN %
                SCP - File #5 LIFTSTATIO - 0
N7:42           - {LIT101_S_MM} RAW SEWER LIFT STATI LEVEL IN MM
                SCP - File #5 LIFTSTATIO - 1, 31
                GRT - File #5 LIFTSTATIO - 9, 30
                LES - File #5 LIFTSTATIO - 8, 30
N7:43           - {FIT101_FLOW} RAW SEWER FLOW (L/min)
                MOV - File #5 LIFTSTATIO - 4
                DIV - File #5 LIFTSTATIO - 5
                SCP - File #5 LIFTSTATIO - 3
                LES - File #5 LIFTSTATIO - 4
N7:44/0         - {SSCR105_A_0_AUTO} ENABLE AUTOMATIC
                XIC - File #6 PRIM SCRN - 12
                XIO - File #6 PRIM SCRN - 12
N7:44/1         - {SSCR106_A_0_AUTO} ENABLE AUTOMATIC
                XIC - File #6 PRIM SCRN - 13
                XIO - File #6 PRIM SCRN - 13
N7:44/2         - {SSCR105_S_AUTO} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 10
N7:44/3         - {SSCR105_S_RUN} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 10
N7:44/4         - {SSCR105_S_WASH} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 10
N7:44/5         - {SSCR105_S_FAULT} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 10
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                XIC - File #6 PRIM SCRN - 6
                XIO - File #6 PRIM SCRN - 12
N7:44/6       - {SSCR105_S_TORQ} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 10
N7:44/7       - {SSCR105_A_START} SCREW SCREEN START I
                XIC - File #6 PRIM SCRN - 12
N7:44/8       - {SSCR105_A_WASH} SCREW SCREEN START A
                XIC - File #6 PRIM SCRN - 12
N7:44/9       - {SSCR106_S_AUTO} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 11
N7:44/10      - {SSCR106_S_RUN} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 11
N7:44/11      - {SSCR106_S_WASH} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 11
N7:44/12      - {SSCR106_S_FAULT} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 11
                XIC - File #6 PRIM SCRN - 6
                XIO - File #6 PRIM SCRN - 13
N7:44/13      - {SSCR106_S_TORQ} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 11
N7:44/14      - {SSCR106_A_START} SCREW SCREEN START I
                XIC - File #6 PRIM SCRN - 13
N7:44/15      - {SSCR106_A_WASH} SCREW SCREEN START A
                XIC - File #6 PRIM SCRN - 13
N7:45         - {LIT102_S_PR} SCREW SCREEN CHAMBER LEVEL (0-100%)
                SCP - File #6 PRIM SCRN - 0
N7:46         - {LIT102_S_MM} SCREW SCREEN CHAMBER IN MM 0-820 (LIT-1120MM)
                SCP - File #6 PRIM SCRN - 1
                GRT - File #6 PRIM SCRN - 7, 19
                LES - File #6 PRIM SCRN - 20
N7:47         - {LIFT_MIN_SPD} minimum speed raw sewer pump
                MOV - File #5 LIFTSTATIO - 29, 31
                SCP - File #5 LIFTSTATIO - 31
                GEQ - File #5 LIFTSTATIO - 17, 22, 27
                LES - File #5 LIFTSTATIO - 31
N7:48/0       - both screw screen fail
                OTE - File #6 PRIM SCRN - 6
                XIC - File #11 ALARM - 4
N7:48/1       - prim screen level > 800 lahh+lit102
                OTE - File #6 PRIM SCRN - 7
                XIC - File #11 ALARM - 4
N7:48/2       - lit 102 fail less 3.5ma
                OTE - File #6 PRIM SCRN - 9
                XIC - File #11 ALARM - 4
N7:48/3       - sscr 105 fail (wont start)
                OTL - File #6 PRIM SCRN - 3
                OTU - File #6 PRIM SCRN - 3
                XIC - File #6 PRIM SCRN - 10
N7:48/4       - sscr 106 fail (wont start)
                OTL - File #6 PRIM SCRN - 5
                OTU - File #6 PRIM SCRN - 5
                XIC - File #6 PRIM SCRN - 11
N7:48/15      - count sscr wash cycle reset
                XIC - File #6 PRIM SCRN - 25
N7:49         - {SSCR105_A_TO_RUN} SCREW SCREEN START auto if no run for x
                MUL - File #6 PRIM SCRN - 14
N7:50         - {SSCR105_A_TO_WASH} SCREW SCREEN WASH N sec
                MUL - File #6 PRIM SCRN - 14
N7:53         - {SSCR_A_HIGH_LVL} SCREW SCREEN start high level (mm)
                GRT - File #6 PRIM SCRN - 19
                LES - File #6 PRIM SCRN - 20
N7:54         - count sscr wash cycle
                MOV - File #6 PRIM SCRN - 25
                ADD - File #6 PRIM SCRN - 24
N7:62/0       - gas fault
                OTE - File #9 GAS ALARM - 1
N7:62/1       - gas ait113
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                OTE - File #9 GAS ALARM - 0
                XIC - File #11 ALARM - 1
N7:65/0       - {FEW_S_S1} FEW PUMP STAGE 1 STA
                OTE - File #8 FEW TANK - 9
N7:65/1       - {FEW_S_S2} FEW PUMP STAGE 2 STA
                OTE - File #8 FEW TANK - 9
N7:65/2       - {FEW_S_P1RUN} FEW PUMP 1 RUN
                OTE - File #8 FEW TANK - 12
                XIC - File #3 TIME BASE - 10
N7:65/3       - {FEW_S_P2RUN} FEW PUMP 2 RUN
                OTE - File #8 FEW TANK - 13
                XIC - File #3 TIME BASE - 10
N7:65/4       - few p3 run
                OTE - File #8 FEW TANK - 14
                XIC - File #3 TIME BASE - 10
N7:65/7       - {FEW_S_A1} FEW PUMP 1 ALARM (WO
                OTL - File #8 FEW TANK - 17
N7:65/8       - {FEW_S_A2} FEW PUMP 2 ALARM (WO
                OTL - File #8 FEW TANK - 20
N7:65/9       - {FEW_S_A3} FEW PUMP 3 ALARM (WO
                OTL - File #8 FEW TANK - 23
N7:65/10      - {FEW_FULL_LAMP}
                OTE - File #8 FEW TANK - 5
N7:65/11      - {FEW_EMPTY_LAMP}
                OTE - File #8 FEW TANK - 4
                XIC - File #11 ALARM - 6
                XIO - File #8 FEW TANK - 15, 18, 21
                      File #12 FEW HEAT - 1, 3
N7:65/12      - VERY LOW FEW LEVEL
                OTE - File #8 FEW TANK - 2
                XIC - File #11 ALARM - 6
N7:65/13      - ALL PUMP FAIL
                OTE - File #8 FEW TANK - 11
                XIC - File #11 ALARM - 6
N7:66         - {FEW_S_LEVEL} FEW TANK LEVEL
                SCP - File #8 FEW TANK - 0
                GRT - File #8 FEW TANK - 5
                LES - File #8 FEW TANK - 1, 3
N7:67         - {FEW_P1_LEADLAGSTAND} 0 lead 1 lag 2 standby
                MOV - File #8 FEW TANK - 24, 25, 26
                EQU - File #8 FEW TANK - 15, 24
                NEQ - File #8 FEW TANK - 24
N7:68         - {FEW_P2_LEADLAGSTAND}
                MOV - File #8 FEW TANK - 24, 25, 26
                EQU - File #8 FEW TANK - 18, 25
                NEQ - File #8 FEW TANK - 25
N7:69         - {FEW_P3_LEADLAGSTAND}
                MOV - File #8 FEW TANK - 24, 25, 26
                EQU - File #8 FEW TANK - 21, 26
                NEQ - File #8 FEW TANK - 26
N7:70         - few elect heater temp
                MOV - File #12 FEW HEAT - 5
N7:71/0       - few p21 fail
                OTL - File #12 FEW HEAT - 7
                OTU - File #12 FEW HEAT - 7
N7:71/1       - few p20 fail
                OTL - File #12 FEW HEAT - 9
                OTU - File #12 FEW HEAT - 9
N7:71/2       - few elect heater fail
                OTL - File #12 FEW HEAT - 11
                OTU - File #12 FEW HEAT - 11
N7:71/3       - few filter flush
                OTL - File #12 FEW HEAT - 13
                OTU - File #12 FEW HEAT - 15
                XIC - File #12 FEW HEAT - 14, 16
                XIO - File #12 FEW HEAT - 12
N7:75         - {BOIL_S_TEMP} HEATING SYSTEM CUREN
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                MOV - File #4 AHU - 1
                DIV - File #4 AHU - 1
N7:76         - {OAT_S_TEMP} OUTSIDE AIR  TEMPERA
                MOV - File #4 AHU - 1
                DIV - File #4 AHU - 1
N7:78         - ahu pre defrost time
                MOV - File #4 AHU - 24
N7:79         - {AHU_S_MV} AHU_S_MV
                SCP - File #4 AHU - 5
N7:80         - {AHU_S_SAT} AHU-3 SUPPLY AIR TEM
                MOV - File #4 AHU - 1
                SCP - File #4 AHU - 3
                LES - File #4 AHU - 28
N7:81         - {AHU_A_SATSET} AHU-3 SUPPLY AIR TEM
                SCP - File #4 AHU - 2
N7:82         - {AHU_S_EAT} AHU-3 EXHAUST AIR temperature
                MOV - File #4 AHU - 1
                LES - File #4 AHU - 24
N7:83         - {AHU_H_O_A} 0 OFF 1 STAND BY 2 LS REMOTE 3 LS LIGHT 4 HS REMOTE 5 HS GAS-- 6 f
                MOV - File #4 AHU - 17
                EQU - File #4 AHU - 18
                NEQ - File #4 AHU - 18
N7:84/1       - ahu3 auto
                OTE - File #4 AHU - 7
                XIC - File #4 AHU - 17
                XIO - File #4 AHU - 17, 30
N7:84/2       - ahu3 hand
                OTE - File #4 AHU - 9
                XIC - File #4 AHU - 17
                XIO - File #4 AHU - 17, 30
N7:84/3       - 1- ahu3 high speed 0- ahu low speed
                OTL - File #4 AHU - 11
                OTU - File #4 AHU - 13
                XIC - File #4 AHU - 17
                XIO - File #4 AHU - 17
N7:84/4       - ahu defrost mmi info
                OTE - File #4 AHU - 27
N7:84/5       - {AHU_S_SF_FAIL}
                OTE - File #4 AHU - 20
                XIC - File #11 ALARM - 1
N7:84/6       - {AHU_S_EF_FAIL}
                OTE - File #4 AHU - 22
                XIC - File #11 ALARM - 1
N7:84/7       - ahu auto defrost latch
                OTL - File #4 AHU - 25
                OTU - File #4 AHU - 26
                XIC - File #4 AHU - 23, 27
N7:84/8       - selector remote ahu defrost
                OTE - File #4 AHU - 14
                XIC - File #4 AHU - 27
N7:84/9       - ahu freeze bellow 0 c more then 5 min
                OTL - File #4 AHU - 29
                OTU - File #4 AHU - 30
                XIC - File #4 AHU - 17
                      File #11 ALARM - 1
N7:85         - {AHU_S_OAT}
                DIV - File #4 AHU - 1
                GRT - File #10 BOILLERS - 0, 2
                LES - File #10 BOILLERS - 1, 3
N7:86         - {AHU_SF_STATUS} 0-off 1-low speed 2 high speed
                MOV - File #4 AHU - 19
N7:87         - {AHU_EF_STATUS} 0-off 1-low speed 2 high speed
                MOV - File #4 AHU - 21
N7:88         - {AHU_A_DEFROST_TEMP}
                LES - File #4 AHU - 24
N7:89         - {AHU_A_DEFROST_DELAY}
                MOV - File #4 AHU - 23
```





```
N7:90         - {B1_START_LEVEL} b1 start set point
                ADD - File #10 BOILLERS - 5
                LEQ - File #10 BOILLERS - 5
N7:91         - {B2_START_LEVEL}
                ADD - File #10 BOILLERS - 6
                LEQ - File #10 BOILLERS - 6
N7:96/0       - {B1_RUN}
                OTL - File #10 BOILLERS - 5
                OTU - File #10 BOILLERS - 5
                XIO - File #10 BOILLERS - 4
N7:96/1       - {B2_RUN}
                OTL - File #10 BOILLERS - 6
                OTU - File #10 BOILLERS - 6
                XIO - File #10 BOILLERS - 4
N7:96/2       - {OAT_GRT_10} oat greater then 10c
                OTL - File #10 BOILLERS - 2
                OTU - File #10 BOILLERS - 3
N7:96/3       - {OAT_GRT_16} oat greater then 16c
                OTL - File #10 BOILLERS - 0
                OTU - File #10 BOILLERS - 1
N7:96/4       - low glycol temp less 30c more 10 sec
                OTE - File #10 BOILLERS - 8
                XIC - File #11 ALARM - 2
N7:96/5       - trailler room freeze
                OTE - File #4 AHU - 31
                XIC - File #11 ALARM - 2
N7:97         - trailler room tempreature
                MOV - File #4 AHU - 1
                LES - File #4 AHU - 31
N7:98         - temp trailler room set alarm
                LES - File #4 AHU - 31
N7:99         - {CLYCOL_DIV10} glycol temperatur give real val 10  = 10c
                DIV - File #4 AHU - 1
                GRT - File #10 BOILLERS - 5, 6
                LES - File #10 BOILLERS - 7
                LEQ - File #10 BOILLERS - 5, 6
N7:100/0      - start hot water auto low speed screen flush
                OTL - File #7 PRIM FILT - 10
                OTU - File #7 PRIM FILT - 12
                XIC - File #7 PRIM FILT - 7, 11, 22, 23
                XIO - File #7 PRIM FILT - 9
N7:100/1      - start cold water bottom flush
                OTL - File #7 PRIM FILT - 14
                OTU - File #7 PRIM FILT - 16
                XIC - File #7 PRIM FILT - 15, 17
                XIO - File #7 PRIM FILT - 13
N7:100/2      - dewatering conveyor enable
                OTL - File #7 PRIM FILT - 4, 22
                OTU - File #7 PRIM FILT - 20
                XIC - File #7 PRIM FILT - 21
N7:100/3      - primary filter blower run
                OTE - File #7 PRIM FILT - 31
                XIC - File #7 PRIM FILT - 0
N7:100/4      - blower  fail
                OTL - File #7 PRIM FILT - 38
                OTU - File #7 PRIM FILT - 39, 40
N7:100/5      - primary filter filter run
                OTE - File #7 PRIM FILT - 28
                XIC - File #7 PRIM FILT - 0
N7:100/6      - primary filter filter alarm vfd fail
                OTE - File #7 PRIM FILT - 29
                XIC - File #11 ALARM - 5
                XIO - File #7 PRIM FILT - 23
N7:100/7      - primary filter auger run
                OTE - File #7 PRIM FILT - 26
                XIC - File #7 PRIM FILT - 0
N7:100/8      - primary filter auger alarm vfd fail
```

```
                OTE - File #7 PRIM FILT - 27
                XIC - File #11 ALARM - 5
N7:100/9        - primary filter blower fan run
                OTE - File #7 PRIM FILT - 32
N7:100/10       - primary filter blower fan alarm
                OTL - File #7 PRIM FILT - 35
                OTU - File #7 PRIM FILT - 36, 40
                XIC - File #11 ALARM - 5
                XIO - File #7 PRIM FILT - 23
N7:100/11       - hot water flush in progress
                OTE - File #7 PRIM FILT - 23
                XIC - File #7 PRIM FILT - 41
N7:100/12       - cold water flush in progress
                OTE - File #7 PRIM FILT - 17
N7:100/13       - not mmi Emergency stop pressed
                OTE - File #7 PRIM FILT - 33
N7:100/14       - {PRIMFIL_ON} primfil unit on
                OTE - File #7 PRIM FILT - 23
N7:100/15       - {PRIFIL_BELTRUN} prim filter belt ask run
                OTL - File #7 PRIM FILT - 4
                OTU - File #7 PRIM FILT - 4
                XIC - File #7 PRIM FILT - 23
N7:101/0        - filter belt speed 0 hand 1 auto (auto reset 2 minutes)
                OTL - File #7 PRIM FILT - 8
                XIC - File #7 PRIM FILT - 7
                XIO - File #7 PRIM FILT - 7, 8, 23
N7:101/1        - {AUGER_HAND} auger 1hand 0auto
                XIC - File #7 PRIM FILT - 21
N7:101/2        - prifil_wash reset
                XIC - File #7 PRIM FILT - 42
N7:101/10       - {PRIFIL_HSFLUSH} start high speed flush
                OTL - File #7 PRIM FILT - 5, 6
                OTU - File #7 PRIM FILT - 12
                XIC - File #7 PRIM FILT - 11, 23
                XIO - File #7 PRIM FILT - 7, 9
N7:102          - hot water screen flush max time w/o flush left
                MUL - File #7 PRIM FILT - 9
N7:103          - hot hater screen flush time
                MOV - File #7 PRIM FILT - 11
N7:104          - cold water bottum flush off time
                MUL - File #7 PRIM FILT - 13
N7:105          - cold water bottum flush on time
                MOV - File #7 PRIM FILT - 15
N7:106          - dewatering conveyor on time
                MOV - File #7 PRIM FILT - 19
N7:107          - {PRIFIL_BELTSTART} belt screen zero speed
                SCP - File #7 PRIM FILT - 1
                GRT - File #7 PRIM FILT - 4
N7:108          - {PRIFIL_BELTSTOP} belt screen full speed
                LES - File #7 PRIM FILT - 4
N7:109          - {PRIFIL_WASHBEGLVL} wash cycle start level
                GRT - File #7 PRIM FILT - 6
N7:110          - actual filter belt speed
                MOV - File #7 PRIM FILT - 25
                SCP - File #7 PRIM FILT - 25
N7:111          - {PRIFIL_WASHSPD} filter belt wash speed
                SCP - File #7 PRIM FILT - 7
N7:112          - {PRIFIL_MANSPD} manual belt set speed from mmi
                MOV - File #7 PRIM FILT - 7
                SCP - File #7 PRIM FILT - 7
N7:113          - {PRIFIL_CALCSPD} calculated belt speed function of level via mmi
                MOV - File #7 PRIM FILT - 2, 7
                SCP - File #7 PRIM FILT - 1, 7
                GRT - File #7 PRIM FILT - 2
                LES - File #7 PRIM FILT - 2
N7:114          - {PRIFIL_LVLMM} primary filter level scaled in mm
                SCP - File #7 PRIM FILT - 1
```



15.1



```
                GRT - File #7 PRIM FILT - 4, 6
                LES - File #7 PRIM FILT - 4
N7:115          - {PRIFIL_COMP_PRESS} primary filter compressor pressure
                SCP - File #7 PRIM FILT - 3
N7:116          - prifil_wash_count
                MOV - File #7 PRIM FILT - 42
                ADD - File #7 PRIM FILT - 41
N7:119/0        - low fuel alarm day tank
                OTE - File #11 ALARM - 0
N7:120/0        - global ahu enable
                XIC - File #11 ALARM - 7, 14
N7:120/1        - ahu alarm
                OTE - File #11 ALARM - 1
                XIC - File #11 ALARM - 7, 14
N7:121/0        - heating alarm enable
                XIC - File #11 ALARM - 7, 14
N7:121/1        - heating alarm
                OTE - File #11 ALARM - 2
                XIC - File #11 ALARM - 7, 14
N7:122/0        - lift station alarm enable
                XIC - File #11 ALARM - 9, 14
N7:122/1        - lift station alarm
                OTE - File #11 ALARM - 3
                XIC - File #11 ALARM - 9, 14
N7:123/0        - prim screen alarm enable
                XIC - File #11 ALARM - 9, 14
N7:123/1        - prim screen alarm
                OTE - File #11 ALARM - 4
                XIC - File #11 ALARM - 9, 14
N7:124/0        - prim filter alarm enable
                XIC - File #11 ALARM - 9, 14
N7:124/1        - prim filter alarm
                OTE - File #11 ALARM - 5
                XIC - File #11 ALARM - 9, 14
N7:125/0        - Few global Alarm enable
                XIC - File #11 ALARM - 9, 14
N7:125/1        - Few global Alarm
                OTE - File #11 ALARM - 6
                XIC - File #11 ALARM - 9, 14
N7:129/0        - auto dialler active
                OTE - File #11 ALARM - 11
N7:201          - PID - File #4 AHU - 4
                SCP - File #4 AHU - 3
N7:202          - PID - File #4 AHU - 4
                SCP - File #4 AHU - 5, 6
N7:240          - {COPY_N7_14}
                MOV - File #5 LIFTSTATIO - 36, 37, 38
                NEQ - File #5 LIFTSTATIO - 36
N7:241          - {COPY_N7_24}
                MOV - File #5 LIFTSTATIO - 36, 37, 38
                NEQ - File #5 LIFTSTATIO - 37
N7:242          - {COPY_N7_34}
                MOV - File #5 LIFTSTATIO - 36, 37, 38
                NEQ - File #5 LIFTSTATIO - 38
N7:245          - {N767COPY}
                MOV - File #8 FEW TANK - 24, 25, 26
                NEQ - File #8 FEW TANK - 24
N7:246          - {N768COPY}
                MOV - File #8 FEW TANK - 24, 25, 26
                NEQ - File #8 FEW TANK - 25
N7:247          - {N769COPY}
                MOV - File #8 FEW TANK - 24, 25, 26
                NEQ - File #8 FEW TANK - 26
N7:250          - temp boiller
                ADD - File #10 BOILLERS - 5
                GRT - File #10 BOILLERS - 5
N7:251          - {0} temp boiller
```

```
                ADD - File #10 BOILLERS - 6
                GRT - File #10 BOILLERS - 6
F8:0          - build sinus
                DIV - File #3 TIME BASE - 17
                SIN - File #3 TIME BASE - 18
F8:1          - build sinus
                MUL - File #3 TIME BASE - 19
                SIN - File #3 TIME BASE - 18
F8:2          - {BLOWER_TTSN} prim filter blower ttsn
                ADD - File #7 PRIM FILT - 0
F8:3          - {PRIFIL_TTSN} prim filter filter ttsn
                ADD - File #7 PRIM FILT - 0
F8:4          - {PRIFIL_AUGER_TTSN} prim filter auger ttsn
                ADD - File #7 PRIM FILT - 0
F8:5          - {P102_S_TTSN}
                ADD - File #3 TIME BASE - 10
F8:6          - {P103_S_TTSN}
                ADD - File #3 TIME BASE - 10
F8:7          - {P104_S_TTSN}
                ADD - File #3 TIME BASE - 10
F8:8          - {SSCR105_TTSN}
                ADD - File #3 TIME BASE - 10
F8:9          - {SSCR106_TTSN}
                ADD - File #3 TIME BASE - 10
F8:10         - {FEW_P1_TTSN}
                ADD - File #3 TIME BASE - 10
F8:11         - {FEW_P2_TTSN}
                ADD - File #3 TIME BASE - 10
F8:12         - {FEW_P3_TTSN}
                ADD - File #3 TIME BASE - 10
F8:13         - {AHU_SF_TTSN}
                ADD - File #4 AHU - 0
F8:14         - {AHU_EF_TTSN}
                ADD - File #4 AHU - 0
F8:15         - few p21 recirc pump
                ADD - File #3 TIME BASE - 10
F8:16         - few p20 recirc pump
                ADD - File #3 TIME BASE - 10
F8:17         - few electric heater heating
                ADD - File #3 TIME BASE - 10
F8:20         - total volume m3 temp var
                ADD - File #5 LIFTSTATIO - 5
                DIV - File #5 LIFTSTATIO - 5
F8:21         - {FIT_TOTALM3} total volume totaliser m3
                MOV - File #5 LIFTSTATIO - 6
                ADD - File #5 LIFTSTATIO - 5
N10:0         -     - Channel Configuration - Channel  1:Route Table File
FILE N10:0 LEN:128 -      - Channel Configuration - Channel  1:Route Table File
N11:0         - COP - File #2 MAIN - 2
FILE N11:0 LEN:12 - COP - File #2 MAIN - 2
N11:12        - COP - File #2 MAIN - 1
FILE N11:12 LEN:8 - COP - File #2 MAIN - 1
N11:20        - COP - File #2 MAIN - 0
FILE N11:20 LEN:12 - COP - File #2 MAIN - 0
N20:0         -     - Channel Configuration - Channel  1:Diagnostic File
FILE N20:0 LEN:256 -      - Channel Configuration - Channel  1:Diagnostic File
N21:0         - {N21} pid ahu3
                PID - File #4 AHU - 4
FILE N21:0 LEN:23 - PID - File #4 AHU - 4
N21:2         - SCP - File #4 AHU - 2
FILE N21:2 LEN:21 - PID - File #4 AHU - 4
U:3           - JSR - File #2 MAIN - 3
U:4           - JSR - File #2 MAIN - 4
U:5           - JSR - File #2 MAIN - 5
U:6           - JSR - File #2 MAIN - 6
U:7           - JSR - File #2 MAIN - 7
U:8           - JSR - File #2 MAIN - 8
```





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U:9           - JSR - File #2 MAIN - 9
U:10          - JSR - File #2 MAIN - 10
U:11          - JSR - File #2 MAIN - 11
U:12          - JSR - File #2 MAIN - 12
```

Data File O0 -- OUTPUT Usage

| Offset | FW | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O:3.0 | | | | | | | | | | X | X | | X | X | | X | X | 1746-OX8 - 8-Output Isolated Relay |
| O:4.0 | | | | | | | | | | X | X | X | X | | X | X | X | 1746-OX8 - 8-Output Isolated Relay |
| O:5.0 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:5.1 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:5.2 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:5.3 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:5.4 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:5.5 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:5.6 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:5.7 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:5.8 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:5.9 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:5.10 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:5.11 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:6.0 | W | | | | | | | | | | | | | | | | | 1746-NO4I - Analog 4 Ch. Current Ou |
| O:6.1 | W | | | | | | | | | | | | | | | | | 1746-NO4I - Analog 4 Ch. Current Ou |
| O:6.2 | W | | | | | | | | | | | | | | | | | 1746-NO4I - Analog 4 Ch. Current Ou |
| O:6.3 | W | | | | | | | | | | | | | | | | | 1746-NO4I - Analog 4 Ch. Current Ou |
| O:9.0 | | | | | | | | | | X | X | X | X | X | | X | X | 1746-OX8 - 8-Output Isolated Relay |
| O:10.0 | | | | | | | | | | | X | X | X | X | X | X | X | 1746-OX8 - 8-Output Isolated Relay |
| O:11.0 | F | | | | | | | | | | | | | | | | | 1746-NT8 - Analog 8 Ch Thermocouple |
| O:11.1 | F | | | | | | | | | | | | | | | | | 1746-NT8 - Analog 8 Ch Thermocouple |
| O:11.2 | F | | | | | | | | | | | | | | | | | 1746-NT8 - Analog 8 Ch Thermocouple |
| O:11.3 | F | | | | | | | | | | | | | | | | | 1746-NT8 - Analog 8 Ch Thermocouple |
| O:11.4 | F | | | | | | | | | | | | | | | | | 1746-NT8 - Analog 8 Ch Thermocouple |
| O:11.5 | F | | | | | | | | | | | | | | | | | 1746-NT8 - Analog 8 Ch Thermocouple |
| O:11.6 | F | | | | | | | | | | | | | | | | | 1746-NT8 - Analog 8 Ch Thermocouple |
| O:11.7 | F | | | | | | | | | | | | | | | | | 1746-NT8 - Analog 8 Ch Thermocouple |
| O:12.0 | | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | 1746-OW16 - 16-Output (RLY) 240 VAC |
| O:13.0 | W | | | | | | | | | | | | | | | | | 1746-NO4I - Analog 4 Ch. Current Ou |
| O:13.1 | | | | | | | | | | | | | | | | | | 1746-NO4I - Analog 4 Ch. Current Ou |
| O:13.2 | | | | | | | | | | | | | | | | | | 1746-NO4I - Analog 4 Ch. Current Ou |
| O:13.3 | | | | | | | | | | | | | | | | | | 1746-NO4I - Analog 4 Ch. Current Ou |
| O:14.0 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:14.1 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:14.2 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:14.3 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:14.4 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:14.5 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:14.6 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:14.7 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:14.8 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:14.9 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:14.10 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| O:14.11 | F | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |





Data File I1 -- INPUT Usage

| Offset | FW | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I:1.0 | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | 1746-IB16 - 16-Input (SINK) 24 VDC |
| I:2.0 | | | X | X | X | X | X | | X | X | | X | X | X | X | X | X | 1746-IB16 - 16-Input (SINK) 24 VDC |
| I:5.0 | W | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:5.1 | W | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:5.2 | W | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:5.3 | W | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:5.4 | W | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:5.5 | W | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:5.6 | W | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:5.7 | W | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:5.8 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:5.9 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:5.10 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:5.11 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:5.12 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:5.13 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:5.14 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:5.15 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:7.0 | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | 1746-IA16 - 16-Input 100/120 VAC |
| I:8.0 | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | 1746-IA16 - 16-Input 100/120 VAC |
| I:11.0 | W | | | | | | | | | | | | | | | | | 1746-NT8 - Analog 8 Ch Thermocouple |
| I:11.1 | W | | | | | | | | | | | | | | | | | 1746-NT8 - Analog 8 Ch Thermocouple |
| I:11.2 | W | | | | | | | | | | | | | | | | | 1746-NT8 - Analog 8 Ch Thermocouple |
| I:11.3 | W | | | | | | | | | | | | | | | | | 1746-NT8 - Analog 8 Ch Thermocouple |
| I:11.4 | W | | | | | | | | | | | | | | | | | 1746-NT8 - Analog 8 Ch Thermocouple |
| I:11.5 | W | | | | | | | | | | | | | | | | | 1746-NT8 - Analog 8 Ch Thermocouple |
| I:11.6 | | | | | | | | | | | | | | | | | | 1746-NT8 - Analog 8 Ch Thermocouple |
| I:11.7 | | | | | | | | | | | | | | | | | | 1746-NT8 - Analog 8 Ch Thermocouple |
| I:14.0 | W | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:14.1 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:14.2 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:14.3 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:14.4 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:14.5 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:14.6 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:14.7 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:14.8 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:14.9 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:14.10 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:14.11 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:14.12 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:14.13 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:14.14 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |
| I:14.15 | | | | | | | | | | | | | | | | | | 1746-NI8 - Analog 8 Channel Input |

Data File S2 -- STATUS Usage

| Offset | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| S:0 | . | X | . | . | X | X | . | . | . | . |
| S:10 | . | . | . | . | . | . | . | . | . | . |
| S:20 | . | . | . | . | . | . | . | . | . | . |
| S:30 | . | . | . | . | . | . | . | . | . | . |
| S:40 | . | . | . | . | . | . | . | . | . | . |
| S:50 | . | . | . | . | . | . | . | . | . | . |
| S:60 | . | . | . | . | . | . | . | . | . | . |
| S:70 | . | . | . | . | . | . | . | . | . | . |
| S:80 | . | . | . | | | | | | | |





Data File B3 -- BINARY Usage

| Offset | FW | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | (Symbol) Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B3:0 | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | |
| B3:1 | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | |
| B3:2 | | . | . | . | . | . | . | . | . | . | . | X | X | X | X | X | X | |
| B3:3 | | . | . | . | . | . | . | . | . | . | . | . | . | . | X | X | X | |
| B3:4 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | X | |
| B3:5 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:6 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:7 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:8 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:9 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:10 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:11 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:12 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:13 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:14 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:15 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:16 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:17 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:18 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:19 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:20 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:21 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:22 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:23 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:24 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:25 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:26 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:27 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:28 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:29 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:30 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:31 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:32 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:33 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:34 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:35 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:36 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:37 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:38 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:39 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:40 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:41 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:42 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:43 | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| B3:44 | | . | . | . | . | . | . | . | . | . | . | . | . | . | X | X | X | |

Data File T4 -- TIMER Usage

| Offset | FW | EN | TT | DN | BASE | PRE | ACC | (Symbol) Description |
|---|---|---|---|---|---|---|---|---|
| T4:0 | W | . | . | X | . | . | . | 1/100 hhs base |
| T4:1 | W | . | . | X | . | . | . | 1/100 h base |
| T4:2 | W | . | . | X | . | X | . | sscr wash duty |
| T4:3 | W | . | . | X | . | X | . | sscr wash period |
| T4:4 | W | . | . | X | . | . | . | timer few 01 fail |
| T4:5 | W | . | . | X | . | . | . | timer few 02 fail |
| T4:6 | W | . | . | X | . | . | . | timer few 03 fail |
| T4:7 | W | . | . | X | . | . | . | tim ahu on |
| T4:8 | W | . | . | X | . | . | . | tim ahu |
| T4:9 | W | . | . | X | . | . | . | ahu ls |
| T4:10 | W | . | . | X | . | . | . | tim 1 minute |
| T4:11 | W | . | . | X | . | . | . | tim 1 minute |
| T4:12 | W | . | . | X | . | X | . | tim ahu defrost |
| T4:13 | W | . | . | X | . | . | . | ahu sf fail |
| T4:14 | W | . | . | X | . | . | . | ahu ef fail |
| T4:15 | W | . | . | X | . | X | . | |
| T4:16 | W | . | . | X | . | . | . | tim ahu freeze |
| T4:17 | W | . | . | X | . | . | . | tim low gly temp |
| T4:18 | W | . | . | X | . | . | . | tim alarm high screw level |
| T4:19 | W | . | . | X | . | . | . | |
| T4:20 | W | . | . | X | . | X | . | ahu pre defrost time |
| T4:21 | W | . | . | X | . | . | . | tim full potable water |
| T4:22 | W | . | . | X | . | . | . | tim few empty |
| T4:23 | W | . | . | X | . | . | . | tim lshh104 |
| T4:24 | W | . | . | X | . | . | . | tim auto prim fil |
| T4:25 | W | . | . | X | . | . | . | tim few heat enable |
| T4:26 | W | . | . | X | . | . | . | tim 1 sec time base |
| T4:27 | W | . | . | X | . | . | . | tim 1 sec time base |
| T4:28 | W | . | . | X | . | . | . | tim sscr level auto wash |
| T4:29 | W | . | . | X | . | . | . | |
| T4:30 | W | . | . | X | . | . | . | tim prifil blower fan fail |
| T4:31 | W | . | . | X | . | . | . | prim filter blower fail |
| T4:32 | W | . | . | X | . | . | . | tim hot few recirc disable no water |
| T4:33 | W | . | . | X | . | . | . | few ovwerflow |
| T4:34 | W | . | . | X | . | . | . | tim few p21 fail |
| T4:35 | W | . | . | X | . | . | . | |
| T4:36 | W | . | . | X | . | . | . | tim few elect heater |
| T4:37 | W | . | . | X | . | . | . | tim sscr 105 fail |
| T4:38 | W | . | . | X | . | . | . | |
| T4:39 | W | . | . | X | . | . | . | tim very low few |
| T4:40 | W | . | . | X | . | . | . | tim few pump fail |
| T4:41 | W | . | . | X | . | . | . | estop beep off time |
| T4:42 | W | . | . | X | . | . | . | estop beep on time |
| T4:43 | W | . | . | X | . | . | . | tim building alarm lag |
| T4:44 | W | . | . | X | . | . | . | tim process alarm |





Data File C5 -- COUNTER Usage

| Offset | FW | CU | CD | DN | OV | UN | UA | PRE | ACC | (Symbol) Description |
|---|---|---|---|---|---|---|---|---|---|---|
| C5:0 | W | . | . | X | . | . | . | . | X | few filter flush |
| C5:1 | W | . | . | X | . | . | . | . | X | few filter flush |
| C5:2 | W | . | . | X | . | . | . | . | X | hot hater screen flush max time w/o flush |
| C5:3 | W | . | . | X | . | . | . | . | X | hot hater screen flush time |
| C5:4 | W | . | . | X | . | . | . | . | X | cold water screen flush off time |
| C5:5 | W | . | . | X | . | . | . | . | X | cold water bottum flush on time |



15.1

Data File R6 -- CONTROL Usage

| Offset | FW | EN | EU | DN | EM | ER | UL | IN | FD | LEN | POS | (Symbol) | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R6:0 | . | . | . | . | . | . | . | . | . | . | . | | |





Data File N7 -- INTEGER Usage

| Offset | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| N7:0 | X | X | X | X | X | X | X | X | X | X |
| N7:10 | X | X | X | X | X | . | . | . | . | . |
| N7:20 | X | X | X | X | X | . | . | . | . | . |
| N7:30 | X | X | X | X | X | . | . | . | . | . |
| N7:40 | . | X | X | X | X | X | X | X | X | X |
| N7:50 | X | . | . | X | X | . | . | . | . | . |
| N7:60 | . | . | X | . | . | X | X | X | X | X |
| N7:70 | X | X | . | . | . | X | X | . | X | X |
| N7:80 | X | X | X | X | X | X | X | X | X | X |
| N7:90 | X | X | . | . | . | . | X | X | X | X |
| N7:100 | X | X | X | X | X | X | X | X | X | X |
| N7:110 | X | X | X | X | X | X | X | . | . | X |
| N7:120 | X | X | X | X | X | X | . | . | . | X |
| N7:130 | . | . | . | . | . | . | . | . | . | . |
| N7:140 | . | . | . | . | . | . | . | . | . | . |
| N7:150 | . | . | . | . | . | . | . | . | . | . |
| N7:160 | . | . | . | . | . | . | . | . | . | . |
| N7:170 | . | . | . | . | . | . | . | . | . | . |
| N7:180 | . | . | . | . | . | . | . | . | . | . |
| N7:190 | . | . | . | . | . | . | . | . | . | . |
| N7:200 | . | X | X | . | . | . | . | . | . | . |
| N7:210 | . | . | . | . | . | . | . | . | . | . |
| N7:220 | . | . | . | . | . | . | . | . | . | . |
| N7:230 | . | . | . | . | . | . | . | . | . | . |
| N7:240 | X | X | X | . | . | X | X | X | . | . |
| N7:250 | X | X | . | . | | | | | | |

Data File F8 -- FLOAT Usage

| Offset | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| F8:0 | X | X | X | X | X |
| F8:5 | X | X | X | X | X |
| F8:10 | X | X | X | X | X |
| F8:15 | X | X | X | . | . |
| F8:20 | X | X | | | |





Data File N10 -- ROUTINGTAB Usage

| Offset | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| N10:0 | X | X | X | X | X | X | X | X | X | X |
| N10:10 | X | X | X | X | X | X | X | X | X | X |
| N10:20 | X | X | X | X | X | X | X | X | X | X |
| N10:30 | X | X | X | X | X | X | X | X | X | X |
| N10:40 | X | X | X | X | X | X | X | X | X | X |
| N10:50 | X | X | X | X | X | X | X | X | X | X |
| N10:60 | X | X | X | X | X | X | X | X | X | X |
| N10:70 | X | X | X | X | X | X | X | X | X | X |
| N10:80 | X | X | X | X | X | X | X | X | X | X |
| N10:90 | X | X | X | X | X | X | X | X | X | X |
| N10:100 | X | X | X | X | X | X | X | X | X | X |
| N10:110 | X | X | X | X | X | X | X | X | X | X |
| N10:120 | X | X | X | X | X | X | X | X | | |

Data File N11 -- STRING Usage

| Offset | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| N11:0 | X | X | X | X | X | X | X | X | X | X |
| N11:10 | X | X | X | X | X | X | X | X | X | X |
| N11:20 | X | X | X | X | X | X | X | X | X | X |
| N11:30 | X | X | | | | | | | | |





Data File N20 -- CH1 Diag Usage

| Offset | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| N20:0 | X | X | X | X | X | X | X | X | X | X |
| N20:10 | X | X | X | X | X | X | X | X | X | X |
| N20:20 | X | X | X | X | X | X | X | X | X | X |
| N20:30 | X | X | X | X | X | X | X | X | X | X |
| N20:40 | X | X | X | X | X | X | X | X | X | X |
| N20:50 | X | X | X | X | X | X | X | X | X | X |
| N20:60 | X | X | X | X | X | X | X | X | X | X |
| N20:70 | X | X | X | X | X | X | X | X | X | X |
| N20:80 | X | X | X | X | X | X | X | X | X | X |
| N20:90 | X | X | X | X | X | X | X | X | X | X |
| N20:100 | X | X | X | X | X | X | X | X | X | X |
| N20:110 | X | X | X | X | X | X | X | X | X | X |
| N20:120 | X | X | X | X | X | X | X | X | X | X |
| N20:130 | X | X | X | X | X | X | X | X | X | X |
| N20:140 | X | X | X | X | X | X | X | X | X | X |
| N20:150 | X | X | X | X | X | X | X | X | X | X |
| N20:160 | X | X | X | X | X | X | X | X | X | X |
| N20:170 | X | X | X | X | X | X | X | X | X | X |
| N20:180 | X | X | X | X | X | X | X | X | X | X |
| N20:190 | X | X | X | X | X | X | X | X | X | X |
| N20:200 | X | X | X | X | X | X | X | X | X | X |
| N20:210 | X | X | X | X | X | X | X | X | X | X |
| N20:220 | X | X | X | X | X | X | X | X | X | X |
| N20:230 | X | X | X | X | X | X | X | X | X | X |
| N20:240 | X | X | X | X | X | X | X | X | X | X |
| N20:250 | X | X | X | X | X | X | | | | |

## Data File N21 -- PID LEN 23 Usage

| Offset | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| N21:0 | X | X | X | X | X | X | X | X | X | X |
| N21:10 | X | X | X | X | X | X | X | X | X | X |
| N21:20 | X | X | X | | | | | | | |





## Address/Symbol Database

| Address | Symbol | Scope | Description |
|---|---|---|---|
| B3:0 | | | |
| B3:0/0 | | | 1 second time base valid one scan |
| B3:0/1 | | | osr few |
| B3:0/2 | | | |
| B3:0/4 | | | |
| B3:0/5 | | | |
| B3:0/6 | | | TIME BASE 1 minute |
| B3:0/7 | | | |
| B3:0/8 | | | lshh 104 latch for time delay (lift station emerg pump run) |
| B3:0/13 | | | osr prifil |
| B3:0/14 | | | alayays on |
| B3:0/15 | | | alaways off |
| B3:1/0 | | | osr few fil flush off time |
| B3:1/1 | | | osr wash cycle sscr |
| B3:1/2 | | | osr few fil flush |
| B3:1/4 | | | osr ahu |
| B3:1/5 | | | osr ahu |
| B3:1/6 | | | osr pri fil |
| B3:1/7 | | | osr prim fil |
| B3:1/8 | | | osr pri fil |
| B3:1/9 | | | osr pri fil |
| B3:1/10 | | | osr prim fil |
| B3:1/11 | | | osr prim fil |
| B3:1/12 | | | osr prim fil |
| B3:1/13 | | | osr prim fil |
| B3:1/14 | | | osr prim fil |
| B3:1/15 | | | osr prim fil |
| B3:2 | | | |
| B3:2/0 | OSR | Global | |
| B3:2/2 | | | O:12/4 REVERS not hot water flush |
| B3:2/3 | | | osr prim fil |
| B3:2/5 | | | osr prifil count wash |
| B3:3/0 | | | gas alarm ahu high speed |
| B3:3/1 | | | osr |
| B3:3/2 | | | osr |
| B3:3/6 | | | |
| B3:44/0 | | | sscr auto wash time latch |
| B3:44/1 | | | sscr auto wash level latch screw |
| B3:44/2 | | | sscr auto wash level latch wash |
| C5:0 | | | few filter flush |
| C5:1 | | | few filter fluah |
| C5:2 | | | hot hater screen flush max time w/o flush |
| C5:2.ACC | | | |
| C5:2/DN | | | |
| C5:3 | | | hot hater screen flush time |
| C5:3.ACC | | | |
| C5:3/DN | | | |
| C5:4 | | | cold water screen flush off time |
| C5:4.ACC | | | |
| C5:5 | | | cold water bottum flush on time |
| C5:5.ACC | | | cold water bottum flush on time |
| F8:0 | | | build sinus |
| F8:1 | | | build sinus |
| F8:2 | BLOWER_TTSN | Global | prim filter blower ttsn |
| F8:3 | PRIFIL_TTSN | Global | prim filter filter ttsn |
| F8:4 | PRIFIL_AUGER_TTSN | Global | prim filter auger ttsn |
| F8:5 | P102_S_TTSN | Global | |
| F8:6 | P103_S_TTSN | Global | |
| F8:7 | P104_S_TTSN | Global | |
| F8:8 | SSCR105_TTSN | Global | |
| F8:9 | SSCR106_TTSN | Global | |
| F8:10 | FEW_P1_TTSN | Global | |
| F8:11 | FEW_P2_TTSN | Global | |
| F8:12 | FEW_P3_TTSN | Global | |
| F8:13 | AHU_SF_TTSN | Global | |
| F8:14 | AHU_EF_TTSN | Global | |
| F8:15 | | | few p21 recirc pump |
| F8:16 | | | few p20 recirc pump |
| F8:17 | | | few electric heater heating |
| F8:20 | | | total volume m3 temp var |
| F8:21 | FIT_TOTALM3 | Global | total volume totaliser m3 |
| I:1/0 | P102_AUTO | Global | raw sewer |
| I:1/1 | P102_RUN | Global | raw sewer |
| I:1/2 | P102_FAULT | Global | raw sewer |
| I:1/3 | P102_LEAK | Global | raw sewer |
| I:1/4 | | | GAS ch1 low |
| I:1/5 | | | GAS ch1 high |
| I:1/6 | | | ad active |
| I:1/7 | | | gas ch2 low |

| Address | Symbol | Scope | Description |
|---|---|---|---|
| I:1/8 | | | |
| I:1/9 | | | gas ch2 high |
| I:1/10 | | | gas global fault |
| I:1/11 | | | prim filter vfd run |
| I:1/12 | P103_AUTO | Global | prim filter belt drive fail |
| I:1/13 | P103_RUN | Global | |
| I:1/14 | P103_FAULT | Global | |
| I:1/15 | P103_LEAK | Global | |
| I:2/0 | P104_AUTO | Global | |
| I:2/1 | P104_RUN | Global | |
| I:2/2 | P104_FAULT | Global | |
| I:2/3 | P104_LEAK | Global | |
| I:2/4 | | | gaz ch3 low |
| I:2/5 | | | gas ch3 high |
| I:2/7 | | | gas ch4 low |
| I:2/8 | | | gas ch4 high |
| I:2/10 | | | prim filter auger vfd run |
| I:2/11 | | | prim filter auger drive fail |
| I:2/12 | | | lahh 103 prim screen hh level |
| I:2/13 | | | lahh 104 lift station hh level |
| I:2/14 | | | not primary filter emergency stop |
| I:5.0 | SI_102 | Global | p-102 raw wastewater speed indication |
| I:5.1 | SI_104 | Global | p-104 raw wastewater speed indication |
| I:5.2 | FI_101 | Global | raw waste water flow indication |
| I:5.3 | SI_103 | Global | p 103 raw waste water speed indication |
| I:5.4 | LI_101 | Global | lit 101 waste water lift station level indication |
| I:5.5 | LIT_102 | Global | screening chamber level indication |
| I:5.6 | LI_501 | Global | lit 501 (few) final effluent water tank level indication |
| I:5.7 | | | primary filter level |
| I:7.0 | | | |
| I:7/0 | YS_105 | Global | sscr 105 auto |
| I:7/1 | MM_105 | Global | sscr 105 run |
| I:7/2 | YA_105 | Global | sscr 105 fault |
| I:7/3 | WA_105_ | Global | sscr 105 high torque |
| I:7/4 | FEW__PS1 | Global | |
| I:7/5 | FEW__PS2 | Global | |
| I:7/6 | | | e-stop p-102 |
| I:7/7 | AHU_AUTO | Global | auto |
| I:7/8 | AHU_HIGH_SPEED | Global | high speed |
| I:7/9 | AHU_LOW_SPEED | Global | low speed |
| I:7/10 | | | not few hot water recirc p21 |
| I:7/11 | | | not hot water booster pump run p20 |
| I:7/12 | | | few elect heater running |
| I:7/13 | | | ptoable water blue lamp |
| I:7/14 | BLDGLAMP1 | Global | bldg lamp on |
| I:7/15 | BLDGLAMP2 | Global | building lamp on |
| I:8/0 | YS_106 | Global | sscr 106 auto |
| I:8/1 | MM_106 | Global | sscr 106 run |
| I:8/2 | YA_106 | Global | sscr 106 fault |
| I:8/3 | WA_106 | Global | sscr 106 high torque |
| I:8/4 | | | e-stop p103 |
| I:8/5 | | | e-stop p104 |
| I:8/6 | | | mcc ahu3 sf not running |
| I:8/7 | | | mcc ahu3 ef not running |
| I:8/8 | FEW_P1_RUN | Global | |
| I:8/9 | FEW_P2_RUN | Global | |
| I:8/10 | FEW_P3_RUN | Global | |
| I:8/11 | | | primary filter on switch |
| I:8/12 | | | filter reset button |
| I:8/13 | | | prim fil blower run |
| I:8/14 | | | prim fil blower fan run |
| I:8/15 | | | low fuel day tank |
| I:11.0 | AHU3_SAT | Global | ahu3 supply air temperature |
| I:11.1 | AHU3_EAT | Global | ahu3 exhaust air temperature |
| I:11.2 | AHU3_OAT | Global | ahu3 outside air temperature |
| I:11.3 | | | |
| I:11.4 | | | few elect heater temp |
| I:11.5 | | | trailler room temperature |
| I:14.0 | | | primary compressor pressur |
| N7:0 | SIM_SIN | Global | |
| N7:1 | SIM_SIN_OUT | Global | |
| N7:2 | SIM_FAST_RAMP | Global | |
| N7:4 | TEMPRAW1 | Global | math temp raw |
| N7:5 | RAWLAGSTART | Global | lag start |
| N7:6 | RAWLEADSTART | Global | lead start |
| N7:7 | RAWLAGSTOP | Global | lag stop |
| N7:8 | RAWLEADSTOP | Global | lead stop |
| N7:9 | | | |
| N7:9/0 | RAWLEADLATCH | Global | |





| Address | Symbol | Scope | Description |
|---|---|---|---|
| N7:9/1 | RAWLAGLATCH | Global | |
| N7:9/2 | | | fit total teset fit102 flow totaliser reset |
| N7:9/4 | | | lit 101 fail |
| N7:9/5 | | | p102-103-104 fail only one remaning |
| N7:9/6 | | | low low level lift station |
| N7:9/7 | | | high high level lift station |
| N7:10 | P102_STATUS | Global | |
| N7:10/0 | P102_S_AUTO | Global | s status UNDER PLC CONTROL |
| N7:10/1 | P102_S_RUNNING | Global | s status |
| N7:10/2 | P102_S_FAULT | Global | s status |
| N7:10/3 | P102_S_LEEK | Global | s status |
| N7:10/4 | P102_A_0HAND | Global | a -> action pv->plc 1AUTO 0HAND |
| N7:10/5 | MINICASRESET | Global | LEEK ALARM RESET |
| N7:11 | P102_S_SPEED | Global | s status (CURRENT)(0-100%) |
| N7:12 | P102_A_SPEED | Global | a action (set point) (0-100%) |
| N7:13 | P102_E_SPEED | Global | E EXPECTED (AUTO)(0-100%) |
| N7:14 | P102_A_PRIORITY | Global | 0 LEAD, 1LAG 2 STAND |
| N7:15 | | | |
| N7:20 | P103_STATUS | Global | |
| N7:20/0 | P103_S_AUTO | Global | s status s status 1UNDER PLC CONTROL |
| N7:20/1 | P103_S_RUNNING | Global | s status |
| N7:20/2 | P103_S_FAULT | Global | s status |
| N7:20/3 | P103_S_LEEK | Global | s status |
| N7:20/4 | P103_A_0HAND | Global | a -> action pv->plc |
| N7:21 | P103_S_SPEED | Global | a status (CURRENT) |
| N7:22 | P103_A_SPEED | Global | a action (set point) |
| N7:23 | P103_E_SPEED | Global | E EXPECTED (AUTO) |
| N7:24 | P103_A_PRIORITY | Global | 0 LEAD, 1LAG 2 STAND |
| N7:30 | P104_STATUS | Global | |
| N7:30/0 | P104_S_AUTO | Global | S status 1UNDER PLC CONTROL |
| N7:30/1 | P104_S_RUNNING | Global | s status |
| N7:30/2 | P104_S_FAULT | Global | s status |
| N7:30/3 | P104_S_LEEK | Global | s status |
| N7:30/4 | P104_A_0HAND | Global | a -> action pv->plc |
| N7:31 | P104_S_SPEED | Global | s status (CURRENT) |
| N7:32 | P104_A_SPEED | Global | a action (set point) |
| N7:33 | P104_E_SPEED | Global | E EXPECTED (AUTO) |
| N7:34 | P104_A_PRIORITY | Global | 0 LEAD, 1LAG 2 STAND |
| N7:41 | LIT101_S_PR | Global | RAW SEWER LIFT STATION LEVEL IN % |
| N7:42 | LIT101_S_MM | Global | RAW SEWER LIFT STATI LEVEL IN MM |
| N7:43 | FIT101_FLOW | Global | RAW SEWER FLOW (L/min) |
| N7:44 | SSCR_STATUS | Global | |
| N7:44/0 | SSCR105_A_0_AUTO | Global | ENABLE AUTOMATIC |
| N7:44/1 | SSCR106_A_0_AUTO | Global | ENABLE AUTOMATIC |
| N7:44/2 | SSCR105_S_AUTO | Global | SCREW SCREEN STATUS |
| N7:44/3 | SSCR105_S_RUN | Global | SCREW SCREEN STATUS |
| N7:44/4 | SSCR105_S_WASH | Global | SCREW SCREEN STATUS |
| N7:44/5 | SSCR105_S_FAULT | Global | SCREW SCREEN STATUS |
| N7:44/6 | SSCR105_S_TORQ | Global | SCREW SCREEN STATUS |
| N7:44/7 | SSCR105_A_START | Global | SCREW SCREEN START I |
| N7:44/8 | SSCR105_A_WASH | Global | SCREW SCREEN START A |
| N7:44/9 | SSCR106_S_AUTO | Global | SCREW SCREEN STATUS |
| N7:44/10 | SSCR106_S_RUN | Global | SCREW SCREEN STATUS |
| N7:44/11 | SSCR106_S_WASH | Global | SCREW SCREEN STATUS |
| N7:44/12 | SSCR106_S_FAULT | Global | SCREW SCREEN STATUS |
| N7:44/13 | SSCR106_S_TORQ | Global | SCREW SCREEN STATUS |
| N7:44/14 | SSCR106_A_START | Global | SCREW SCREEN START I |
| N7:44/15 | SSCR106_A_WASH | Global | SCREW SCREEN START A |
| N7:45 | LIT102_S_PR | Global | SCREW SCREEN CHAMBER LEVEL (0-100%) |
| N7:46 | LIT102_S_MM | Global | SCREW SCREEN CHAMBER IN MM 0-820 (LIT-1120MM) |
| N7:47 | LIFT_MIN_SPD | Global | minimum speed raw sewer pump |
| N7:48/0 | | | both screw screen fail |
| N7:48/1 | | | prim screen level > 800 lahh+lit102 |
| N7:48/2 | | | lit 102 fail less 3.5ma |
| N7:48/3 | | | sscr 105 fail (wont start) |
| N7:48/4 | | | sscr 106 fail (wont start) |
| N7:48/15 | | | count sscr wash cycle reset |
| N7:49 | SSCR105_A_TO_RUN | Global | SCREW SCREEN START auto if no run for x |
| N7:50 | SSCR105_A_TO_WASH | Global | SCREW SCREEN WASH N sec |
| N7:53 | SSCR_A_HIGH_LVL | Global | SCREW SCREEN start high level (mm) |
| N7:54 | | | count sscr wash cycle |
| N7:62/0 | | | gas fault |
| N7:62/1 | | | gas ait113 |
| N7:65 | FEW_STATUS | Global | |
| N7:65/0 | FEW_S_S1 | Global | FEW PUMP STAGE 1 STA |
| N7:65/1 | FEW_S_S2 | Global | FEW PUMP STAGE 2 STA |
| N7:65/2 | FEW_S_P1RUN | Global | FEW PUMP 1 RUN |
| N7:65/3 | FEW_S_P2RUN | Global | FEW PUMP 2 RUN |
| N7:65/4 | | | few p1 run |

| Address | Symbol | Scope | Description |
|---|---|---|---|
| N7:65/7 | FEW_S_A1 | Global | FEW PUMP 1 ALARM (WO |
| N7:65/8 | FEW_S_A2 | Global | FEW PUMP 2 ALARM (WO |
| N7:65/9 | FEW_S_A3 | Global | FEW PUMP 3 ALARM (WO |
| N7:65/10 | FEW_FULL_LAMP | Global | |
| N7:65/11 | FEW_EMPTY_LAMP | Global | |
| N7:65/12 | | | VERY LOW FEW LEVEL |
| N7:65/13 | | | ALL PUMP FAIL |
| N7:66 | FEW_S_LEVEL | Global | FEW TANK LEVEL |
| N7:67 | FEW_P1_LEADLAGSTAND | Global | 0 lead 1 lag 2 standby |
| N7:68 | FEW_P2_LEADLAGSTAND | Global | |
| N7:69 | FEW_P3_LEADLAGSTAND | Global | |
| N7:70 | | | few elect heater temp |
| N7:71 | | | |
| N7:71/0 | | | few p21 fail |
| N7:71/1 | | | few p20 fail |
| N7:71/2 | | | few elect heater fail |
| N7:71/3 | | | few filter flush |
| N7:75 | BOIL_S_TEMP | Global | HEATING SYSTEM CUREN |
| N7:76 | OAT_S_TEMP | Global | OUTSIDE AIR TEMPERA |
| N7:78 | | | ahu pre defrost time |
| N7:79 | AHU_S_MV | Global | AHU_S_MV |
| N7:80 | AHU_S_SAT | Global | AHU-3 SUPPLY AIR TEM |
| N7:81 | AHU_A_SATSET | Global | AHU-3 SUPPLY AIR TEM |
| N7:82 | AHU_S_EAT | Global | AHU-3 EXHAUST AIR temperature |
| N7:83 | AHU_H_O_A | Global | 0 OFF 1 STAND BY 2 LS REMOTE 3 LS LIGHT 4 HS REMOTE 5 HS GAS-- 6 fail |
| N7:84 | AHU_BIT_STATUS | Global | |
| N7:84/1 | | | ahu3 auto |
| N7:84/2 | | | ahu3 hand |
| N7:84/3 | | | 1- ahu3 high speed 0- ahu low speed |
| N7:84/4 | | | ahu defrost mmi info |
| N7:84/5 | AHU_S_SF_FAIL | Global | |
| N7:84/6 | AHU_S_EF_FAIL | Global | |
| N7:84/7 | | | ahu auto defrost latch |
| N7:84/8 | | | selector remote ahu defrost |
| N7:84/9 | | | ahu freeze bellow 0 c more then 5 min |
| N7:85 | AHU_S_OAT | Global | |
| N7:86 | AHU_SF_STATUS | Global | 0-off 1-low speed 2 high speed |
| N7:87 | AHU_EF_STATUS | Global | 0-off 1-low speed 2 high speed |
| N7:88 | AHU_A_DEFROST_TEMP | Global | |
| N7:89 | AHU_A_DEFROST_DELAY | Global | |
| N7:90 | B1_START_LEVEL | Global | b1 start set point |
| N7:91 | B2_START_LEVEL | Global | |
| N7:92 | B1_START_SUMMER | Global | |
| N7:93 | B2_START_SUMMER | Global | |
| N7:96/0 | B1_RUN | Global | |
| N7:96/1 | B2_RUN | Global | |
| N7:96/2 | OAT_GRT_10 | Global | oat greater then 10c |
| N7:96/3 | OAT_GRT_16 | Global | oat greater then 16c |
| N7:96/4 | | | low glycol temp less 30c more 10 sec |
| N7:96/5 | | | trailler room freeze |
| N7:97 | | | trailler room tempreature |
| N7:98 | | | temp trailler room set alarm |
| N7:99 | CLYCOL_DIV10 | Global | glycol temperatur give real val 10 = 10c |
| N7:100/0 | | | start hot water auto low speed screen flush |
| N7:100/1 | | | start cold water bottom flush |
| N7:100/2 | | | dewatering conveyor enable |
| N7:100/3 | | | primary filter blower run |
| N7:100/4 | | | blower fail |
| N7:100/5 | | | primary filter filter run |
| N7:100/6 | | | primary filter filter alarm vfd fail |
| N7:100/7 | | | primary filter auger run |
| N7:100/8 | | | primary filter auger alarm vfd fail |
| N7:100/9 | | | primary filter blower fan run |
| N7:100/10 | | | primary filter blower fan alarm |
| N7:100/11 | | | hot water flush in progress |
| N7:100/12 | | | cold water flush in progress |
| N7:100/13 | | | not mmi Emergency stop pressed |
| N7:100/14 | PRIMFIL_ON | Global | primfil unit on |
| N7:100/15 | PRIFIL_BELTRUN | Global | prim filter belt ask run |
| N7:101/0 | | | filter belt speed 0 hand 1 auto (auto reset 2 minutes) |
| N7:101/1 | AUGER_HAND | Global | auger 1hand 0auto |
| N7:101/2 | | | prifil_wash reset |
| N7:101/10 | PRIFIL_HSFLUSH | Global | start high speed flush |
| N7:102 | | | hot water screen flush max time w/o flush left |
| N7:103 | | | hot hater screen flush time |
| N7:104 | | | cold water bottum flush off time |
| N7:105 | | | cold water bottum flush on time |
| N7:106 | | | dewatering conveyor on time |
| N7:107 | PRIFIL_BELTSTART | Global | belt screen zero speed |





| Address | Symbol | Scope | Description |
|---|---|---|---|
| N7:108 | PRIFIL_BELTSTOP | Global | belt screen full speed |
| N7:109 | PRIFIL_WASHBEGLVL | Global | wash cycle start level |
| N7:110 | | | actual filter belt speed |
| N7:111 | PRIFIL_WASHSPD | Global | filter belt wash speed |
| N7:112 | PRIFIL_MANSPD | Global | manual belt set speed from mmi |
| N7:113 | PRIFIL_CALCSPD | Global | calculated belt speed function of level via mmi |
| N7:114 | PRIFIL_LVLMM | Global | primary filter level scaled in mm |
| N7:115 | PRIFIL_COMP_PRESS | Global | primary filter compressor pressure |
| N7:116 | | | prifil_wash_count |
| N7:119/0 | | | low fuel alarm day tank |
| N7:120/0 | | | global ahu enable |
| N7:120/1 | | | ahu alarm |
| N7:121/0 | | | heating alarm enable |
| N7:121/1 | | | heating alarm |
| N7:122/0 | | | lift station alarm enable |
| N7:122/1 | | | lift station alarm |
| N7:123/0 | | | prim screen alarm enable |
| N7:123/1 | | | prim screen alarm |
| N7:124/0 | | | prim filter alarm enable |
| N7:124/1 | | | prim filter alarm |
| N7:125/0 | | | Few global Alarm enable |
| N7:125/1 | | | Few global Alarm |
| N7:129/0 | | | auto dialler active |
| N7:201 | | | |
| N7:202 | | | |
| N7:240 | COPY_N7_14 | Global | |
| N7:241 | COPY_N7_24 | Global | |
| N7:242 | COPY_N7_34 | Global | |
| N7:245 | N767COPY | Global | |
| N7:246 | N768COPY | Global | |
| N7:247 | N769COPY | Global | |
| N7:250 | | | temp boiller |
| N7:251 | 0 | Global | temp boiller |
| N7:252 | | | temp b1 |
| N7:253 | | | temp b2 summer |
| N21:0 | N21 | Global | pid ahu3 |
| N21:2 | | | |
| O:3/0 | P102START | Global | |
| O:3/1 | P104START | Global | |
| O:3/2 | | | |
| O:3/3 | SSCR106RUN | Global | wash selenoid sscr 106 |
| O:3/4 | P103START | Global | |
| O:3/5 | | | e-stop nonyfy |
| O:3/6 | SSCR105RUN | Global | sscr 105 output run |
| O:3/7 | LEAKALARMSESET | Global | MINICAS LEEK ALARM RESET |
| O:4/0 | | | few low level red lamp on |
| O:4/1 | | | few full level blue lamp |
| O:4/2 | HORNFEW | Global | horn few plus selenoid valve to dump few water outside when potable water full |
| O:4/4 | FEW_P1 | Global | start few p1 |
| O:4/5 | FEW_P2 | Global | start few p2 |
| O:4/6 | FEW_P3 | Global | start few p3 |
| O:4/7 | | | hot few recirc pump p21 |
| O:6.0 | SC_102 | Global | raw waste water speed set point analog out 4-20ma int 6242-31208 |
| O:6.1 | SC_104 | Global | raw waste water speed set point |
| O:6.2 | SC_103 | Global | raw waste water speed set point |
| O:6.3 | | | ahu-3 coil control valve |
| O:9/0 | STOP_B1 | Global | |
| O:9/1 | STOP_B2 | Global | |
| O:9/3 | | | few p20 very hot water booster pump enable |
| O:9/4 | | | auto dialler chanel 1 |
| O:9/5 | | | auto dialler chanel 2 |
| O:9/6 | | | ahu unit on lamp |
| O:9/7 | | | defrost damper |
| O:10/0 | | | ahu3 sf run low |
| O:10/1 | | | ahu3 sf run high |
| O:10/2 | | | ahu3 ef run low |
| O:10/3 | | | ahu3 ef run high |
| O:10/4 | | | fresh air intake outdoor air damper |
| O:10/5 | | | few electric heater enable |
| O:10/6 | | | exhaust air damper |
| O:12/0 | | | prim filt auger vfd start |
| O:12/1 | | | prim filt auger vfd fault |
| O:12/2 | | | prim filt drive vfd start |
| O:12/3 | | | prim filt drive vfd fault reset |
| O:12/4 | | | hot water flush |
| O:12/5 | | | cold water flush POWER = CLOSE VALVE |
| O:12/6 | | | cold water bottom flush valve POWER = CLOSE SO OPEN PRESSVALVE |
| O:12/7 | | | prim blower start |
| O:12/8 | | | prim blower fan start |



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Address/Symbol Database

| Address | Symbol | Scope | Description |
|---|---|---|---|
| O:12/9 | | | primary filter run lamp |
| O:12/10 | | | primary filter fail lamp |
| O:12/11 | SV_106 | Global | wash selenoid sscr 105 |
| O:12/12 | SV_105 | Global | wash selenoid sscr 106 |
| O:12/13 | | | e-stop notify |
| O:12/14 | | | |
| O:12/15 | | | few filter flush 1 minutes every 24 hres |
| O:13.0 | PRIMFIL_BELT_SPD | Global | primary filter belt speed |
| S:0 | | | Arithmetic Flags |
| S:0/0 | | | Processor Arithmetic Carry Flag |
| S:0/1 | | | Processor Arithmetic Underflow/ Overflow Flag |
| S:0/2 | | | Processor Arithmetic Zero Flag |
| S:0/3 | | | Processor Arithmetic Sign Flag |
| S:1 | | | Processor Mode Status/ Control |
| S:1/0 | | | Processor Mode Bit 0 |
| S:1/1 | | | Processor Mode Bit 1 |
| S:1/2 | | | Processor Mode Bit 2 |
| S:1/3 | | | Processor Mode Bit 3 |
| S:1/4 | | | Processor Mode Bit 4 |
| S:1/5 | | | Forces Enabled |
| S:1/6 | | | Forces Present |
| S:1/7 | | | Comms Active |
| S:1/8 | | | Fault Override at Powerup |
| S:1/9 | | | Startup Protection Fault |
| S:1/10 | | | Load Memory Module on Memory Error |
| S:1/11 | | | Load Memory Module Always |
| S:1/12 | | | Load Memory Module and RUN |
| S:1/13 | | | Major Error Halted |
| S:1/14 | | | Access Denied |
| S:1/15 | | | First Pass |
| S:2/0 | | | STI Pending |
| S:2/1 | | | STI Enabled |
| S:2/2 | | | STI Executing |
| S:2/3 | | | Index Addressing File Range |
| S:2/4 | | | Saved with Debug Single Step |
| S:2/5 | | | DH-485 Incoming Command Pending |
| S:2/6 | | | DH-485 Message Reply Pending |
| S:2/7 | | | DH-485 Outgoing Message Command Pending |
| S:2/15 | | | Comms Servicing Selection |
| S:3 | | | Current Scan Time/ Watchdog Scan Time |
| S:4 | | | Time Base |
| S:4/0 | | | |
| S:4/2 | | | |
| S:4/7 | | | |
| S:4/8 | | | |
| S:4/9 | | | |
| S:4/10 | | | |
| S:5/0 | | | Overflow Trap |
| S:5/2 | | | Control Register Error |
| S:5/3 | | | Major Err Detected Executing UserFault Routine |
| S:5/4 | | | M0-M1 Referenced on Disabled Slot |
| S:5/8 | | | Memory Module Boot |
| S:5/9 | | | Memory Module Password Mismatch |
| S:5/10 | | | STI Overflow |
| S:5/11 | | | Battery Low |
| S:6 | | | Major Error Fault Code |
| S:7 | | | Suspend Code |
| S:8 | | | Suspend File |
| S:9 | | | Active Nodes |
| S:10 | | | Active Nodes |
| S:11 | | | I/O Slot Enables |
| S:12 | | | I/O Slot Enables |
| S:13 | | | Math Register |
| S:14 | | | Math Register |
| S:15 | | | Node Address/ Baud Rate |
| S:16 | | | Debug Single Step Rung |
| S:17 | | | Debug Single Step File |
| S:18 | | | Debug Single Step Breakpoint Rung |
| S:19 | | | Debug Single Step Breakpoint File |
| S:20 | | | Debug Fault/ Powerdown Rung |
| S:21 | | | Debug Fault/ Powerdown File |
| S:22 | | | Maximum Observed Scan Time |
| S:23 | | | Average Scan Time |
| S:24 | | | Index Register |
| S:25 | | | I/O Interrupt Pending |
| S:26 | | | I/O Interrupt Pending |
| S:27 | | | I/O Interrupt Enabled |
| S:28 | | | I/O Interrupt Enabled |
| S:29 | | | User Fault Routine File Number |





Address/Symbol Database

| Address | Symbol | Scope | Description |
|---|---|---|---|
| S:10 | | | STI Setpoint |
| S:31 | | | STI File Number |
| S:32 | | | I/O Interrupt Executing |
| S:33 | | | Extended Proc Status Control Word |
| S:33/0 | | | Incoming Command Pending |
| S:33/1 | | | Message Reply Pending |
| S:33/2 | | | Outgoing Message Command Pending |
| S:33/3 | | | Selection Status User/DF1 |
| S:33/4 | | | Communicat Active |
| S:33/5 | | | Communicat Servicing Selection |
| S:33/6 | | | Message Servicing Selection Channel 0 |
| S:33/7 | | | Message Servicing Selection Channel 1 |
| S:33/8 | | | Interrupt Latency Control Flag |
| S:33/9 | | | Scan Toggle Flag |
| S:33/10 | | | Discrete Input Interrupt Reconfigur Flag |
| S:33/11 | | | Online Edit Status |
| S:33/12 | | | Online Edit Status |
| S:33/13 | | | Scan Time Timebase Selection |
| S:33/14 | | | DTR Control Bit |
| S:33/15 | | | DTR Force Bit |
| S:34 | | | Pass-thru Disabled |
| S:34/0 | | | Pass-Thru Disabled Flag |
| S:34/1 | | | DH+ Active Node Table Enable Flag |
| S:34/2 | | | Floating Point Math Flag Disable,Fl |
| S:35 | | | Last 1 ms Scan Time |
| S:36 | | | Extended Minor Error Bits |
| S:36/8 | | | DII Lost |
| S:36/9 | | | STI Lost |
| S:36/10 | | | Memory Module Data File Overwrite Protection |
| S:37 | | | Clock Calendar Year |
| S:38 | | | Clock Calendar Month |
| S:39 | | | Clock Calendar Day |
| S:40 | | | Clock Calendar Hours |
| S:41 | | | Clock Calendar Minutes |
| S:42 | | | Clock Calendar Seconds |
| S:43 | | | STI Interrupt Time |
| S:44 | | | I/O Event Interrupt Time |
| S:45 | | | DII Interrupt Time |
| S:46 | | | Discrete Input Interrupt- File Number |
| S:47 | | | Discrete Input Interrupt- Slot Number |
| S:48 | | | Discrete Input Interrupt- Bit Mask |
| S:49 | | | Discrete Input Interrupt- Compare Value |
| S:50 | | | Processor Catalog Number |
| S:51 | | | Discrete Input Interrupt- Return Number |
| S:52 | | | Discrete Input Interrupt- Accumulat |
| S:53 | | | Reserved/ Clock Calendar Day of the Week |
| S:55 | | | Last DII Scan Time |
| S:56 | | | Maximum Observed DII Scan Time |
| S:57 | | | Operating System Catalog Number |
| S:58 | | | Operating System Series |
| S:59 | | | Operating System FRN |
| S:61 | | | Processor Series |
| S:62 | | | Processor Revision |
| S:63 | | | User Program Type |
| S:64 | | | User Program Functional Index |
| S:65 | | | User RAM Size |
| S:66 | | | Flash EEPROM Size |
| S:67 | | | Channel 0 Active Nodes |
| S:68 | | | Channel 0 Active Nodes |
| S:69 | | | Channel 0 Active Nodes |
| S:70 | | | Channel 0 Active Nodes |
| S:71 | | | Channel 0 Active Nodes |
| S:72 | | | Channel 0 Active Nodes |
| S:73 | | | Channel 0 Active Nodes |
| S:74 | | | Channel 0 Active Nodes |
| S:75 | | | Channel 0 Active Nodes |
| S:76 | | | Channel 0 Active Nodes |
| S:77 | | | Channel 0 Active Nodes |
| S:78 | | | Channel 0 Active Nodes |
| S:79 | | | Channel 0 Active Nodes |
| S:80 | | | Channel 0 Active Nodes |
| S:81 | | | Channel 0 Active Nodes |
| S:82 | | | Channel 0 Active Nodes |
| S:83 | | | DH+ Active Nodes |
| S:84 | | | DH+ Active Nodes |
| S:85 | | | DH+ Active Nodes |
| S:86 | | | DH+ Active Nodes |
| T4:0 | | | 1/100 hhs base |
| T4:1 | | | 1/100 h base |

| Address | Symbol | Scope | Description |
|---|---|---|---|
| T4:1/DN | | | |
| T4:2 | | | sscr wash duty |
| T4:2/DN | | | |
| T4:3 | | | sscr wash period |
| T4:4 | | | timer few 01 fail |
| T4:4/DN | | | |
| T4:5 | | | timer few 02 fail |
| T4:6 | | | timer few 03 fail |
| T4:6/DN | | | |
| T4:7 | | | tim ahu on |
| T4:7/DN | | | |
| T4:8 | | | tim ahu |
| T4:8/DN | | | |
| T4:9 | | | ahu ls |
| T4:9/DN | | | |
| T4:10 | | | tim 1 minute |
| T4:10/DN | | | tim 1 minute |
| T4:11 | | | tim 1 minute |
| T4:11/DN | | | |
| T4:12 | | | tim ahu defrost |
| T4:12/DN | | | |
| T4:13 | | | ahu sf fail |
| T4:13/DN | | | |
| T4:14 | | | ahu ef fail |
| T4:14/DN | | | |
| T4:15/DN | | | |
| T4:16 | | | tim ahu freeze |
| T4:16/DN | | | |
| T4:17 | | | tim low gly temp |
| T4:17/DN | | | |
| T4:18 | | | tim alarm high screw level |
| T4:18/DN | | | |
| T4:19/DN | | | |
| T4:20 | | | ahu pre defrost time |
| T4:20/DN | | | |
| T4:21 | | | tim full potable water |
| T4:21/DN | | | |
| T4:22 | | | tim few empty |
| T4:22/DN | | | |
| T4:23 | | | tim lshh104 |
| T4:23/DN | | | |
| T4:24 | | | tim auto prim fil |
| T4:24/DN | | | |
| T4:25 | | | tim few heat enable |
| T4:25/DN | | | |
| T4:26 | | | tim 1 sec time base |
| T4:27 | | | tim 1 sec time base |
| T4:28 | | | tim sscr level auto wash |
| T4:28/DN | | | |
| T4:29/DN | | | |
| T4:30 | | | tim prifil blower fan fail |
| T4:30/DN | | | |
| T4:31 | | | prim filter blower fail |
| T4:32 | | | tim hot few recirc disable no water |
| T4:32/DN | | | |
| T4:33 | | | few ovwerflow |
| T4:33/DN | | | |
| T4:34 | | | tim few p21 fail |
| T4:35 | | | |
| T4:36 | | | tim few elect heater |
| T4:37 | | | tim sscr 105 fail |
| T4:37/DN | | | |
| T4:38/DN | | | |
| T4:39 | | | tim very low few |
| T4:39/DN | | | |
| T4:40 | | | tim few pump fail |
| T4:40/DN | | | |
| T4:41 | | | estop beep off time |
| T4:41/DN | | | |
| T4:42 | | | estop beep on time |
| T4:42/DN | | | |
| T4:43 | | | tim building alarm lag |
| T4:43/DN | | | |
| T4:44 | | | tim process alarm |
| T4:44/DN | | | |
| U:4 | | | |
| U:5 | | | |
| U:6 | | | |
| U:7 | | | |





| Address | Symbol | Scope | Description |
|---|---|---|---|
| U:9 | | | |
| U:10 | | | |
| U:11 | | | |

Instruction Comment Database

| Address | Instruction | Description |
|---|---|---|



151



Symbol Group Database

| Group_Name | Description |
|---|---|

# Chapter 16 PLANT CONTROL CABLE

## MANUFACTURER/DISTRIBUTOR:

ANIXTER
3000,LOUIS AMOS
LACHINE,QUE
PH:514-636-3636 fax:1286

## 16.1 CONTROL CABLE AND CONNECTOR.

**END OF CHAPTER 16**

[redacted] JUMP TO Select Site

SEARCH Keyword(s)

1015-16 [redacted]

Advanced Part Number Search

Quick Quote

BROWSE -- Select A Catalog --

CANADA (English)

[redacted]

# Part Detail

Quantity: Feet [redacted]

[redacted]

| | |
|---|---|
| **Anixter Part No.** | TOS-1015-16/26-0 |
| **Manufacturer** | ALL GENERIC VENDORS |
| **Manufacturer Part Nos.** | - |
| | - |
| **Description** | UL1015 16 26STR TNC PVC BLK 600V 105C MTW CSA TEW |

**Attributes**

| | |
|---|---|
| **UL Style:** | UL TYPE AWM, STYLE 1015 |
| **Gauge: (AWG)** | 16 AWG (AMERICAN WIRE GAUGE) |
| **CONDUCTOR: Stranding** | 26 STRANDS IN EACH CONDUCTOR |
| **Material** | TINNED COPPER |
| **INSULATION: Material** | PVC-POLYVINYL CHLORIDE |
| **Color** | BLACK |
| **Shielded:** | NOT SHIELDED |
| **SPEC/STD: UL** | UL LISTED TYPE AWM(APPLIANCE WIRING MATERIAL) |
| **CSA** | CSA TYPE TEW |
| **Temperature Rating:** | 105 DEGREES CENTIGRADE (221 F) |
| **Voltage Rating:** | 600 VOLTS AC OR DC |
| **Product Type:** | UL STYLES 1000-1999 |
| **Unspsc Code** | 26121539 |

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☑ NO EXCEPTIONS TAKEN

☐ MAKE NOTED CORRECTIONS

☐ REVISE & RESUBMIT

☐ REJECTED

DATE Nov 7/05 BY DC

EARTH TECH (CANADA) INC.

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# TMCX TER ATOR™ Cable Fitting
## Installation & M enance Information

COOPER Crouse-Hinds

**IF1184**

**SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE**

### APPLICATION

TMCX series Terminator cable fittings are designed for use with Type MC jacketed metal clad cable, interlocked armor and continuous corrugated armor and Type TC tray cable in hazardous (classified) locations when installed, in accordance with NEC sections 501-4(a) and (b), 501-5(c)(d) and (e), 502-4(a) and (b), 502-5 and 503-3.

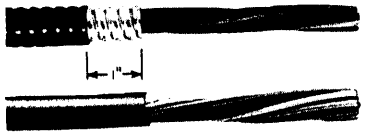
TMCX series Terminator cable fittings are installed to provide a means for passing Type MC (metal clad jacketed cable) and Type TC† (tray cable) into an enclosure, panelboard or other equipment to provide a watertight termination. TMCX series Terminator cable fittings are reusable. The armor stop / sealing chamber serves as an integral union that allows disassembly and reuse without compromising the integrity of the cable or the seal. Once the cable has been sealed, the TMCX can be disassembled to remove the cable and armor stop / sealing chamber from the body.

Ground continuity between cable armor and metal enclosures is inherently maintained with type MC cable. Type TC cable is grounded by a separate ground conductor.

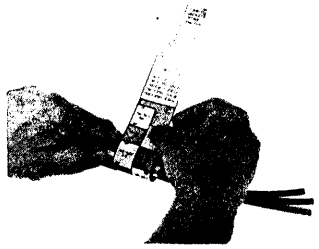
TMCX series Terminator cable fittings are UL listed for hazardous locations (with TSC Epoxy Sealing Compound only) according to UL Standards 514B and 886*. They are suitable for use in NEC Class I, Divisions 1 & 2, Groups A, B, C, D; Class II, Divisions 1 & 2, Groups E, F & G; and Class III, Division 1 & 2 hazardous (classified) locations when installed in accordance with NEC articles 501-4(a) and (b), 501-5(c)(d) and (e), 502-4(a) and (b), 502-5 and 503-3 (See Table 5).

### INSTALLATION

1. Remove the jacket (and armor if applicable) from the cable to expose a sufficient length of conductors required for the job. For Type MC cable leave approximately 1" of armor exposed.




2. Using the cable gauge and sizer supplied with the Terminator, measure the exposed cable armor or tray cable outside diameter and select the appropriate cable fitting. Place the bottom of the gauge on the exposed cable armor or sheath and hold the gauge with your thumb. Wrap gauge tightly. The arrows at the bottom of the gauge indicate which catalog number will be required to terminate the cable. In the example shown below a TMCX3112 would be used.



**Note:** If a cable gauge and sizer is not available, determine the O.D. of the cable armor or cable sheath and chose the appropriate fitting using Table 1.

* TMCX 10402 is UL Listed for use with steel interlock armor cable only.
† 1/2" - 2-1/2" sizes

| NPT Size | Cat.No. | Cable Range Over Type MC Armor or Type TC Sheath (inches) |
|---|---|---|
| 1/2" | TMCX165 | .440"-.650" |
| 3/4" | TMCX285 | .600"-.850" |
| 1" | TMCX3112 | .800"-1.120" |
| 1-1/4" | TMCX4140 | 1.100"-1.400" |
| 1-1/2" | TMCX5161 | 1.280"-1.610" |
| 2" | TMCX6206 | 1.570"-2.060" |
| 2-1/2" | TMCX7247 | 1.930"-2.470" |
| 3" | TMCX8302 | 2.450"-3.020" |
| 3-1/2" | TMCX9352 | 2.950"-3.520" |
| 4" | TMCX10402 | 3.500"-4.020" |

Table 1

3. For Type MC cables: Refer to Table 2 or the steps on the cable gauge and sizer to determine the proper amount of armor to be exposed for assembly. Remove additional jacket if necessary. Inspect the armor and use a file to remove any burrs.

| NPT Size | Amount of Cable Armor to be Exposed (Dim. A) |
|---|---|
| 1/2" | 1-1/4" |
| 3/4" | 1-1/4" |
| 1" | 1-3/8" |
| 1-1/4" | 1-3/8" |
| 1-1/2" | 1-3/8" |
| 2" | 1-1/8" |
| 2-1/2" | 1-1/8" |
| 3" | 1-1/8" |
| 3-1/2" | 1-1/8" |
| 4" | 1-1/8" |

Table 2
Amount of Armor to be Exposed

**Note:** Refer to the line drawing on the back page for identification of TMCX cable fittings components.

4. Prepare Cable. For Type MC remove all fillers and shielding back to armor. For Type TC remove fillers back to sheath. Disassemble body and armor stop / sealing chamber from fitting. Install body into the enclosure and tighten with wrench. Slide gland nut and intermediate body assembly onto cable as shown below. Separate uninsulated ground conductors back to armor or sheath to allow sealing of individual strands.

5. Type MC Cable: In order to accomodate the variation of cable manufacturing processes, and the cable armor O.D. range of the fitting, a non-metallic armor stop reducer is installed in the armor stop/sealing chamber. If the conductors do not pass through the armor stop reducer, remove the reducer. Make certain that the cable armor is stopped by the armor stop / sealing chamber insert or armor stop reducer.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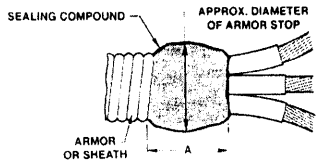
6. Separate conductors and individual strands of ground conductor. Wooden wedges are recommended to hold large conductors apart for compound packing. Mix 2-part epoxy sealing compound provided by kneading and folding until a uniform color is obtained (approximately 2-3 minutes). Refer to Table 3. More compound than is needed for the installation is provided. Use only as much as is needed.

**Note:** Gloves are not required for installation of sealing compound. However, for those with sensitive skin or for prolonged exposure it is recommended that gloves are worn.

Pack a sufficient amount of compound between inside diameter of armor sheath and conductor filler bundle. See Table 3.

| NPT Size | Cat.No. | Amount of Compound Required(oz.) | Amount of Compound Provided(oz.) | Dim. "A" |
|---|---|---|---|---|
| 1/2" | TMCX165 | 0.25 | 0.50 | 1" |
| 3/4" | TMCX285 | 0.50 | 1.00 | 1" |
| 1" | TMCX3112 | 0.70 | 1.00 | 1-1/4" |
| 1-1/4" | TMCX4140 | 1.50 | 2.00 | 1-1/4" |
| 1-1/2" | TMCX5161 | 1.85 | 2.00 | 1-1/2" |
| 2" | TMCX6206 | 4.50 | 5.00 | 2" |
| 2 1/2" | TMCX7247 | 8.65 | 9.00 | 2 1/2" |
| 3" | TMCX8302 | 15.75 | 16.00 | 3" |
| 3-1/2" | TMCX9352 | 25.55 | 28.00 | 3-1/2" |
| 4" | TMCX10402 | 38.95 | 41.00 | 4" |

Table 3



Use a hardwood stick or dowel to pack compound in areas not readily accessible to fingers and particularly in the center most areas of the cable. To prevent damage to conductors during packing of the compound, do not use metal tools. Seal end of fillers, and any resulting voids with a layer of compound 1/4" minimum thickness.

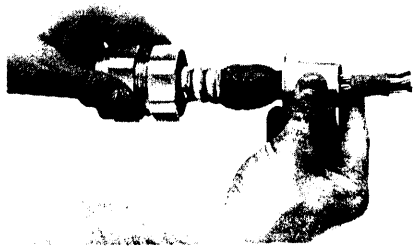
**Note:** When preparing the seal in cold temperatures, mix sealing compound one tube at a time.

**Note:** Working life of compound is approximately 30 minutes at 68°F. Working life decreases at elevated temperatures. In cold weather warm components and sealing compound until ready for use by storing in the cab of a truck or inside a pocket. Fitting may be assembled at temperatures as low as 40°F/4°C. Allow assembly to set at 40°F/4°C for 24 hours.

conductors through armor stop chamber.

Note: Duct tape or similar mat helpful when wrapping conductors.

Slide the armor stop / sealing chamber over the epoxy compound and back against the armor or sheath, squeezing compound into leads and back over armor or sheath.



8. Remove excess compound from the large end of the armor stop / sealing chamber to expose the insert taper. This surface must remain clean for the spring to seat properly and provide grounding continuity and pullout strength. After removing excess compound, fill in any voids with additional compound.

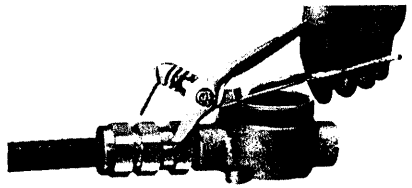
9. Pack compound between and around conductors at the small end of the armor stop / sealing chamber to fill any voids. Chamber should remain flush with the end of the armor stop / sealing chamber.

**⚠ CAUTION**

The outside surface of the armor stop / sealing chamber must remain clean and free of compound and other foreign matter. Immediately wipe any excess compound from the outside surface of the armor stop / sealing chamber. Do not use metal tools as they can damage the surface of the armor stop / sealing chamber.

10. Insert the cable and armor stop / sealing chamber assembly into body.

With armor stop / sealing chamber fully inserted into body, slide intermediate body with gland nut over the armor stop / sealing chamber and thread onto body. Completely tighten intermediate body with wrench. Tighten gland nut on intermediate body to compress bushing for a weathertight seal. Refer to Table 4 for torquing requirements.

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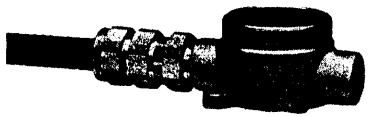
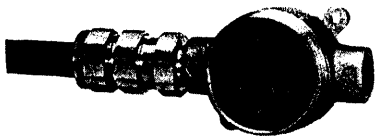
| Dim. NPT | N°cat. | de serrage (lb - po) Corps | Écrou |
|---|---|---|---|
| 1/2 po | TMCX165 | 300 | 300 |
| 3/4 po | TMCX285 | 500 | 500 |
| 1 po | TMCX3112 | 700 | 700 |
| 1 1/4 po | TMCX4140 | 1000 | 700 |
| 1 1/2 po | TMCX5161 | 1200 | 700 |
| 2 po | TMCX6206 | 1600 | 700 |
| 2 1/2 po | TMCX7247 | 1600 | 700 |
| 3 po | TMCX8302 | 1600 | 700 |
| 3 1/2 po | TMCX9352 | 1600 | 700 |
| 4 po | TMCX10402 | 1600 | 700 |

Tableau 4

11. Si l'on utilise un câble de type MC, vérifier la continuité entre l'armure du câble et le boîtier.
12. Si l'on utilise un câble de type MC, vérifier la continuité entre l'armure du câble et le boîtier.



**Installation de câble de type MC terminée**



**Installation de câble de type TC terminée**

## DÉMONTAGE

Pour démonter un raccord TMCX, se reporter à la figure 1 et aux directives ci-dessous :

1. Couper l'alimentation électrique de l'équipement et défaire tous les raccordements électriques.
2. Desserrer l'écrou d'étanchéité (1) sans le détacher du corps intermédiaire (2).
3. Séparer l'ensemble écrou d'étanchéité et corps intermédiaire (1 et 2) du corps (4).

   **N.B.** : Si l'ensemble écrou d'étanchéité et corps intermédiaire résiste, insérer un tournevis ou un outil semblable dans la rainure (3) (entre la butée d'armure et le corps) et s'en servir comme levier pour le séparer du corps.

   Faire glisser l'ensemble écrou d'étanchéité et corps intermédiaire sur le câble.
4. Retirer précautionneusement le câble et la butée d'armure / la chambre d'étanchéité du corps en tirant sur le câble ou sur le corps / le boîtier.
5. Le raccord TMCX est prêt à être remonté.

## REMONTAGE

**⚠ ATTENTION**

Avant le remontage, examiner les surfaces du joint conique entre le corps et la butée d'armure / la chambre d'étanchéité. Ces surfaces doivent pouvoir être serrées hermétiquement l'une contre l'autre de manière à former un joint vraiment antidéflagrant. Éliminer la poussière ou les matières étrangères des deux surfaces. Si l'une des deux est égratignée, abîmée, corrodée ou endommagée de quelque façon que ce soit, ne pas procéder au remontage. Remplacer le raccord.

Si les surfaces de la butée d'armure / la chambre d'étanchéité sont en bon état, on peut alors remonter le raccord TMCX. Se reporter aux étapes nos 10 à 12 pour connaître les exigences de remontage et de serrage.

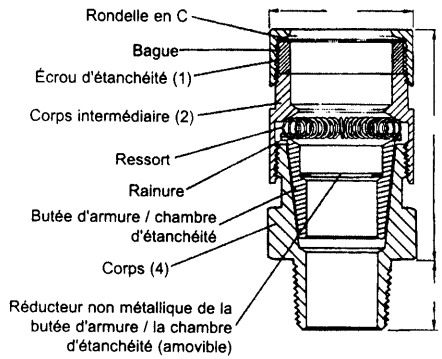



**Figura 1**

## DIMENSIONS

| Dim. NPT | N°cat. | Dim. d'armure de câble (type MC) ou de gaine (type TC) correspondantes | A (pouces) | B (pouces) | C (pouces) |
|---|---|---|---|---|---|
| 1/2 po | TMCX165 | 0,440 po - 0,650 po | 2 5/8 | 3/4 | 1 3/8 |
| 3/4 po | TMCX285 | 0,600 po - 0,850 po | 2 7/8 | 25/32 | 1 5/8 |
| 1 po | TMCX3112 | 0,800 po - 1,120 po | 3 1/8 | 15/16 | 2 |
| 1 1/4 po | TMCX4140 | 1,100 po - 1,400 po | 3 1/8 | 31/32 | 2 7/16 |
| 1 1/2 po | TMCX5161 | 1,280 po - 1,610 po | 3 3/8 | 31/32 | 2 3/4 |
| 2 po | TMCX6206 | 1,570 po - 2,060 po | 5-5/16 | 1 | 3 1/2 |
| 2 1/2 po | TMCX7247 | 1,930 po - 2,470 po | 6-6/16 | 1 7/16 | 4 |
| 3 po | TMCX8302 | 2,450 po - 3,020 po | 6-11/16 | 1 7/16 | 4 7/8 |
| 3 1/2 po | TMCX9352 | 2,950 po - 3,520 po | 7-3/4 | 1 5/8 | 5 3/8 |
| 4 po | TMCX10402 | 3,500 po - 4,020 po | 8-5/16 | 1 5/8 | 5 7/8 |

Table 5 - Conformités

Les raccords de câbles Terminator de la série TMCX sont répertoriés UL pour les emplacements dangereux (avec le ciment d'étanchéité à l'époxy TSC seulement) selon les normes 514B et 886 des UL**. Ils conviennent à l'utilisation dans les emplacements dangereux (classifiés) du NEC conformément aux sections 501-4(a) et (b), 501-5(c)(d) et (e), 502-4(a) et (b), 502-5 et 503-3 du NEC. Le câble pour chemin de câbles ne convient pas à l'utilisation dans les emplacements dangereux (classifiés) de classe III.

| Numéro de catalogue | Conformités |
|---|---|
| TMCX165<br>TMCX285<br>TMCX3112<br>TMCX4140<br>TMCX5161 | Classe I**, divisions 1 et 2, groupes A, B, C, D<br>Classe II, divisions 1 et 2, groupes E, F et G<br>Classe III |

| Numéro de catalogue | Conformités |
|---|---|
| TMCX6206<br>TMCX7247<br>TMCX8302†<br>TMCX9352†<br>TMCX10402† | Classe I** divisions 1 et 2, groupes A, B, C, D<br>Classe II, divisions 1 et 2, groupes E, F et G<br>Classe III |

** Le TMCX10402 n'est répertorié UL que pour utilisation avec un câble à armure articulée en acier.

† Les TMCX8302, -9352 et -10402 ne sont pas répertoriés UL pour utilisation avec les câbles TC.

← La série TMCX est homologuée pour utilisation dans les emplacements dangereux de division 1 quand on l'utilise avec des câbles MC homologués pour utilisation dans les emplacements dangereux de division 1.

Tous les énoncés, de même que tous les renseignements techniques et les recommandations contenus dans le présent document, sont fondés sur une information et des résultats que nous croyons fiables.Nous ne pouvons toutefois en garantir ni la précision ni l'exhaustivité. Conformément aux "conditions de vente" de Crouse-Hinds et étant donné que les conditions d'utilisation échappent à notre contrôle, l'acheteur doit décider lui-même si le produit est approprié à l'usage qu'il entend en faire et assumer tous les risques et toutes les responsabilités connexes.

**COOPER** Crouse-Hinds

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IF1184
Révision 2
Révise 04/02

# TMCX TERMINATOR™

COOPER Crouse-Hinds

## Información de Instalación y Mantenimiento

**IF1184**

**CONSERVE ESTAS INSTRUCCIONES PARA FUTURAS CONSULTAS**

### APLICACIÓN

Los accesorios TMCX "Terminators" están diseñados para utilizarse con cables con cubierta metálica con cubierta exterior Tipo MC, armadura engargolada y armadura corrugada continua y cable Tipo TC en charola en lugares peligrosos (clasificados) cuando se instalan, de acuerdo con las secciones 501-4(a) y (b), 501-5(c)(d) y (e), 502-4(a) y (b), 502-5 y 503-3 del NEC.

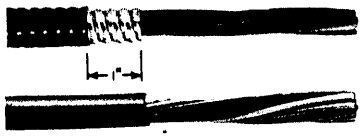
Los accesorios TMCX "Terminators" se instalan para proporcionar un medio para pasar el cable Tipo MC (cables con cubierta metálica con cubierta exterior) y cable Tipo TC† (cables para charola) en una envolvente, panel de alumbrado y control u otro equipo para proporcionar una terminación hermética al agua. Los accesorios Los TMCX son reusables. La cámara de retención / sellado de la armadura sirve como una unión integral que permite desensamblar y reusar sin comprometer la integridad del cable o del sello. Una vez que se ha sellado el cable, el TMCX puede desensamblarse para quitar el cable y la cámara de retención / sellado de la armadura del cuerpo.

La continuidad de la tierra entre la armadura del cable y las envolventes de metal se mantiene inherentemente con el cable tipo MC. El cable tipo TC es puesto a tierra por un conductor de tierra separado.

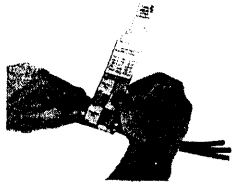
Los accesorios TMCX "Terminators" están listados por UL para lugares peligrosos (únicamente con el Compuesto Sellador Epóxico TSC) de acuerdo con las Normas UL 514B y 886 *. Son adecuados para utilizarse en la Clase I, Divisiones 1 y 2, Grupos A, B, C, D; Clase II, Divisiones 1 y 2, Grupos E, F y G; y Clase III, Divisiones 1 y 2 lugares peligrosos (clasificados) del NEC, cuando se instalan de acuerdo con los artículos 501-4(a) y (b), 501-5(c) (d) y (e), 502-4(a) y (b), 502-5 y 503-3 del NEC: (Vea la Tabla 5).

### INSTALACIÓN

1. Quite la cubierta (y la armadura si es aplicable) del cable para exponer una longitud suficiente de los conductores requerida para el trabajo. Para el cable Tipo MC deje expuesta la armadura aproximadamente 25,4 mm (1").



2. Usando el medidor-calibrador de cable proporcionado con el "Terminator", mida el diámetro exterior expuesto de la armadura del cable o cable para charola y seleccione el accesorio del cable adecuado. Coloque el fondo del medidor en la armadura o cubierta expuesta del cable y sostenga el medidor con su dedo pulgar. Envuelva el medidor herméticamente. Las flechas en el fondo del medidor indican qué número de catálogo se requiere para el cable en cuestion. En el ejemplo mostrado a continuación, se utilizaría un TMCX3112.



**Nota:** Si no se tiene disponible un medidor-calibrador de cable, determine el diámetro exterior de la armadura del cable o cubierta del cable y seleccione el accesorio adecuado utilizando la Tabla 1.

* El TMCX10402 está listado por UL únicamente para utilizarse en cables con armadura de acero engargolada.

† 1/2" - 2-1/2"

Rango de tamaños para cables del

| Medida NPT | Catalogo | Tipo MC y TC |
|---|---|---|
| 16 (1/2") | TMCX165 | 11,17mm - 16,51mm (.440"-.650") |
| 21 (3/4") | TMCX285 | 15,24mm - 21,59mm (.600"-.850") |
| 27 (1") | TMCX3112 | 20,32mm - 28,44mm (.800" - 1.120") |
| 35 (1-1/4") | TMCX4140 | 27,94mm - 35,56mm (1.100" - 1.400") |
| 41 (1-1/2") | TMCX5161 | 32,51mm - 40,89mm (1.280" - 1.610") |
| 53 (2") | TMCX6206 | 39,87mm - 52,32mm (1.570" - 2.060") |
| 63 (2-1/2") | TMCX7247 | 49,02mm - 62,73mm (1.930" - 2.470") |
| 78 (3") | TMCX8302 | 62,23mm - 76,70mm (2.450" - 3.020") |
| 91 (3-1/2") | TMCX9352 | 74,93mm - 89,40mm (2.950" - 3.520") |
| 103 (4") | TMCX10402 | 88,9mm -102,10mm (3.500" - 4.020") |

3. Para los cables Tipo MC: Refiérase a la Tabla 2 o siga los pasos con el medidor-calibrador de cable para determinar la cantidad adecuada de armadura que debe exponerse para el ensamble. Quite la cubierta adicional si es necesario. Inspeccione la armadura y use una lima para quitar las rebabas.

Cantidad de cable armado a ser

| Medida NPT | expuesto (Dim. A) |
|---|---|
| 16 (1/2") | 31,75mm (1-1/4") |
| 21 (3/4") | 31,75mm (1-1/4") |
| 27 (1") | 34,92mm (1-3/8") |
| 35 (1-1/4") | 34,92mm (1-3/8") |
| 41 (1-1/2") | 34,92mm (1-3/8") |
| 53 (2") | 28,57mm (1-1/8") |
| 63 (2-1/2") | 28,57mm (1-1/8") |
| 78 (3") | 28,57mm (1-1/8") |
| 91 (3-1/2") | 28,57mm (1-1/8") |
| 103 (4") | 28,57mm (1-1/8") |

Tabla 2

Cantidad de Armado a ser expuesto

**Nota:** Refiérase al esquema de la página posterior para la identificación de los accesorios componentes para cable TMCX.

4. Preparación del Cable. Para el Tipo MC quite todos los rellenos y pantallas debajo de la armadura. Para el Tipo TC quite los rellenos debajo de la cubierta. Desensamble el cuerpo y la cámara de retención / sellado de la armadura del accesorio. Instale el cuerpo sobre la envolvente y apriétese con una llave de tuercas. Deslice la tuerca collarín y el ensamble del cuerpo intermedio sobre el cable como se muestra a continuación. Separe los conductores de puesta a tierra sin aislar atrás de la armadura o cubierta para permitir sellar los alambres individuales.

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5. Cable Tipo MC: Para acomodar la variación de los procesos de fabricación del cable, y el rango del diámetro exterior de la armadura del cable del accesorio, se instala un reductor no metálico de retención de la armadura en la cámara de retención / sellado de la armadura. Si los conductores no pasan a través del reductor de retención de la armadura, quite el reductor. Asegúrese de que la armadura del cable es detenida por la inserción de la cámara de retención / sellado de la armadura o el reductor de retención de la armadura.

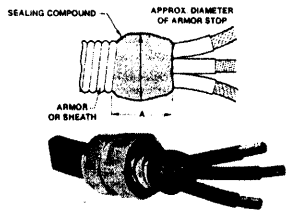
6. Separe los conductores y alambres individuales del conductor de puesta a tierra. Se recomiendan cuñas de madera para sostener a los conductores grandes aparte para el empaque del compuesto. Mezcle 2 partes del compuesto sellador epóxico proporcionado amasando y plegando hasta que se obtenga un color uniforme (aproximadamente 2 a 3 min). Refiérase a la Tabla 3. Se proporciona más compuesto del necesario para la instalación. Use únicamente el necesario.

**Nota:** No se requieren guantes para la instalación del compuesto sellador. Sin embargo, para aquellos con piel sensible o para la exposición prolongada se recomienda que se utilicen guantes.

Ponga una cantidad suficiente de compuesto entre el diámetro interior de la cubierta de la armadura y manojo de rellenos del conductor. Vea la Tabla 3.

| Medida NPT | Catalogo | Cantidad de compuesto requerido | Cantidad de compuesto que se provee | Dim. "A" |
|---|---|---|---|---|
| 16 (1/2") | TMCX165 | 0.25 | 0.50 | 25,4mm (1") |
| 21 (3/4") | TMCX285 | 0.50 | 1.00 | 25,4mm (1") |
| 27 (1") | TMCX3112 | 0.70 | 1.00 | 31,75mm (1-1/4") |
| 35 (1-1/4") | TMCX4140 | 1.50 | 2.00 | 31,75mm (1-1/4") |
| 41 (1-1/2") | TMCX5161 | 1.85 | 2.00 | 38,1mm (1-1/2") |
| 53 (2") | TMCX6206 | 4.50 | 5.00 | 50,8mm (2") |
| 63 (2-1/2") | TMCX7247 | 8.65 | 9.00 | 63,5mm (2-1/2") |
| 78 (3") | TMCX8302 | 15.75 | 16.00 | 76,2mm (3") |
| 91 (3-1/2") | TMCX9352 | 25.55 | 28.00 | 88,9mm (3-1/2") |
| 103 (4") | TMCX10402 | 38.95 | 41.00 | 101,6mm (4") |

Tabla 3




Use un palo de madera dura o espiga para poner compuesto en áreas no accesibles fácilmente con los dedos y particularmente en la mayoría de las áreas del centro del cable. Para prevenir dañar a los conductores durante la colocación del compuesto, no utilice herramientas de metal. Selle el extremo de los rellenos, y cualquier hueco resultante con una capa de compuesto con espesor mínimo de 6,4 mm (1/4").

**Nota:** Al preparar el sello en temperaturas frías, mezcle un tubo de compuesto sellador a la vez.

**Nota:** La duración del compuesto antes de que endurezca es de aproximadamente 30 min a 20 °C (68 °F). La duración del compuesto disminuye a temperaturas elevadas. En climas fríos - calientes los componentes y el compuesto sellador guardándolos en la cabina de un camión o dentro de una bolsa, pueden usarse cuando se requieran. El accesorio puede ensamblarse a temperaturas tan bajas como 4 °C (40 °F). Permita que el ensamble se fije a 4 °C (40 °F) durante 24 h.

7. Herméticamente envuelva los extremos de los conductores juntos y deslice los conductores a través de la cámara de retención / sellado de la armadura.

**Nota:** La cinta de aislar o material similar es útil para envolver a los conductores.

Deslice la cámara de retención / sellado de la armadura sobre el compuesto epóxico y regrésela contra la armadura o la cubierta, apretando el compuesto en las guías y regrésela sobre la armadura o cubierta.

8. Quite el exceso de compuesto del extremo mayor de la cámara de retención / sellado de la armadura para exponer el afilamiento de la inserción. Esta superficie debe permanecer limpia para que el resorte asiente adecuadamente y proporcione continuidad de la puesta a tierra y fuerza de jalado. Después de quitar el exceso de compuesto, rellene cualquier hueco con compuesto adicional.

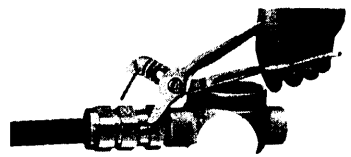
9. Ponga compuesto entre y alrededor de los conductores en el extremo menor de la cámara de retención / sellado de la armadura para llenar cualquier hueco. La cámara debe permanecer nivelada con el extremo de la cámara de retención / sellado de la armadura.

**⚠ PRECAUCIÓN**

La superficie exterior de la cámara de retención / sellado de la armadura debe permanecer limpia y libre del compuesto y de otra materia extraña. Inmediatamente limpie cualquier exceso de compuesto de la superficie exterior de la cámara de retención / sellado de la armadura. No use herramientas de metal porque pueden dañar la superficie de la cámara de retención / sellado de la armadura.

10. Inserte el cable y el ensamble de la cámara de retención / sellado de la armadura en el cuerpo.

Con la cámara de retención / sellado de la armadura completamente insertada en el cuerpo, deslice el cuerpo intermedio con la tuerca collarín sobre la cámara de retención / sellado de la armadura y enrósquela hacia el cuerpo. Apriete completamente el cuerpo intermedio con una llave de tuercas. Apriete la tuerca collarín en el cuerpo intermedio para comprimir la boquilla para obtener un sello hermético al agua. Refiérase a la Tabla 4 para los requisitos de la fuerza de apriete.





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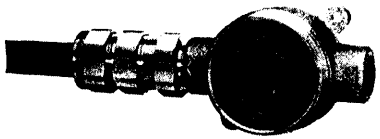
| Size | Cat.No. | Body | Nut |
|---|---|---|---|
| 1/2" | TMCX165 | 300 | 300 |
| 3/4" | TMCX285 | 500 | 500 |
| 1" | TMCX3112 | 700 | 700 |
| 1-1/4" | TMCX4140 | 1000 | 700 |
| 1-1/2" | TMCX5161 | 1200 | 700 |
| 2" | TMCX6206 | 1600 | 700 |
| 2-1/2" | TMCX7247 | 1600 | 700 |
| 3" | TMCX8302 | 1600 | 700 |
| 3-1/2" | TMCX9352 | 1600 | 700 |
| 4" | TMCX10402 | 1600 | 700 |

Table 4

11. When using Type MC cable, verify continuity between cable armor and enclosure.
12. Installation is complete. Allow sealing compound to set before moving cables or making cable connections.

**Completed Type MC Installation**



**Completed Type TC Installation**

To disassemble a TMCX fitting refer to Figure 1 and the following instructions:

1. Turn off power to the equipment and disconnect all electrical connections.
2. Loosen gland nut (1) without disconnecting it from the intermediate body (2).
3. Disconnect the intermediate body / gland nut assembly (1 & 2) from the body (4).

   Note: If the intermediate body / gland nut assembly does not easily separate from the body, insert a screw driver or similar tool in groove (3) (between armor stop and body) and pry to separate.

   Slide the intermediate body / gland nut assembly back onto cable.
4. Carefully remove the cable and armor stop /sealing chamber assembly from the body by pulling the cable away from the body / enclosure or by moving the body / enclosure away from the cable.
5. The TMCX fitting is ready to be reassembled.

## REASSEMBLY

**⚠ CAUTION**

Before reassembly, examine the tapered joint surfaces of the body and armor stop / sealing chamber. Surfaces must seat fully against each other to provide a proper explosion-proof joint. Remove any dirt or other foreign matter from both surfaces. If either surface is scratched, marred, corroded, or otherwise damaged, do not reassemble. Replace the fitting.

If the surfaces of the armor stop / sealing chamber and body are in good condition, the TMCX may be reassembled. Refer to steps #10 - #12 for proper assembly and torquing requirements.

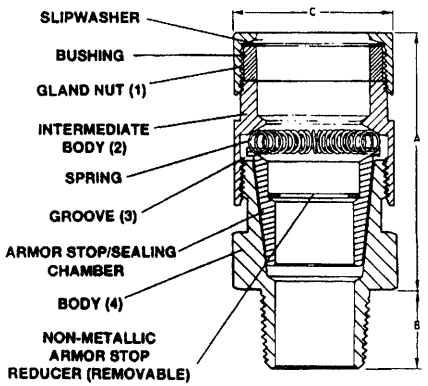



**Figure 1**

| NPT Size | Cat.No. | Cable Range Over Type MC Armor or Type TC Sheath in. | A Inches | B Inches | C Inches |
|---|---|---|---|---|---|
| 1/2" | TMCX165 | .440"-.650" | 2-5/8 | 3/4 | 1-3/8 |
| 3/4" | TMCX285 | .600"-.850" | 2-7/8 | 25/32 | 1-5/8 |
| 1" | TMCX3112 | .850"-1.120" | 3-1/8 | 15/16 | 2 |
| 1-1/4" | TMCX4140 | 1.100"-1.400" | 3-1/8 | 31/32 | 2-7/16 |
| 1-1/2" | TMCX5161 | 1.280"-1.610" | 3-3/8 | 31/32 | 2-3/4 |
| 2" | TMCX6206 | 1.570"-2.060" | 4-1/2 | 1 | 3-1/2 |
| 2-1/2" | TMCX7247 | 1.930"-2.470" | 4-3/4 | 1-7/16 | 4 |
| 3" | TMCX8302 | 2.450"-3.020" | 4-7/8 | 1-7/16 | 4-7/8 |
| 3-1/2" | TMCX9352 | 2.950"-3.520" | 5-3/8 | 1-5/8 | 5-3/8 |
| 4" | TMCX10402 | 3.500"-4.020" | 5-1/2 | 1-5/8 | 5-7/8 |

TABLE 5 - COMPLIANCES

TMCX Series Terminator cable fittings are UL Listed for hazardous locations (with TSC Epoxy Sealing Compound only) according to UL sstandards 514B and 886**. They are suitable for use in NEC hazardous (classified) locations when installed in accordance with NEC articles 501-4(a) and (b), 501-5(c)(d) and (e), 502-4(a) and (b), 502-5 and 503-3. Tray cable is not suitable for use in Class III hazardous (classified) locations.

| Catalog Number | Compliances | Catalog Number | Compliances |
|---|---|---|---|
| TMCX165 | Class I←, Division 1&2, Groups A,B,C,D | TMCX6206 | Class I←, Division 1&2, Groups A,B,C,D |
| TMCX285 | Class II, Division 1&2, Groups E,F,& G | TMCX7247 | Class II, Division 1&2, Groups E,F,& G |
| TMCX3112 | Class III | TMCX8302† | Class III |
| TMCX4140 | | TMCX9352† | |
| TMCX5161 | | TMCX10402† | |

** TMCX10402 is UL Listed only for use with steel interlocked armor cable.
† TMCX8302, -9352 and -10402 are not UL Listed for use with Type TC cable.
← The TMCX Series is approved for use in Division 1 hazardous locations when used with MC cable approved for Division 1 hazardous locations.

All statements, technical information and recommendations contained herein are based on information and tests we believe to be reliable. The accuracy or completeness thereof are not guaranteed. In accordance with Crouse-Hinds "Terms and Conditions of Sale", and since conditions of use are outside our control, the purchaser should determine the suitability of the product for the intended use and assumes all risk and liability whatsoever in connection therewith.

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Revision 2
Revised 04/02
Supercedes 02/02



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# Raccord d[e] câble TMCX TERMINATORMD

COOPER Crouse-Hinds

## Renseigneme[nts] sur l'installation et l'entretien

**IF1184**

**CONSERVEZ CES INSTRUCTIONS POUR VOUS Y RÉFÉRER ULTÉRIEUREMENT.**

### APPLICATION

Les raccords de câbles Terminator de la série TMCX sont conçus pour être utilisés avec des câbles gainés à armure métallique MC, des câbles à armure articulée, à armure gaufrée continue et des câbles pour chemin de câbles de type TC dans des emplacements dangereux (classifiés) lorsqu'ils sont installés selon les sections 501-4(a) et (b), 501-5(c)(d) et (e), 502-4(a) et (b), 502-5 et 503-3 du NEC.

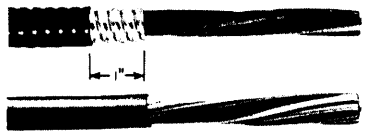
Les raccords de câbles Terminator de la série TMCX permettent l'introduction de câbles de types MC (gainés à armure métallique) et TC (pour chemins de câbles) dans un boîtier, un tableau ou autre équipement de manière à assurer une terminaison étanche à l'eau. Ils sont réutilisables. La chambre d'étanchéité / la butée d'armure sert de raccord union intégral permettant le démontage et la réutilisation sans mettre en danger l'intégrité du câble ou du joint. Une fois le câble étanchéisé, il est possible de démonter le TMCX pour retirer le câble et la chambre d'étanchéité / la butée d'armure du corps.

Avec les câbles de type MC, la continuité à la terre entre l'armure du câble et les boîtiers métalliques est maintenue. Le câble de type TC est mis à la terre à l'aide d'un conducteur de terre distinct.

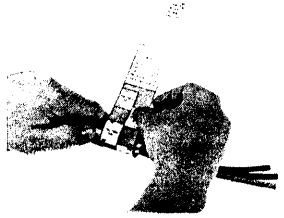
Les raccords de câbles Terminator de la série TMCX sont répertoriés UL pour les emplacements dangereux (avec le ciment d'étanchéité à l'époxy TSC seulement) selon les normes 514B et 886 des UL. Ils conviennent à l'utilisation dans les emplacements dangereux (classifiés) de classe I, divisions 1 et 2, groupes A, B, C, D; de classe II, divisions 1 et 2, groupes E, F et G; et de classe III, divisions 1 et 2 du NEC conformément aux sections 501-4(a) et (b), 501-5(c)(d) et (e), 502-4(a) et (b), 502-5 et 503-3 du NEC (voir le tableau 5).

### INSTALLATION

1. Retirer la gaine (et, au besoin, l'armure) du câble de manière à exposer une longueur suffisante de conducteurs. Dans le cas de câbles de type MC, laisser environ 1 po d'armure exposée.




2. En se servant de la jauge et du calibre de câble fournis avec le Terminator, mesurer la longueur de l'armure de câble exposée ou le diamètre extérieur du câble pour chemin de câbles et choisir le raccord approprié. Placer le bas du calibre sur l'armure du câble ou la gaine exposée et maintenir le calibre à l'aide du pouce. Enrouler fermement le calibre. La flèche au bas du calibre indique le numéro de catalogue du raccord nécessaire pour terminer le câble. Dans l'exemple ci-dessous, il faudrait utiliser un raccord TMCX3112.



**N.B.** : Se reporter au dessin au trait de la dernière page pour identifier les composants du raccord de câble TMCX.

* TMCX 10402 is UL Listed for use with steel interlock armor cable only
† 1/2" - 2-1/2" sizes

| Dim. NPT | N°cat. | Dim. d'armure de câble (type MC) ou de gaine (type TC) correspondantes | |
|---|---|---|---|
| 1/2 po | TMCX165 | 0,440 po | 0,650 po |
| 3/4 po | TMCX285 | 0,600 po | 0,850 po |
| 1 po | TMCX3112 | 0,800 po | 1,120 po |
| 1 1/4 po | TMCX4140 | 1,100 po | 1,400 po |
| 1 1/2 po | TMCX5161 | 1,280 po | 1,610 po |
| 2 po | TMCX6206 | 1,570 po | 2,060 po |
| 2 1/2 po | TMCX7247 | 1,930 po | 2,470 po |
| 3 po | TMCX8302 | 2,450 po | 3,020 po |
| 3 1/2 po | TMCX9352 | 2,950 po | 3,520 po |
| 4 po | TMCX10402 | 3,500 po | 4,020 po |

Tableau 1

3. Dans le cas des câbles de type MC, se reporter au tableau 2 ou aux étapes relatives au calibre et à la jauge de câble pour calculer la longueur d'armure à dénuder en vue de l'assemblage. Au besoin, enlever davantage de gaine. Inspecter l'armure et se servir d'une lime pour éliminer les ébarbures éventuelles.

| Dim. NPT | Long. d'armure à dénuder (dim. A) |
|---|---|
| 1/2 po | 1 1/4 po |
| 3/4 po | 1 1/4 po |
| 1 po | 1 3/8 po |
| 1 1/4 po | 1 3/8 po |
| 1 1/2 po | 1 3/8 po |
| 2 po | 1 1/8 po |
| 2 1/2 po | 1 1/8 po |
| 3 po | 1 1/8 po |
| 3 1/2 po | 1 1/8 po |
| 4 po | 1 1/8 po |

Tableau 2
Long. d'armure à dénuder

**N.B.** : Se reporter au dessin au trait de la dernière page pour identifier les composants du raccord de câble TMCX.

4. Préparer le câble. Dans le cas du type MC, retirer le bourrage et le blindage jusqu'à l'armure. Dans celui des câbles de type TC, retirer le bourrage jusqu'à la gaine. Retirer le corps et la butée d'armure / la chambre d'étanchéité du raccord. Installer le corps dans le boîtier et serrer à l'aide d'une clé. Glisser l'écrou d'étanchéité et le corps intermédiaire sur le câble de la manière illustrée ci-dessous. Ramener individuellement les conducteurs de terre non isolés vers l'arrière jusqu'à l'armure ou la gaine pour pouvoir cimenter chaque brin.

5. Dans le cas des câbles MC, pour tenir compte des écarts dans les procédés de fabrication des câbles et de la gamme de diam. ext. d'armure de câble du raccord, on installe un réducteur de butée d'armure dans la butée d'armure / la chambre d'étanchéité. Il faut le retirer si les conducteurs ne passent pas dans le réducteur. S'assurer que le câble n'est pas bloqué par la butée d'armure / la chambre d'étanchéité ou le réducteur.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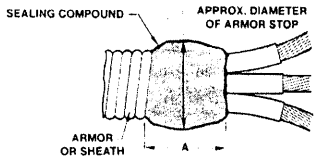
6. Séparer les conducteurs et les brins du conducteur de terre. On recommande de placer des cales en bois pour maintenir les gros conducteurs à distance et poser le ciment. Mélanger le ciment d'étanchéité époxydique à deux éléments fourni en le pétrissant et en le pliant jusqu'à ce qu'on obtienne une couleur uniforme (environ 2 à 3 minutes). Se reporter au tableau 3. L'emballage contient plus de ciment que nécessaire pour l'installation. Ne pas en utiliser plus que nécessaire.

**N.B.** : Il n'est pas nécessaire de porter des gants pour appliquer le ciment. Toutefois, le port de gants est recommandé aux personnes à la peau sensible ou qui sont exposées au ciment pendant une longue période.

Mettre une quantité suffisante de ciment entre le diamètre intérieur de l'armure ou de la gaine et le faisceau de conducteurs. Se reporter au tableau 3.

| Dim. NPT | N°cat. | Quantité de composé nécessaire(oz) | Quantité de composé fournie(oz) | Dim. «A» |
|---|---|---|---|---|
| 1/2 po | TMCX165 | 0.25 | 0.50 | 1 po |
| 3/4 po | TMCX285 | 0.50 | 1.00 | 1 po |
| 1 po | TMCX3112 | 0.70 | 1.00 | 1 1/4 po |
| 1 1/4 po | TMCX4140 | 1.50 | 2.00 | 1 1/4 po |
| 1 1/2 po | TMCX5161 | 1.85 | 2.00 | 1 1/2 po |
| 2 po | TMCX6206 | 4.50 | 5.00 | 2 po |
| 2 1/2 po | TMCX7247 | 8.65 | 9.00 | 2 1/2 po |
| 3 po | TMCX8302 | 15.75 | 16.00 | 3 po |
| 3 1/2 po | TMCX9352 | 25.55 | 28.00 | 3 1/2 po |
| 4 po | TMCX10402 | 38.95 | 41.00 | 4 po |

Tableau 3



Se servir d'une cheville ou d'un bâton en bois dur pour pousser le ciment dans les endroits qu'on ne peut atteindre avec les doigts, particulièrement au centre du câble. Éviter d'utiliser des outils en métal, qui risqueraient d'abîmer les conducteurs. Cimenter l'extrémité du bourrage, ainsi que les vides qui subsistent en posant une couche d'une épaisseur minimale de ⁄ po.

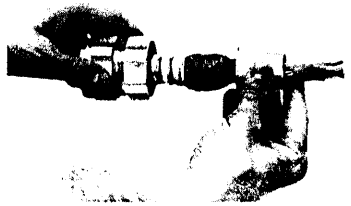
**N.B.** : Si l'on prépare le ciment par temps froid, mélanger un tube à la fois.

**N.B.** : Le ciment reste malléable pendant environ 30 minutes à 68 °F (20 °C). Cette durée diminue à mesure que la température augmente. Par temps froid, réchauffer les composants et le ciment d'étanchéité dans la cabine d'un camion ou dans sa poche jusqu'au moment de les utiliser. On peut assembler le raccord jusqu'à des températures aussi basses que 40 °F (4 °C). Laisser sécher le tout à 40 °F (4 °C) pendant 24 heures.

7. Enrouler fermement les extrém[ités] s conducteurs ensemble et les insérer dans ' d'armure / la chambre d'étanchéité.

**N.B.** : Pour enrouler les con[ducteu]rs, on peut se servir de ruban pour canalisations ou d'un matériau semblable.

Faire glisser la butée d'armure / la chambre d'étanchéité sur le ciment à l'époxy et la ramener contre l'armure ou la gaine, en repoussant le ciment sur les conducteurs puis sur l'armure ou la gaine.



8. Éliminer l'excédent de ciment de l'extrémité la plus grosse de la butée d'armure / la chambre d'étanchéité de manière à exposer le cône. Cette surface doit demeurer propre pour permettre au ressort de bien se positionner pour assurer un bon contact et offrir une bonne prise pour le retrait. Après avoir éliminé l'excédent de ciment, remplir les vides à l'aide de ciment supplémentaire.

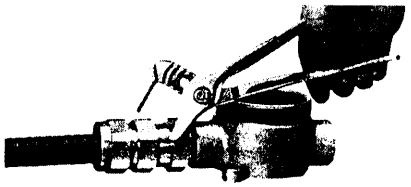
9. Pack compound between and around conductors at the small end of the armor stop / sealing chamber to fill any voids. Chamber should remain flush with the end of the armor stop / sealing chamber.

**⚠ ATTENTION**

La surface extérieure de la butée d'armure / la chambre d'étanchéité doit demeurer propre et exempte de ciment ou d'autres matières étrangères. Essuyer sans tarder l'excédent de ciment de la surface extérieure de la butée d'armure / la chambre d'étanchéité. Éviter d'utiliser des outils en métal qui risqueraient d'abîmer la surface de la butée d'armure / la chambre d'étanchéité.

10. IInsérer la butée d'armure / la chambre d'étanchéité dans le corps.

Une fois la butée d'armure / la chambre d'étanchéité insérée à fond dans le corps, faire glisser le corps intermédiaire et l'écrou d'étanchéité sur la butée d'armure / la chambre d'étanchéité puis visser dans le corps en serrant à fond à l'aide d'une clé. Serrer l'écrou d'étanchéité sur le corps intermédiaire de manière à comprimer la bague et ainsi obtenir un joint étanche à l'eau. Voir les exigences de serrage au tableau 4.

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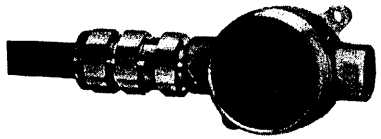
| Medida NPT | Catalogo | Torque de Apriete Cuerpo | Tuerca |
|---|---|---|---|
| 16 (1/2") | TMCX165 | -cm(300 lb-plg) | 345,6 kg-cm(300 lb-plg) |
| 21 (3/4") | TMCX285 | cm (500 lb-plg) | 576 kg-cm (500 lb-plg) |
| 27 (1") | TMCX3112 | kg-cm (700 lb-plg) | 806 kg-cm (700 lb-plg) |
| 35 (1-1/4") | TMCX4140 | 1152 kg-cm (1000 lb-plg) | 806 kg-cm (700 lb-plg) |
| 41 (1-1/2") | TMCX5161 | 1382,4 kg-cm (1200 lb-plg) | 806 kg-cm (700 lb-plg) |
| 53 (2") | TMCX6206 | 1843,2 kg-cm (1600 lb-plg) | 806 kg-cm (700 lb-plg) |
| 63 (2-1/2") | TMCX7247 | 1843,2 kg-cm (1600 lb-plg) | 806 kg-cm (700 lb-plg) |
| 78 (3") | TMCX8302 | 1843,2 kg-cm (1600 lb-plg) | 806 kg-cm (700 lb-plg) |
| 91 (3-1/2") | TMCX9352 | 1843,2 kg-cm (1600 lb-plg) | 806 kg-cm (700 lb-plg) |
| 103 (4") | TMCX10402 | 1843,2 kg-cm (1600 lb-plg) | 806 kg-cm (700 lb-plg) |

Tabla 4

11. Al usar el cable Tipo MC, verifique la continuidad entre la armadura del cable y la envolvente.
12. La instalación está completa. Permita que se endurezca el compuesto sellador antes de mover los cables o hacer las conexiones del cable.

**Completada la Instalación del Tipo MC**



**Completada la Instalación del Tipo TC**

## DESMONTAJE

Para desmontar un accesorio TMCX, referirse a la Figura 1 y las instrucciones siguientes:

1. Apague la energía del equipo y desconecte todas las conexiones eléctricas.
2. Afloje la tuerca collarín (1) sin desconectarla del cuerpo intermedio (2).
3. Desconecte el ensamble cuerpo intermedio / tuerca collarín (1 y 2) del cuerpo (4).

   **Nota:** Si el ensamble cuerpo intermedio / tuerca collarín no se separa fácilmente del cuerpo, inserte un destornillador o herramienta similar en la ranura (3) (entre la retención de la armadura y el cuerpo) y haga palanca para separar.

   Deslice el ensamble cuerpo intermedio / tuerca collarín de regreso hacia el cable.
4. Cuidadosamente quite el cable y el ensamble de la cámara de retención / sellado de la armadura del cuerpo sacando el cable del cuerpo / envolvente o retirando el cuerpo / envolvente del cable.
5. El accesorio TMCX está listo para montarse de nuevo.

**⚠ PRECAUCIÓN**

Antes del volver a montar, examine las superficies adelgazadas de la unión del cuerpo y de la cámara de retención / sellado de la armadura. Las superficies deben asentarse completamente una contra otra para proporcionar una unión a prueba de explosión adecuada. Quite cualquier suciedad u otra materia extraña de ambas superficies. Si cualquier superficie se rasga, estropea, corroe, o se daña de otra forma, no se vuelve a montar. Reemplace el accesorio.

## VOLVER A MONTAR

Si las superficies de la cámara de retención / sellado de la armadura y el cuerpo están en buenas condiciones, el TMCX puede volverse a montar. Refiérase a los pasos #10 - #12 para el ensamble adecuado y los requisitos de la fuerza de apriete.

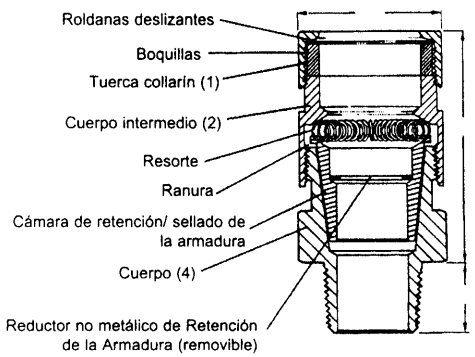



**Figura 1**

## DIMENSIONES

| Medida NPT | Catalogo | Rango de Cable Tipo MC o TC | A | B | C |
|---|---|---|---|---|---|
| 16 (1/2") | TMCX165 | 11,17mm - 16,51mm (.440"-.650") | 66,675mm (2-5/8") | 19,5mm (3/4") | 79,37 mm (3-1/8") |
| 21 (3/4") | TMCX285 | 15,24mm - 21,59mm (.600"-.850") | 73,02 mm (2-7/8") | 19,84 mm (25/32") | 41,27 mm (1-5/8") |
| 27 (1") | TMCX3112 | 20,32mm - 28,44mm (.800" - 1.120") | 79,37 mm (3-1/8") | 23,81 mm (15/16") | 50,8mm (2") |
| 35 (1-1/4") | TMCX4140 | 27,94mm - 35,56mm (1.100" - 1.400") | 79,37 mm (3-1/8") | 24,60 mm (31/32") | 11,11 mm (2-7/16") |
| 41 (1-1/2") | TMCX5161 | 32,51mm - 40,89mm (1.280" - 1.610") | 85,72 mm (3-3/8") | 24,60 mm (31/32") | 69,85 mm (2-3/4") |
| 53 (2") | TMCX6206 | 39,87mm - 52,32mm (1.570" - 2.060") | 134,94 mm (5-5/16") | 25,4mm (1") | 88,9mm (3-1/2") |
| 63 (2-1/2") | TMCX7247 | 49,02mm - 62,73mm (1.930" - 2.470") | 153,99 mm (6-1/16") | 36,51 mm (1-7/16") | 101,6mm (4") |
| 78 (3") | TMCX8302 | 62,23mm - 76,70mm (2.450" - 3.020") | 169,86mm (6-11/16") | 36,51 mm (1-7/16") | 123,82mm (4-7/8") |
| 91 (3-1/2") | TMCX9352 | 74,93mm - 89,40mm (2.950" - 3.520") | 196,85 mm (7-3/4") | 41,27 mm (1-5/8") | 136,52 mm (5-3/8") |
| 103 (4") | TMCX10402 | 88,9mm -102,10mm (3.500" - 4.020") | 211,14 mm (8-5/16") | 41,27 mm (1-5/8") | 149,22 mm (5-7/8") |

TABLA 5 - EQUIVALENCIAS

Los accesorios Terminadores del cable Serie TMCX están listados por UL para lugares peligrosos (únicamente con el Compuesto Sellador Epóxico TSC) de acuerdo con las Normas UL 514B y 886 **. Son adecuados para utilizarse lugares peligrosos (clasificados) del NEC, cuando se instalan de acuerdo con los artículos 501-4(a) y (b), 501-5(c) (d) y (e), 502-4(a) y (b), 502-5 y 503-3 del NEC. El cable para charolas no es adecuado para utilizarse en lugares peligrosos (clasificados) Clase III.

| Número de catálogo | Cumple con | Número de catálogo | Cumple con |
|---|---|---|---|
| TMCX165 | Clase I, Divisiones 1 y 2, Grupos A,B,C,D | TMCX6206 | Clase I, Divisiones 1 y 2, Grupos A,B,C,D |
| TMCX285 | Clase II, Divisiones 1 y 2, Grupos E,FyG | TMCX7247 | Clase II, Divisiones 1 y 2, Grupos E,FyG |
| TMCX3112 | Clase III | TMCX8302† | Clase III |
| TMCX4140 | | TMCX9352† | |
| TMCX5161 | | TMCX10402† | |

** El TMCX10402 está listado por UL únicamente para utilizarse en cables con armadura de acero engargolada.

† El TMCX8302, -9352 y -10402 no están listados por UL para utilizarse con cables Tipo TC.

← La Serie de TMCX esta aprobada para utilizarse en lugares peligrosos División 1 cuando se utiliza con cables MC aprobados para lugares peligrosos División 1.

Todas las declaraciones, información técnica y recomendaciones contenidas aquí se basan en la información y pruebas que creemos que son confiables. No se garantizan la exactitud o integridad de esto. De acuerdo con "los Términos y Condiciones de Venta" de Crouse-Hinds, y dado que las condiciones de uso están fuera de nuestro control, el comprador debe determinar la conveniencia del producto por su uso intencional y debe asumir todo el riesgo y obligación en absoluto en relación con esto.

**COOPER** Crouse-Hinds

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Crouse-Hinds Division
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IF1184
Revisión 2
Revised 04/02
Supercedes 02/02

## Chapter 17 PLANT EMERGENCY EQUIPMENT

## MANUFACTURER/DISTRIBUTOR:

ANIXTER
3000,LOUIS AMOS
LACHINE,QUE
PH:514-636-3636 fax:1286

### 17.1 UPS MODEL SUA750 XL.

## MANUFACTURER/DISTRIBUTOR:

BARNETT ENGINEERING LTD.
215,7710 5th .SE
T2H-2L9
PH. 403-255-9544.
FAX: 403-259-2343

### 17.2 PROTALK PLUS ALARM REPORTING UNIT.

**END OF CHAPTER 17**

# APC Smart-UPS XL 750VA USB & Serial 120V

REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT. ANY ACTION TAKEN MAY BE SUBJECT TO THE REQUIREMENTS OF THE CONTRACT.
☑ [illegible]
☐ MAKE NOTED CORRECTIONS
☐ REVISE & RESUBMIT
☐ REJECTED
DATE Nov 7/05 BY DC
EARTH TECH (CANADA) INC.

APC
Legendary Reliability™

Canada

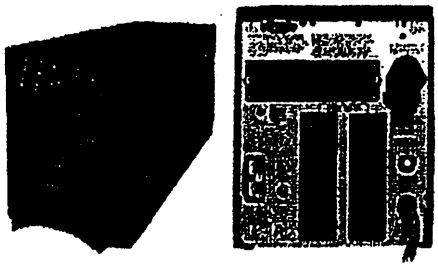


## APC Smart-UPS XL 750VA USB & Serial 120V

APC Smart-UPS XL, 750VA/600W, Input 120V/Output 120V, Interface Port DB-9 RS-232, SmartSlot, USB, Extended runtime model

Includes: CD with software, Smart UPS signalling RS-232 cable, USB cable, User Manual

Part Number : SUA750XL



Compare Models
Runtime Chart
Email Technical Specifications
Printer Friendly

Additional Information
Product Overview
User Manual & Installation Guides
Product Distribution

[+] More Images

## Technical Specifications

### Output

| | |
|---|---|
| Output Power Capacity | 600 Watts / 750 VA |
| Max Configurable Power | 600 Watts / 750 VA |
| Nominal Output Voltage | 120V |
| Output Voltage Distortion | Less than 5% at full load |
| Output Frequency (sync to mains) | 47 - 53 Hz for 50 Hz nominal,57 - 63 Hz for 60 Hz nominal |
| Crest Factor | up to 5 : 1 |
| Waveform Type | Sine wave |
| Output Connections | (8) NEMA 5-15R |

### Input

| | |
|---|---|
| Nominal Input Voltage | 120V |
| Input Frequency | 50/60 Hz +/- 3 Hz (auto sensing) |
| Input Connections | NEMA 5-15P |
| Cord Length | 6 feet ( 1.83 meters) |
| Input voltage range for main operations | 82 - 144V |
| Input voltage adjustable range for mains operation | 75 - 154V |

Options:
- Automatic Transfer Switches
- Batteries
- Interface Connections
- Management Devices
- Rack Power Distribution
- Replacement Battery Cartridges
- Services
- Software

Features:
- USB connectivity

General Features:
- Adjustable voltage sensitivity
- Adjustable voltage-transfer points
- Audible alarms
- Automatic restart of loads after UPS shutdown
- Automatic self-test
- Boost and Trim Automatic Voltage Regulation (AVR)
- Cold-start capable
- Disconnected battery notification
- Generator compatible
- Hot-swappable batteries
- Intelligent battery management
- LED status indicators
- Network manageable
- Plug-and-Play external batteries
- Power conditioning
- Predictive failure notification
- Resettable circuit breakers
- Safety-agency approved
- Scalable runtime
- Serial Connectivity
- SmartSlot
- Temperature-compensated battery charging

# APC Smart-UPS XL 750VA USB & Serial 120V

more details...

Topology: Line Interactive

## Batteries & Runtime

| | |
|---|---|
| Battery Type | Maintenance-free sealed Lead-Acid battery with suspended electrolyte : leakproof |
| Replacement battery cartridge | RBC7 |
| RBC™ Quantity | 1 |
| Typical Backup Time at Half Load | 50.6 minutes (300 Watts) |
| Typical Backup Time at Full Load | 16.6 minutes (600 Watts) |
| Runtime Chart | Smart-UPS XL |
| Extended Run Options | APC Smart-UPS XL 750VA USB & Serial 120V |

## Communications & Management

| | |
|---|---|
| Interface Port(s) | DB-9 RS-232,SmartSlot,USB |
| Available SmartSlot™ Interface Quantity | 1 |
| Control panel | LED status display with load and battery bar-graphs and On Line : On Battery : Replace Battery : and Overload Indicators |
| Audible Alarm | Alarm when on battery : distinctive low battery alarm : configurable delays |
| Emergency Power Off (EPO) | Optional |

## Surge Protection and Filtering

| | |
|---|---|
| Surge energy rating | 459 Joules |
| Filtering | Full time multi-pole noise filtering : 0.3% IEEE surge let-through : zero clamping response time : meets UL 1449 |

## Physical

| | |
|---|---|
| Maximum Height | 8.50 inches (216 mm) |
| Maximum Width | 6.70 inches (170 mm) |
| Maximum depth | 17.30 inches (439 mm) |
| Net Weight | 53.00 lbs. ( 24.09 kg) |
| Shipping Weight | 58.00 lbs. ( 26.36 kg) |
| Shipping Height | 15.25 inches (387 mm) |
| Shipping Width | 12.60 inches (320 mm) |
| Shipping Depth | 23.25 inches (591 mm) |
| Color | Black |
| Units per Pallet | 24.00 |

## Environmental

| | |
|---|---|
| Operating Environment | 0 - 40 °C (32 - 104 °F) |
| Operating Relative Humidity | 0 - 95% |
| Operating Elevation | 0-10000 feet (0-3000 meters) |
| Storage Temperature | -15 - 45 °C (5 - 113 °F) |

| | |
|---|---|
| Storage Relative Humidity | 0 - 95% |
| Storage Elevation | 0-50000 feet (0-15000 meters) |
| Online Thermal Dissipation | 100 BTU/hr |

**Conformance**

| | |
|---|---|
| Regulatory Approvals | BSMI,CSA,FCC Part 15 Class A,UL 1778 |
| Standard Warranty | 2 years repair or replace |
| Equipment protection policy | Lifetime : $150000 |

*Estimated Resale Price - Without Tax/VAT

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APC
Legendary Reliability™

## Runtime by load for: Smart-UPS XL

Filter by input voltage [All Voltages] [Refresh]

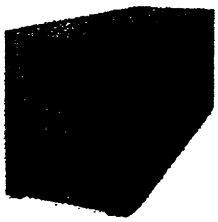
**120V**

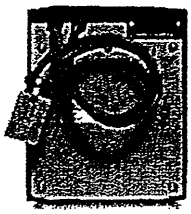
| Watts | 50 | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2500 | 3000 | 3500 | Full | Half |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VA~ | 70 | 140 | 280 | 420 | 560 | 700 | 840 | 980 | 1120 | 1260 | 1400 | 1680 | 1960 | 2240 | 2520 | 2800 | 3500 | 4200 | 4900 | Load | Load |
| SUA750XL | 5 hrs 1 mins | 2 hrs 52 mins | 1 hrs 24 mins | 51 min | 33 min | 23 min | 17 min | – | – | – | – | – | – | – | – | – | – | – | – | 17 min (600 Watts) | 51 min (300 Watts) |
| SUA750XL + (1)SUA24XLBP | 16 hrs 13 mins | 9 hrs 45 mins | 5 hrs 16 mins | 3 hrs 30 mins | 2 hrs 33 mins | 1 hrs 58 mins | 1 hrs 35 mins | – | – | – | – | – | – | – | – | – | – | – | – | 1 hrs 35 mins (600 Watts) | 3 hrs 30 mins (300 Watts) |
| SUA750XL + (1)UXBP24 | 51 hrs 12 mins | 31 hrs 16 mins | 17 hrs 25 mins | 11 hrs 57 mins | 9 hrs 2 mins | 7 hrs 13 mins | 5 hrs 59 mins | – | – | – | – | – | – | – | – | – | – | – | – | 5 hrs 59 mins (600 Watts) | 11 hrs 57 mins (300 Watts) |
| SUA750XL + (2)SUA24XLBP | 27 hrs 26 mins | 16 hrs 39 mins | 9 hrs 9 mins | 6 hrs 12 mins | 4 hrs 38 mins | 3 hrs 39 mins | 2 hrs 59 mins | – | – | – | – | – | – | – | – | – | – | – | – | 2 hrs 59 mins (600 Watts) | 6 hrs 12 mins (300 Watts) |
| SUA750XL + (2)UXBP24 | 103 hrs 0 mins | 63 hrs 9 mins | 35 hrs 26 mins | 24 hrs 31 mins | 18 hrs 40 mins | 15 hrs 2 mins | 12 hrs 33 mins | – | – | – | – | – | – | – | – | – | – | – | – | 12 hrs 33 mins (600 Watts) | 24 hrs 31 mins (300 Watts) |
| SUA750XL + (3)SUA24XLBP | 38 hrs 40 mins | 23 hrs 33 mins | 13 hrs 3 mins | 8 hrs 55 mins | 6 hrs 43 mins | 5 hrs 20 mins | 4 hrs 24 mins | – | – | – | – | – | – | – | – | – | – | – | – | 4 hrs 24 mins (600 Watts) | 8 hrs 55 mins (300 Watts) |
| SUA750XL + (3)UXBP24 | 149 hrs 12 mins | 91 hrs 35 mins | 51 hrs 30 mins | 35 hrs 43 mins | 27 hrs 16 mins | 22 hrs 0 mins | 18 hrs 25 mins | – | – | – | – | – | – | – | – | – | – | – | – | 18 hrs 25 mins (600 Watts) | 35 hrs 43 mins (300 Watts) |
| SUA750XL + (4)SUA24XLBP | 49 hrs 53 mins | 30 hrs 28 mins | 16 hrs 57 mins | 11 hrs 38 mins | 8 hrs 48 mins | 7 hrs 1 mins | 5 hrs 49 mins | – | – | – | – | – | – | – | – | – | – | – | – | 5 hrs 49 mins (600 Watts) | 11 hrs 38 mins (300 Watts) |
| SUA750XL + (4)UXBP24 | 195 hrs 24 mins | 120 hrs 1 mins | 67 hrs 34 mins | 46 hrs 55 mins | 35 hrs 52 mins | 28 hrs 59 mins | 24 hrs 17 mins | – | – | – | – | – | – | – | – | – | – | – | – | 24 hrs 17 mins (600 Watts) | 46 hrs 55 mins (300 Watts) |
| SUA1000XL | 5 hrs 1 mins | 2 hrs 52 mins | 1 hrs 24 mins | 51 min | 33 min | 23 min | 17 min | 12 min | 10 min | – | – | – | – | – | – | – | – | – | – | 10 min (800 Watts) | 33 min (400 Watts) |
| Watts | 50 | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2500 | 3000 | 3500 | Full | Half |
| VA~ | 70 | 140 | 280 | 420 | 560 | 700 | 840 | 980 | 1120 | 1260 | 1400 | 1680 | 1960 | 2240 | 2520 | 2800 | 3500 | 4200 | 4900 | Load | Load |
| SUA1000XL + (1)SUA24XLBP | 16 hrs 13 mins | 9 hrs 45 mins | 5 hrs 16 mins | 3 hrs 30 mins | 2 hrs 33 mins | 1 hrs 58 mins | 1 hrs 35 mins | 1 hrs 18 mins | 1 hrs 5 mins | – | – | – | – | – | – | – | – | – | – | 1 hrs 5 mins (800 Watts) | 2 hrs 33 mins (400 Watts) |
| SUA1000XL + (1)UXBP24 | 51 hrs 12 mins | 31 hrs 16 mins | 17 hrs 25 mins | 11 hrs 57 mins | 9 hrs 2 mins | 7 hrs 13 mins | 5 hrs 59 mins | 5 hrs 5 mins | 4 hrs 24 mins | – | – | – | – | – | – | – | – | – | – | 4 hrs 24 mins (800 Watts) | 9 hrs 2 mins (400 Watts) |

# APC Smart-UPS XL 24V Battery Pack

Includes: User Manual

Part Number : **SUA24XLBP**





[+] More Images

Email Technical Specifications
Printer Friendly

**Additional Information**
Product Distribution

## Technical Specifications

### Batteries & Runtime

| | |
|---|---|
| Battery Volt-Amp-Hour Capacity | 816 |
| Battery Type | Maintenance-free sealed Lead-Acid battery with suspended electrolyte : leakproof |
| Expected Battery Life (years) | 3 - 5 |
| RBC™ Quantity | 1 |

**Options:**
- Replacement Battery Cartridges
- Services

**Features:**
- Cascading Capabilities
- Hot Pluggable Operation
- Intelligent Battery Management

### Physical

| | |
|---|---|
| Net Weight | 69.00 lbs. ( 31.36 kg) |
| Maximum Height | 8.50 inches (216 mm) |
| Maximum Width | 6.70 inches (170 mm) |
| Maximum depth | 17.30 inches (439 mm) |
| Shipping Weight | 73.00 lbs. ( 33.18 kg) |
| Shipping Width | 12.60 inches (320 mm) |
| Shipping Height | 15.25 inches (387 mm) |
| Shipping Depth | 23.25 inches (591 mm) |
| Color | Black |
| Units per Pallet | 24.00 |

### Environmental

APC Smart-UPS XL 24V Battery Pack

| | |
|---|---|
| Operating Environment | 0 - 40 °C (32 - 104 °F) |
| Operating Relative Humidity | 0 - 95% |
| Operating Elevation | 0-10000 feet (0-3000 meters) |
| Storage Temperature | -15 - 45 °C (5 - 113 °F) |
| Storage Relative Humidity | 0 - 95% |
| Storage Elevation | 0-50000 feet (0-15000 meters) |

⊟ **Conformance**

| | |
|---|---|
| Standard Warranty | 2 years repair or replace |

*Estimated Resale Price - Without Tax/VAT

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**User Manual**

**English**

# APC Smart-UPS®

500 VA
100 VAC

750 VA
100/120/230 VAC

Tower

Uninterruptible Power Supply

990-1587A 12/2005

17.1

## *Introduction*

The APC Uninterruptible Power Supply (UPS) is designed to prevent blackouts, brownouts, sags, and surges from reaching your equipment. The uninterruptible power supply (UPS) filters small utility line fluctuations and isolates your equipment from large disturbances by internally disconnecting from the utility line. The UPS provides continuous power from its internal battery until the utility line returns to safe levels or the battery is fully discharged.

# 1: INSTALLATION

**The User Manual and Safety Guide are accessible on the supplied User Manuals CD and on the APC web site, www.apc.com.**

## *Unpack*

**Attention: Read the safety instruction sheet before installation.**

Inspect the UPS upon receipt. Notify the carrier and dealer if there is damage.

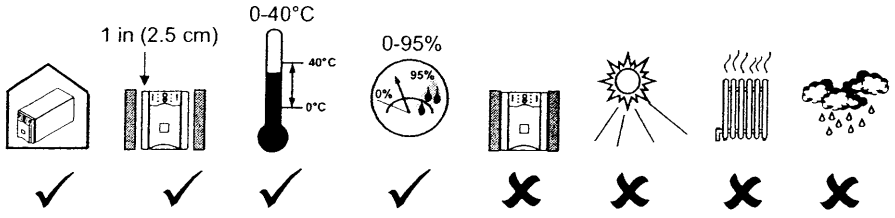
The packaging is recyclable; save it for reuse or dispose of it properly.

Check the package contents:

**Attention: The UPS comes with battery disconnected.**

- ❑ UPS
- ❑ UPS literature kit containing:
  - ❑ Product documentation, safety and warranty information
  - ❑ Smart-UPS™ User Manuals CD
  - ❑ *120V and 230V models:* PowerChute® CD
  - ❑ *120V and 230V models:* Serial and USB communication cables
  - ❑ *230V model*: Two jumper cables

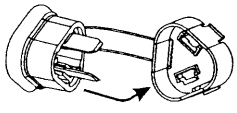
## *Position the UPS*




## *Connect the Battery*

The battery connector is located on the rear panel.

For battery connection, push the tethered jumper plug into the corresponding port.



## *Connect Equipment and Power to the UPS*

1. Connect equipment to the UPS.

   **Note: A laser printer draws significantly more power than other types of equipment and may overload the UPS.**

2. Add accessories to the Smart-Slot (optional).
3. Connect ground leads to the TVSS screw (optional). To make the connection, loosen the screw and connect the surge suppression device ground lead. Tighten the screw to secure the lead.
4. Plug the UPS into a two-pole, three-wire, grounded receptacle only. Avoid using extension cords.

   *100V/120V models*: The power cord is attached to the UPS. The input plug is a NEMA 5-15P.

   *230V model:* The power cord is supplied in the UPS literature kit.

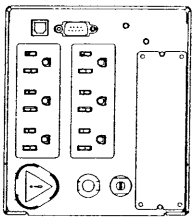
5. *120V model*: Check the *site wiring fault* LED ◎ located on the rear panel. It will be illuminated if the UPS is plugged into an improperly wired utility power outlet (see *Troubleshooting*).
6. Turn on all connected equipment. To use the UPS as a master *on/off* switch, be sure all connected equipment is on.
7. Press the (Test) button on the front panel to power the UPS.

   Note: The battery charges to 90% capacity during the first four hours of normal operation. Do not expect full battery run capability during this initial charge period.

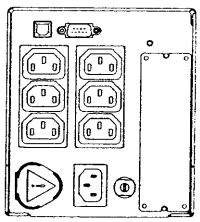
8. For optimal computer system security, install PowerChute Smart-UPS monitoring software.

### *Rear Panels*

***100V/120V***



***230V***



### *Basic Connectors*

***Serial Port*** ***USB Port*** ***TVSS Screw***

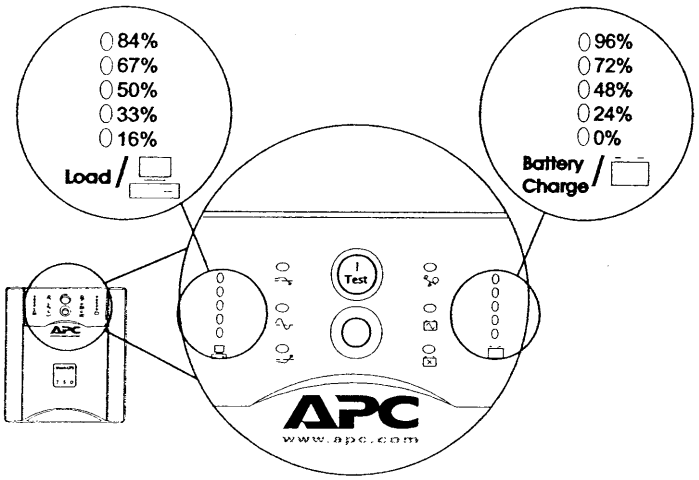
Use only interface kits approved by APC.

Use only the supplied cable to connect to the Serial Port. A standard serial interface cable is incompatible with the UPS. **Serial and USB Ports cannot be used simultaneously.**

The UPS features a transient voltage surge-suppression (TVSS) screw for connecting the ground lead on surge suppression devices such as telephone and network line protectors.
When connecting grounding cable, disconnect the UPS from utility power.

## 2: OPERATION

### *Front Display Panel*




| INDICATOR | DESCRIPTION |
|---|---|
| Online | The UPS is supplying utility power to the connected equipment. |
| AVR Trim | The UPS is compensating for a high utility voltage. |
| AVR Boost | The UPS is compensating for a low utility voltage. |
| On Battery | The UPS is supplying battery power to the connected equipment. |
| Overload | The connected loads are drawing more than the UPS power rating. |
| Replace Battery/ Battery Disconnected | The battery is disconnected or must be replaced. |
| **FEATURE** | **FUNCTION** |
| Power On | Press this button to turn on the UPS. (Read on for additional capabilities.) |
| Power Off | Press this button to turn off the UPS. |

| FEATURE | FUNCTION |
|---|---|
| Self-Test | **Automatic:** The UPS performs a self-test automatically when turned on, and every two weeks thereafter (by default). During the self-test, the UPS briefly operates the connected equipment on battery.<br><br>**Manual:** Press and hold the (Test) button for a few seconds to initiate the self-test. |
| Cold Start | *120V and 230V models only*: Supply battery power to the UPS and connected equipment in the absence of utility voltage (see *Troubleshooting*). Press the (Test) button for one second and release. The UPS will beep briefly and go quiet. Press and hold the button again, but for approximately three seconds. The unit will emit a sustained beep. Release the button during this beep. |
| Diagnostic Utility Voltage<br><br>100V 120V 230V<br>119 133 266<br>109 124 248<br>100 114 229<br>91 105 210<br>81 96 191<br>Battery Charge | The UPS has a diagnostic feature that displays the utility voltage.<br>**The UPS starts a self-test as part of this procedure. The self-test does not affect the voltage display.**<br>Press and hold the (Test) button to view the utility voltage bar graph display. After a few seconds, this five-LED *battery charge* display on the right of the front panel will show the utility input voltage.<br>Refer to the figure at left for the voltage reading (values are not listed on the UPS).<br>The display indicates the voltage is between the displayed value on the list and the next higher value (see *Troubleshooting*). |

## Battery Operation

The UPS switches to battery operation automatically if the utility power fails. While running on battery, an alarm beeps four times every 30 seconds.

Press the (Test) button to silence this alarm. If the utility power does not return, the UPS continues to supply power to the connected equipment until the battery is fully discharged.

If PowerChute is not being used, files must be manually saved and the computer must be turned off before the UPS fully discharges the battery.

Refer to www.apc.com for on battery runtimes.



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## 3: User Configurable Items

| Note: Settings are adjusted through PowerChute software or optional Smart Slot accessory cards. | | | |
|---|---|---|---|
| **Function** | **Factory Default** | **User Selectable Choices** | **Description** |
| Automatic Self-Test | Every 14 days (336 hours) | Every 7 days (168 hours), On Startup Only, No Self-Test | Set the interval at which the UPS will execute a self-test. |
| UPS ID | UPS_IDEN | Up to eight characters (alphanumeric) | Uniquely identify the UPS, (i.e. server name or location) for network management purposes. |
| Date of Last Battery Replacement | Manufacture Date | mm/dd/yy | Reset this date when you replace the battery module. |
| Minimum Capacity Before Return from Shutdown | 0 percent | 0, 15, 30, 45, 50, 60, 75, 90 percent | Specify the percentage to which batteries will be charged following a low-battery shutdown before powering connected equipment. |
| Voltage Sensitivity<br>The UPS detects and reacts to line voltage distortions by transferring to battery operation to protect connected equipment. | High | High sensitivity, Medium sensitivity, Low sensitivity | Note: In situations of poor power quality, the UPS may frequently transfer to battery operation. If the connected equipment can operate normally under such conditions, reduce the sensitivity setting to conserve battery capacity and service life. |
| Alarm Delay Control | Enable | Enable, Mute, Disable | Mute ongoing alarms or disable all alarms permanently. |
| Shutdown Delay | 90 seconds | 0, 90, 180, 270, 360, 450, 540, 630 seconds | Set the interval between the time when the UPS receives a shutdown command and the actual shutdown. |
| Low Battery Warning | 2 minutes<br>PowerChute software provides automatic, unattended shutdown when approximately 2 minutes of battery operated runtime remains. | 2, 5, 8, 11, 14, 17, 20, 23 minutes<br>(Times are approximate.) | The UPS will beep when 2 minutes of battery runtime remains.<br>Change the low battery warning interval setting to the time that the operating system or system software requires to safely shut down. |
| Synchronized Turn-on Delay | 0 seconds | 0, 60, 120, 180, 240, 300, 360, 420 seconds | Specify the time the UPS will wait after the return of utility power before turn-on (to avoid branch circuit overload). |



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| NOTE: SETTINGS ARE ADJUSTED THROUGH POWERCHUTE SOFTWARE OR OPTIONAL SMART SLOT ACCESSORY CARDS. | | | |
|---|---|---|---|
| **FUNCTION** | **FACTORY DEFAULT** | **USER SELECTABLE CHOICES** | **DESCRIPTION** |
| High Transfer Point | *100V model:* 108 Vac<br>*120V model:* 127 Vac<br>*230V model:* 253 Vac | *100V model:* 108, 110, 112, 114 Vac<br>*120V model:* 127, 130, 133, 136 Vac<br>*230V model:* 253, 257, 261, 265 Vac | Set the high transfer point higher to avoid unnecessary battery usage when the utility voltage is usually high and the connected equipment is specified to operate with input voltages this high. |
| Low Transfer Point | *100V model:* 92 Vac<br>*120V model:* 106 Vac<br>*230V model:* 208 Vac | *100V model:* 86, 88, 90, 92 Vac<br>*120V model:* 97, 100, 103, 106 Vac<br>*230V model:* 196, 200, 204, 208 Vac | Set the low transfer point lower when the utility voltage is usually low and the connected equipment is specified to operate with input voltages this low. |
| Output Voltage (*230V model only*) | 230 Vac | 220, 230, 240 Vac | Select the output voltage. |

# 4: Storage, Maintenance, and Shipping

## Storage

Store the UPS covered in a cool, dry location, with the battery fully charged.

At -15 to +30 °C (+5 to +86 °F), charge the UPS battery every six months.
At +30 to +45 °C (+86 to +113 °F), charge the UPS battery every three months.

## Battery Module Maintenance

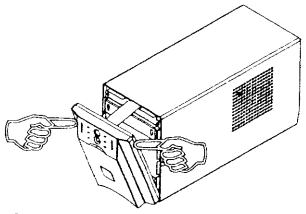
The UPS battery life differs based on usage and environment. Consider replacing the battery every three years.

This UPS has an easy to replace, hot-swappable battery. Replacement is a safe procedure, isolated from electrical hazards. You may leave the UPS and connected equipment on during the replacement procedure. See your dealer or contact APC (see *Contact Information*) for information on replacement batteries.

**Note: Upon battery disconnection, equipment is not protected from power outages.**

### Removing the Front Bezel and Battery Module

❶



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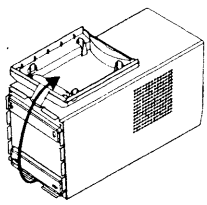

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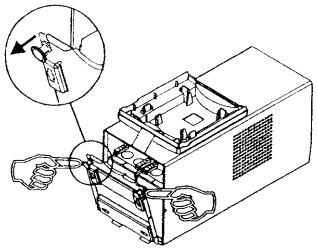

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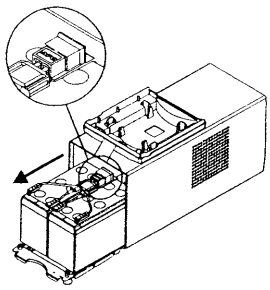

### Replacing the Battery Module

Reverse the instructions for *Removing the Front Bezel and Battery Module*. Note: To close the battery door, ensure the plungers are in the extended position, push the door shut, and push the plungers into the locked position.

Be sure to deliver the spent battery to a recycling facility or ship it to APC in the replacement battery packing material.

## Shipping

1. Shut down and disconnect any equipment attached to the UPS.
2. Shut down the UPS, and disconnect the UPS from the utility power outlet.
3. Unplug the battery connector, located on the rear panel.

For further shipping instructions and to obtain appropriate packing materials, contact APC (see *Contact Information*).



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## 5: TROUBLESHOOTING

Use the chart below to solve minor UPS installation and operation problems. Refer to www.apc.com with complex UPS problems.

| PROBLEM AND/OR POSSIBLE CAUSE | SOLUTION |
|---|---|
| ***UPS WILL NOT TURN ON*** | |
| UPS not connected to utility power supply. | Check that the power cord from the UPS to the utility power supply is securely connected at both ends. |
| Battery not connected properly. | Check that battery connector on the rear panel is fully snapped into position. |
| Very low or no utility voltage. | Check the utility power supply to the UPS by plugging in a table lamp. If the light is very dim, have the utility voltage checked. |
| ***UPS WILL NOT TURN OFF*** | |
| Internal UPS fault. | Do not attempt to use the UPS. Unplug the UPS, unplug the battery connector on the rear panel, and have it serviced immediately. |
| ***UPS BEEPS OCCASIONALLY*** | |
| Normal operating UPS beeps when running on battery. | None. The UPS is protecting the connected equipment from occasional utility power irregularities. |
| ***UPS IS NOT PROVIDING EXPECTED BACKUP TIME*** | |
| The UPS battery is weak due to a recent outage or is near the end of the service life. | Charge the battery. Batteries require recharging after extended outages, and wear faster when frequently put into service or when operated at elevated temperatures. If the battery is near the end of the service life, consider replacing even if the *replace battery* LED is not yet illuminated. |
| ***LEFT HALF, RIGHT HALF, OR CENTER SECTION OF FRONT PANEL LEDS ARE FLASHING*** | |
| Internal UPS fault. The UPS has shut down. | Do not attempt to use the UPS. Turn off the UPS, unplug the battery connector on the rear panel, and have it serviced immediately. |
| ***FRONT PANEL LEDS FLASH SEQUENTIALLY*** | |
| The UPS has been shut down remotely through software or an optional accessory card. | None. The UPS will restart automatically when utility power returns. |
| ***ALL LEDS ARE OFF AND THE UPS IS PLUGGED INTO A WALL OUTLET*** | |
| The UPS is shut down or the battery is discharged from an extended outage. | None. The UPS will return to normal operation when the power is restored and the battery has a sufficient charge. |

| PROBLEM AND/OR POSSIBLE CAUSE | SOLUTION |
|---|---|
| ***THE OVERLOAD LED IS ILLUMINATED AND THE UPS EMITS A SUSTAINED ALARM TONE*** | |
| The UPS is overloaded. The connected equipment is drawing more VA than the UPS can sustain. | The connected equipment exceeds the specified "maximum load."<br>The alarm remains on until the overload is removed. Disconnect nonessential equipment from the UPS to eliminate the overload.<br>The UPS continues to supply power as long as it is online and the circuit breaker does not trip; the UPS will not provide power from batteries in the event of a utility voltage interruption.<br>If a continuous overload occurs while the UPS is on battery, the unit turns off output in order to protect the UPS from possible damage. |
| ***THE REPLACE BATTERY/BATTERY DISCONNECTED LED IS ILLUMINATED*** | |
| This LED flashes and a short beep is emitted every two seconds to indicate the battery is disconnected. | Check that the battery connector on the rear panel is fully engaged. |
| Weak battery. | Allow the battery to recharge for 24 hours. Then, perform a self-test. If the problem persists after recharging, replace the battery. |
| Failure of a battery self-test. | The UPS emits short beeps for one minute and the *replace battery* LED illuminates. The UPS repeats the alarm every five hours. Perform the self-test procedure after the battery has charged for 24 hours to confirm the *replace battery* condition. The alarm stops and the LED clears if the battery passes the self-test. |
| ***THE SITE WIRING FAULT LED ON THE REAR PANEL IS ILLUMINATED (120V MODEL ONLY)*** | |
| The UPS is plugged into an improperly wired utility power outlet. | Wiring faults detected include missing ground, hot-neutral polarity reversal, and overloaded neutral circuit.<br>Contact a qualified electrician to correct the building wiring. |
| ***THE INPUT CIRCUIT BREAKER HAS TRIPPED*** | |
| The UPS is overloaded. The plunger on the circuit breaker has popped out. | Reduce the load on the UPS by unplugging equipment. Press in the plunger on the circuit breaker. |
| ***THE AVR BOOST OR AVR TRIM LEDS ARE ILLUMINATED*** | |
| The system is experiencing excessive periods of low or high voltage. | Seek qualified service personnel to check your facility for electrical problems. If the problem continues, contact the utility company for further assistance. |
| ***UPS OPERATES ON BATTERY ALTHOUGH UTILITY VOLTAGE EXISTS*** | |
| The UPS input circuit breaker has tripped. | To reduce the load on the UPS, unplug equipment and press in the plunger on the circuit breaker. |
| The line voltage is very high, low or distorted. | Move the UPS to a different outlet on a different circuit, as inexpensive fuel powered generators may distort the voltage. Test the input voltage with the utility voltage display (see *Operation*). If acceptable to the connected equipment, reduce the UPS sensitivity (see *User Configurable Items*). |

| PROBLEM AND/OR POSSIBLE CAUSE | SOLUTION |
|---|---|
| ***BATTERY CHARGE AND LOAD LED BARGRAPHS FLASH SIMULTANEOUSLY*** | |
| The UPS has shutdown. The internal temperature of the UPS has exceeded the allowable threshold for safe operation. | Check that the room temperature is within the specified limits for operation.<br>Check that the UPS is properly installed, allowing for adequate ventilation (see *Position the UPS*).<br>Allow the UPS to cool down. Restart the UPS. If the problem continues, contact APC (see *Contact Information*). |
| ***DIAGNOSTIC UTILITY VOLTAGE*** | |
| All five LEDs are illuminated. | The line voltage is extremely high and should be checked by an electrician. |
| There is no LED illumination. | If the UPS is plugged into a properly functioning utility power outlet, the line voltage is extremely low. |
| ***ONLINE LED*** | |
| There is no illumination. | The UPS is running on battery, or it must be turned on. |
| The LED is blinking. | The UPS is running an internal self-test. |

## Service

If the UPS requires service do not return it to the dealer. Follow these steps:

1. Review the problems discussed in *Troubleshooting* to eliminate common problems.
2. If the problem persists, contact APC Customer Service through the APC web site, www.apc.com/support.
   - Note the model number of the UPS, the serial number, and the date purchased. If you call APC Customer Service, a technician will ask you to describe the problem and attempt to solve it over the phone. If this is not possible, the technician will issue a Returned Material Authorization Number (RMA#).
   - If the UPS is under warranty, repairs are free.
3. Pack the UPS in its original packaging. If this is not available, refer to www.apc.com/support for information about obtaining a new set.
   - Pack the UPS properly to avoid damage in transit. Never use Styrofoam beads for packaging. Damage sustained in transit is not covered under warranty.
   - **Always DISCONNECT THE BATTERY before shipping in compliance with U.S. Department of Transportation (DOT) regulations.** The battery module(s) may remain in the UPS; it does not have to be removed.
4. Mark the RMA# on the outside of the package.
5. Return the UPS by insured, prepaid carrier to the address given to you by Customer Service.

### Contact Information

U.S. Customers - Refer to www.apc.com/support.

International Customers - Refer to www.apc.com, select the appropriate country from the country selection field, and select the *Support* tab at the top of the web page.



17.1

# 6: REGULATORY AND WARRANTY INFORMATION

### *100V/120V models*

LISTED 42C2
E95463

LR 63938

警告使用者:
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

Shielded signal cables must be used with this product to ensure compliance with the Class A FCC limits.

### *230V models*

N394

ME 61

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take corrective actions.

2003

**EC Declaration of Conformity**

We, the undersigned, declare under our sole responsibility that the equipment specified below conforms to the following standards and directives:

**Standards to Which Conformity Declared:** IEC/EN 62040-1-1, -2, IEC 60950-1, and EN 60950-1

**Application of Council Directives:** 73/23/EEC, 89/336/EEC, 91/157/EEC, 92/31/EEC

**Type of Equipment:** Uninterruptible Power Supply

**Model Numbers:** SUA750I

**Manufacturer's Name and Address:**

American Power Conversion
132 Fairgrounds Road
West Kingston, Rhode Island, 02892, USA
-or-
American Power Conversion (A. P. C.) b. v.
Ballybritt Business Park
Galway, Ireland
-or-
American Power Conversion
2nd Street
PEZA Cavite Economic Zone
Rosario, Cavite
Philippines
-or-

American Power Conversion
Lot 10, Block 16, Phase 4
PEZA, Rosario, Cavite
Philippines
-or-
American Power Conversion
Lot 3, Block 14, Phase 3
PEZA, Rosario, Cavite
Philippines
-or-
APC (Suzhou) UPS Co., Ltd
339 Suhong Zhong Lu
Suzhou Industrial Park
Suzhou Jiangsu 215021
P R China

**Importer's Name and Address:** American Power Conversion (A. P. C.) b. v.
Ballybritt Business Park
Galway, Ireland

**Place:** N. Billerica, MA U.S.A. Richard J. Everett, Sr. Regulatory Compliance Engineer — 5 Jan 03

**Place:** Galway, Ireland Ray S. Ballard, Managing Director, Europe — 5 Jan 03



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### *Limited Warranty*

American Power Conversion (APC) warrants its products to be free from defects in materials and workmanship for a period of two years from the date of purchase. Its obligation under this warranty is limited to repairing or replacing, at its own sole option, any such defective products. To obtain service under warranty you must obtain a Returned Material Authorization (RMA) number from customer support. Products must be returned with transportation charges prepaid and must be accompanied by a brief description of the problem encountered and proof of date and place of purchase. This warranty does not apply to equipment that has been damaged by accident, negligence, or misapplication or has been altered or modified in any way. This warranty applies only to the original purchaser who must have properly registered the product within 10 days of purchase.

EXCEPT AS PROVIDED HEREIN, AMERICAN POWER CONVERSION MAKES NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Some states do not permit limitation or exclusion of implied warranties; therefore, the aforesaid limitation(s) or exclusion(s) may not apply to the purchaser.

EXCEPT AS PROVIDED ABOVE, IN NO EVENT WILL APC BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF THIS PRODUCT, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. Specifically, APC is not liable for any costs, such as lost profits or revenue, loss of equipment, loss of use of equipment, loss of software, loss of data, costs of substitutes, claims by third parties, or otherwise.

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17.1

# APC Smart-UPS
# Uninterruptible Power Supply
# 120 VAC User's Manual

www.apcc.com

990-7016B, Revision 3

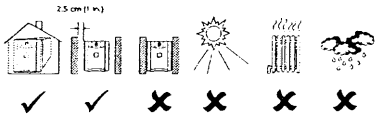
## Initial Start-Up

To obtain warranty coverage, please fill out and return the warranty registration card now.

### Inspection

Inspect the UPS upon receipt. Notify the carrier and dealer if there is damage. The packaging is recyclable; save it for reuse or dispose of it properly.

### Placement




✓ ✓ ✗ ✗ ✗ ✗

Install the UPS in a protected area that is free of excessive dust and has adequate air flow. Do not operate the UPS where the temperature and humidity is outside the specified limits.

**Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the warranty.**

### Installation

**To install this UPS, please follow the installation instructions in the *Smart-UPS Quick Reference Guide*.**
**This UPS is equipped with a SmartSlot for accessories. See the APC Website (www.apcc.com) for available accessories.**

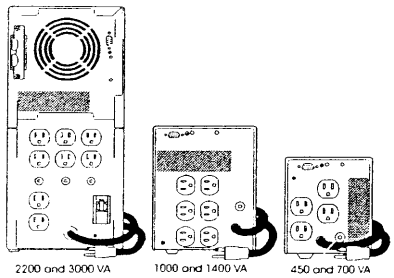
### Check the Site Wiring Fault Indicator

**Caution: If the site wiring fault indicator lights, get a qualified electrician to correct the building wiring.**

### Charge the battery

The UPS charges its battery whenever it is connected to utility power. The battery will charge fully during the first 4 hours of normal operation. Do not expect full runtime during this initial charge period.

### Rear Views




### Connect Computer Interface Port (Optional)

Power management software and interface kits can be used with this UPS. Use only kits supplied or approved by the manufacturer. If used, connect the interface cable to the 9-pin computer interface port on the back panel of the UPS. Secure the connector's screws to complete the connection.

### Connect Ground Leads to TVSS Connector (Optional)

The UPS features a TVSS connector for connecting the ground lead on transient voltage surge-suppression (TVSS) devices such as telephone and network line protectors. The TVSS connector provides grounding through the UPS's power cord ground conductor. To make a connection to the TVSS connector, loosen the screw and connect the surge suppression device's ground lead. Tighten the screw to secure the lead.

### Battery Pack Connector (3000 VA only)

Use the battery pack connector to connect the optional external battery pack.

### Voltage Sensitivity

The UPS detects line voltage distortions such as spikes, notches, dips, and swells, as well as distortions caused by operation with inexpensive fuel-powered generators. By default, the UPS reacts to distortions by transferring to on-battery operation to protect the loads. Where power quality is poor, the UPS may frequently transfer to on-battery operation. If the loads can operate normally under such conditions, battery capacity and service life may be conserved by reducing the sensitivity of the UPS.

To reduce UPS sensitivity, press the configuration button on the rear panel. Use a pointed object such as a pen to press the button. Press it once to set the UPS's sensitivity to **reduced**. Press it again to set the sensitivity to **low**. Press the button a third time to reset **normal** sensitivity.

- normal — When the UPS is set to normal sensitivity, the configuration LED is brightly lit. When it is set to reduced sensitivity, the LED is dimly lit. When it is set to low sensitivity, the LED is off.
- reduced
- low

### Low Battery Warning Interval

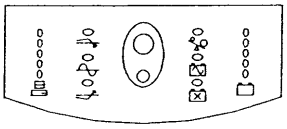
By default, the low battery warning occurs when there are approximately two minutes of on-battery run time remaining. This may not be enough time to gracefully shut down some protected computer systems.

To change the warning interval, press the rear panel configuration button while pressing and holding the front-panel on/test button.

- 2 min. — Press the configuration button once to set the low battery warning interval to approximately five minutes. Press it again to set the interval to approximately seven minutes. Press the button a third time to reset the interval to two minutes.
- 5 min.
- 7 min

## Operating Instructions

### Switch On — Switch Off



With the UPS plugged in, press and release the large upper on/test button to supply power to the loads. The loads are immediately powered while the UPS performs a self-test.

Press and release the small, lower off button to turn off power to the loads. It may be convenient to use the UPS as a master on/off switch for the protected equipment.

**Note: Whenever the UPS is plugged in and utility voltage is present, the charger maintains battery charge.**

The on-line LED illuminates when the UPS is supplying utility power to the loads.

### Self-test

The UPS performs a self-test automatically when turned on, and every two weeks thereafter (by default). Automatic self-test eases maintenance requirements by eliminating the need for periodic manual self-tests.

During the self-test, the UPS briefly operates the loads on-battery. If the UPS passes the self-test, it returns to on-line operation.

If the UPS fails the self-test it immediately returns to on-line operation and lights the replace battery LED.

The loads are not affected by a failed test. Recharge the battery overnight and perform the self-test again. If the replace battery LED is still on, replace the battery using the ***Replacing the Battery*** procedure.

### SmartTrim

The SmartTrim LED comes on to indicate that the UPS is compensating for a high voltage.

### SmartBoost

The SmartBoost LED comes on to indicate that the UPS is compensating for a low voltage.

### On Battery

During on-battery operation, the on-battery LED illuminates and the UPS sounds an audible alarm consisting of four beeps every 30 seconds. The alarm stops when the UPS returns to on-line operation.

### Low Battery

When the UPS is operating on-battery and the energy reserve of the battery runs low, the UPS beeps continuously until the UPS shuts down from battery exhaustion or returns to on-line operation.

### Battery Charge Bar Graph

- 100%
- 80%
- 60%
- 40%
- 20%

The 5-LED display on the right of the front panel shows the present charge of the UPS's battery as a percentage of the battery's capacity. When all five LEDs light, the battery is fully charged. The top LED goes out whenever the battery is not 100% charged. When the LEDs are flashing, the battery can supply less than the "low battery warning interval" time for the load.

### Shutdown Mode

If there is no utility power present, a host system connected to the computer interface port can command the UPS to shut down. This is normally done to preserve battery capacity after a controlled shutdown of the protected system. In shutdown mode the UPS stops supplying power to the load, waiting for the return of utility power.

The UPS scrolls the front panel indicators sequentially in shutdown mode. If the UPS has shutdown due to a low battery, the UPS lights the Battery Charge Bar Graph only. When line power is restored, the UPS returns to on-line operation.

### Replace Battery

If the battery fails a self-test, the UPS emits short beeps for one minute and the replace battery LED illuminates. The UPS repeats the alarm every five hours. Perform the self-test procedure to confirm replace battery conditions. The alarm stops when the battery passes the self-test.

### Load Bar Graph

- 85%
- 67%
- 50%
- 33%
- 17%

The 5-LED display on the left of the front panel shows the power drawn from the UPS by the load. The display indicates the percentage of the UPS's rated capacity. For example, if three LEDs are lit, the load is drawing between 50% and 67% of the UPS's capacity. If all five LEDs light, thoroughly test your complete system to make sure that the UPS will not become overloaded.

### Overload

When loads exceed the UPS's capacity, the overload LED illuminates, the UPS emits a sustained tone, and the input circuit breaker may trip (the resettable center plunger of the circuit breaker pops out). The alarm remains on until the overload is removed. Disconnect nonessential load equipment from the UPS to eliminate the overload. If there is AC power and the circuit breaker does not trip during overload, the loads are still powered. If the circuit breaker trips and the UPS attempts to go on-battery, the output AC will shut down.

### Cold Start

When the UPS is off and there is no utility power, it is possible to cold start the UPS to power the loads from the UPS's battery.

**Note: Cold start is not a normal condition.**

- Press and hold the on/test button until the UPS begins beeping.
- Release the on/test button during the beeping to start the UPS.

### Utility Voltage Bar Graph

This UPS has a diagnostic feature that displays the utility voltage. With the UPS plugged into the normal utility power, press and hold the on/test button to see the utility voltage bar graph display. After approximately four seconds the 5-LED display on the right of the front panel shows the utility input voltage. Refer to the figure below for the voltage reading.

- 132
- 123
- 115
- 107
- 98

The display indicates that the voltage is between the displayed value from the list and the next higher value. For example, with three LEDs lit, the input voltage is between 115 and 123 VAC.

If no LEDs come on and the UPS is plugged into a working AC power outlet, the line voltage is extremely low.

If all five LEDs come on, the line voltage is extremely high and should be checked by an electrician.

**Note: The UPS starts a self-test as part of this procedure. The self-test does not affect the voltage display.**

## Storage

### Storage Conditions

Store the UPS covered and upright in a cool, dry location, with its battery fully charged. Before storing, charge the UPS for at least 4 hours. Disconnect any cables connected to the computer interface port to avoid unnecessarily draining the battery.

### Extended storage

- At -15 to +30 °C (+5 to +86 °F), charge the UPS's battery every 6 months.
- At +30 to +45 °C (+86 to +113 °F), charge the UPS's battery every 3 months.

## Replacing the Battery

This UPS has an easy to replace hot-swappable battery. Battery replacement is a safe procedure, isolated from electrical hazards. You may leave the UPS and loads on for the following procedure. See your dealer or call the number in this manual for information on replacement battery kits.

**Note: Please read the cautions in the *APC Safety Guide*.**
**Once the battery is disconnected, the loads are not protected from power outages.**

### Battery Replacement Procedure - 2200 - 3000 VA Models

1. Grasp the top edge of the bottom front cover and **tilt** it out.

2. **Unhook** the bottom section of the front cover from the chassis and set it aside.
3. Use a flat-blade screwdriver or a coin to **remove** the two battery door screws and open the door.
4. Grip the wires for the front set of batteries and **pull** firmly to disconnect the connector from the battery compartment.
5. Pull the white cord on the front battery connector to remove the batteries.
6. Set aside the foam spacer located between the batteries.
7. Reach into the battery compartment and grasp the white cord on the other battery connector. **Pull** firmly to disconnect the connector and remove the second set of batteries.

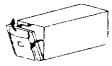
**Note: Be careful removing the batteries - they are heavy.**

8. Slide the first set of new batteries into the unit. Hold the connector down below the top of the batteries and toward the door, otherwise the assembly will not fit. Guide the connector over the top of the batteries and **press firmly** to connect it to the rear connector of the battery compartment.

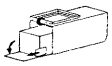
**Note: Small sparks at the battery connectors are normal during connection.**

9. Set the foam spacer against the rear batteries to prevent the wires from being pinched.
10. **Slide** the second set of batteries in, then guide the connector over the batteries and **press firmly** to connect it to the front connector of the battery compartment.
11. **Close** the battery door, **replace** the screws, and replace the lower front cover.
12. Dispose of the old battery properly at an appropriate recycling facility or return it to the supplier in the packing material for the new battery. See the new battery instructions for more information.

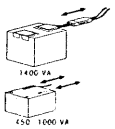
### Battery Replacement Procedure - 450 - 1400 VA Models



1. Grasp the top of the front cover and **tilt** it out and down.



2. **Unhook** the bottom of the cover from the chassis and lift it upward to expose the battery door. Be careful not to strain the ribbon cable. Do not touch the exposed printed circuit board.
3. **Fold** the front cover on top of the UPS as shown.
4. Use a flat-blade screwdriver or a coin to **remove** the two battery door screws and open the door.
   Grasp the tab and gently **pull** the battery out of the UPS.
5. Disconnect the battery leads.
   - For the 450 through 1000 VA models, loosen the connectors by gently wiggling them while pulling straight back from the battery connector.
   - For the 1400 VA model, pull the two gray couplers apart to disconnect the battery.




6. **Connect** the battery leads to the new battery.

**Note: Small sparks at the battery connectors are normal during connection.**

   - For the 450 through 1000 VA models, connect the red wire to the positive (+) terminal and the black wire to the negative (–) terminal.
   - For the 1400 VA model, connect the gray battery coupler to the UPS's coupler.
7. **Slide** the battery into the UPS.
8. **Close** the battery door, **replace** the battery compartment screws, and replace the front cover.
9. Dispose of the old battery properly at an appropriate recycling facility or return it to the supplier in the packing material for the new battery. See the new battery instructions for more information.

## User Configuration Items

**Note: Setting these items requires optional software or hardware.**

| Function | Factory Default | User Selectable Choices | Description |
|---|---|---|---|
| Automatic Self-Test | Every 14 days (336 hours) | Every 7 days (168 hours), On Startup Only, No Self-Test | Sets the interval at which the UPS will execute a self-test. |
| UPS ID | UPS_IDEN | Up to eight characters to define the UPS. | Use this field to uniquely identify the UPS for network management purposes. |
| Date of Last Battery Replacement | Manufacture Date | Date of Battery Replacement | Reset this date on battery replacement. |
| Minimum Capacity Before Return from Shutdown | 0 percent | 15, 50, 90 percent | The UPS will charge its batteries to the specified percentage before return from a shutdown. |
| Sensitivity | Normal | Reduced, Low | Set lower than normal sensitivity to avoid lowered battery capacity and service life in situations where the load can tolerate minor power disturbances. |
| Duration of Low Battery Warning | 2 minutes | 5, 7, 10 minutes | Sets the time before shutdown at which the UPS issues a low battery warning. Set higher than the default only if the OS needs the time for graceful shutdown. |
| Alarm Delay After Line Fail | 5 second delay | 30 second delay, At Low Battery Condition, No Alarm | To avoid alarms for minor power glitches, set the alarm delay. |
| Shutdown Delay | 20 seconds | 180, 300, 600 seconds | Sets the interval between when the UPS receives a shutdown command and when shutdown occurs. |
| Synchronized Turn-on Delay | 0 seconds | 60, 180, 300 seconds | To avoid branch circuit overload, the UPS will wait the specified time after the return of utility power before turn-on. |
| High Transfer Point | 132 VAC | 135, 138, 129 VAC | To avoid unnecessary battery usage, set the High Transfer Point higher if the utility voltage is chronically high and the load is known to work well under this condition. |
| Low Transfer Point | 103 VAC | 100, 97, 106 VAC | Set the Low Transfer Point lower if the utility voltage is chronically low and the load can tolerate this condition. |

**For Computer Interface Port Specifications, see the APC Website (www.apcc.com).**

## Service

**If the UPS requires service do not return it to the dealer!**

Follow these steps:

1. Use the ***Troubleshooting*** section of the ***Quick Reference Guide*** to eliminate common problems.
2. Verify that no circuit breakers are tripped. A tripped circuit breaker is the most common UPS problem!
3. If the problem persists, call customer service or visit the APC Internet Website (www.apcc.com).
   - Note the model number of the UPS, the serial number, and the date purchased. A technician will ask you to describe the problem and try to solve it over the phone, if possible. If this is not possible the technician will issue a Return Merchandise Authorization Number (RMA#).
   - If the UPS is under warranty, repairs are free. If not, there is a repair charge
4. Pack the UPS in its original packaging. If the original packing is not available, ask customer service about obtaining a new set.
   - Pack the UPS properly to avoid damage in transit. Never use Styrofoam beads for packaging. Damage sustained in transit is not covered under warranty.
   - Include a letter with your name, RMA#, address, copy of the sales receipt, description of the trouble, your daytime phone number, and a check (if necessary).
5. Mark the RMA# on the outside of the package.
6. Return the UPS by insured, prepaid carrier to the address given to you by Customer Service.

| North & Latin America | Europe |
|---|---|
| APC<br>132 Fairgrounds Road<br>West Kingston, Rhode Island 02892 USA<br>1-800-800-4APC/1-401-789-5735 | APC<br>Ballybritt Business Park<br>Galway, Ireland 10800-702000<br>353-91-702020 |
| **Internet**<br>http://www.apcc.com | **E-Mail**<br>apctech@apcc.com |

## Specifications

| | 450 VA | 700 VA | 1000 VA | 1400 VA | 2200 VA | 3000 VA |
|---|---|---|---|---|---|---|
| Acceptable input voltage | 0 - 160 VAC | | | | | |
| Output voltage | 103-132 VAC (by default) | | | | | |
| Input Protection | Resettable circuit breaker | | | | | |
| Frequency limits (on-line operation) | 50 or 60 Hz, ±5% | | | | | |
| Transfer time | 2 ms typical, 4 ms maximum | | | | | |
| Maximum load | 450 VA<br>280 W | 700 VA<br>450 W | 1000 VA<br>670 W | 1400 VA<br>950 W | 2200 VA<br>1600 W | 3000 VA<br>2250 W |
| On-battery output voltage | 115 VAC | | | | | |
| On-battery frequency | 50 or 60 Hz, ±0.1 Hz; unless synchronized to utility during brownout. | | | | | |
| On-battery waveshape | Low-distortion sine wave | | | | | |
| Protection | Overcurrent and short-circuit protected, latching shutdown on overload. | | | | | |
| Noise Filter | Normal and common mode EMI/RFI suppression, 100 kHz to 10 MHz | | | | | |
| Battery type | Spill proof, maintenance free, sealed lead-acid | | | | | |
| Typical battery life | 3 to 6 years, depending on number of discharge cycles and ambient temperature | | | | | |
| Typical recharge time | 2 to 5 hours from total discharge | | | | | |
| Operating temperature | 0 to +40 °C (+32 to +104 °F) | | | | | |
| Storage temperature | -15 to +45 °C (+5 to +113 °F) | | | | | |
| Operatng and storage relative humidity | 0 to 95%, non-condensing | | | | | |
| Operating elevation | 0 to +3,000 m (0 to +10,000 ft) | | | | | |
| Storage elevation | 0 to +15,000 m (0 to +50,000 ft) | | | | | |
| Electromagnetic immunity | IEC 801-2, 801-3, 801-4 | | | | | |
| Audible noise in dBA at 1 m (3 ft) | <41 | <42 | <45 | | <53 | |
| Size (H x W x D) | 15.8 x 13.7 x 35.8 cm (6.2 x 5.4 x 14.1 in.) | | 21.6 x 17 x 43.9 cm (8.5 x 6.7 x 17.3 in.) | | 43.2 x 19.6 x 54.6 cm (17.0 x 7.7 x 21.5 in.) | |
| Weight - net (shipping) | 10.5 (11.8) kg<br>23.2 (26) lb. | 13.1 (14.5) kg<br>29 (32) lb. | 18.8 (20.8) kg<br>41.5 (46) lb. | 24.1 (26.1) kg<br>53 (58) lb. | 51 (60.8) kg<br>112 (134) lb. | 55.8 (64.4) kg<br>123 (142) lb. |
| Safety approvals | Listed to UL 1778, certified to CSA 107.1 | | | | | |
| EMC verification | FCC/DOC Class B certified | | | | FCC/DOC Class A verified | |

# ProTalk® Plus

## Alarm Reporting Unit
## Operating Manual

BARNETT ENGINEERING LTD.
www.barnett-engg.com

# ProTalk® Plus

## Alarm Reporting Unit
## Operating Manual

BARNETT ENGINEERING LTD.
www.barnett-engg.com

# ProTalk® Plus

## Alarm Reporting Unit

## Operating Manual

## Model B1290

215, 7710 5th St. S.E.
Calgary, Alberta, Canada
T2H 2L9
Phone: (403) 255 9544
Fax: (403) 259 2343
Web: www.barnett-engg.com
e-mail: sales@barnett-engg.com
October, 2004
Rev. 1.07

BARNETT ENGINEERING LTD.

# ACTA/IC Customer Instructions

The ProTalk Model B1290 ARU meets and exceeds the necessary requirements for operation and connection to a PSTN telephone line in Canada and the United States. It currently holds the following approvals:

1. FCC part 15, subsection J/A
2. Industry Canada CS-03 Part I Issue 8
3. TIA/EIA-968
4. CSA C22.2 No 60950-00 / UL 60950, 3rd Edition

### FCC Regulations

1. This equipment complies with Part 68 of the FCC rules and the requirements adopted by ACTA. On the side of this equipment is a label that contains, among other information, a product identifier in the format US:AAAEQ##TXXXX. If requested, this information must be provided to the telephone company.

2. A plug and jack used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by ACTA. A compliant telephone cord and modular plug is provided with this product. It is designed to be connected to a compatible modular jack that is also compliant.

3. The ringer equivalence number (REN) is used to determine the number of devices that may be connected to a telephone line. The total number of all RENs on any one line should not exceed 5.0 in most cases. Excessive RENs on the telephone line may result in the devices not ringing in response to an incoming call. To be certain of the number of devices that may be connected to a line, as determined by the total RENs, contact the telephone company to determine the maximum REN for the calling area. The REN for this product is shown separately on the label and is also part of the product identifier that has the format US:AAAEQ##TXXXX. The digits represented by ## are the REN without a decimal point (e.g. 00 is a REN of 0.0).

4. If the ProTalk Plus model B1290 causes harm to the telephone network, the telephone company will notify you in advance that a temporary discontinuance of service may be required. But if advance notice is not practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.



5. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make the necessary modifications in order to maintain uninterrupted service.

6. If trouble is experienced with the B1290, please contact Barnett Engineering Ltd., 215 7710 5th Street SE, Calgary, Alberta, Canada T2H 2L9 for repair and/or warranty information. If the trouble is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.

7. Repair work must be performed by Barnett Engineering Ltd.

8. This device must not be installed on coin-operated or multi-party telephone lines.

### Class B Computing Device

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/ TV technician for help.

### FCC Part 68 Continuing Compliance

The testing which will be performed on this equipment as part of the Part 68 compliance program will essentially follow the same format as the contained in the test data portion of this application. Testing and evaluation will be performed at least annually on a minimum of one production unit. Testing will be performed in-house or by a laboratory that has the proper facilities for verifying compliance to the requirements of Part 68. Should

such testing indicate the need for changes to the equipment under test, said changes will be demonstrated to comply with Part 68 by testing and evaluation and proper notification will be given to the FCC in the form of a modification filing.

Upon request from the FCC, copies of the reports showing Part 68 compliance for a recent production lot, or one or more units for Part 68 compliance verification inspection, will be supplied.

### Industry Canada Regulations

*NOTICE*: This equipment meets the applicable Industry Canada Terminal Equipment Technical Specifications. This is confirmed by the registration number. The abbreviation, IC, before the registration number signifies that registration was performed based on a Declaration of Conformity indicating that Industry Canada technical specifications were met. It does not imply that Industry Canada approved the equipment.

*NOTICE*: The Ringer Equivalence Number (REN) for this terminal equipment is 0. The REN assigned to each terminal equipment provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed five.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas. *Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.*



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# Introduction

## Description

### Basic Operation

The ProTalk Plus model B1290 is a device used to monitor alarms at an unattended site. If an alarm occurs, such as building intrusion, power failure, high or low temperature or equipment failure, the B1290 automatically dials out on the telephone line. When the telephone is answered, the B1290 announces in a clear voice the name of the site and the alarm condition that has occurred. If there is no answer, the B1290 will continue to dial through a list of telephone numbers until it reaches someone and is able to report its alarm.

This manual describes the basic operation of the ProTalk Plus model B1290, and its most common applications. The B1290 can, however, be programmed to perform many more functions at the discretion of the user. It can announce alarms over radio, telephone, a public address system or a combination of these. It can also be programmed to send coded tones along with the voice messages to activate such devices as radio pagers, relays or annunciator panels. It can be used as a master station to concentrate alarms from a number of remote sites. It can be commanded to perform remote control functions by receiving codes from a tone telephone. Expanders can be added to increase the capacity of the unit from the basic eight alarm inputs and four relay outputs up to 64 inputs and 32 outputs.

The B1290 can be completely customized for your application because all of the operating parameters are programmed by the user, including the voice messages. Like its predecessor, the ProTalk B1270, the B1290 can also be programmed using a standard tone telephone. A stored voice in the B1290 prompts you step-by-step when you are entering new voice messages or codes, and speaks back all the values that you have saved.

With the added feature of PC software, it is also possible to program the B1290 from a computer. Using the PC software all of the information in the B1290 can be read, written and stored to disk.

The programming sections of this manual describe how the B1290 is configured with a phone set. Instructions for programming with the software application are found in the Help section of the program.

# How to Use this Manual

This manual is organized in such a way that if you want the B1290 to function with its default settings as a simple telephone dialer, you need only read the first two chapters of the manual covering the physical installation, basic programming and operation. If you wish to change some of the default settings or have the B1290 perform more advanced functions, continue on to the next chapter where the Program Codes are described in detail. Several step-by-step examples of programming the B1290 into different configurations are given. The final chapter describes some of the problems most commonly experienced when the B1290 is first installed, and gives advice on troubleshooting.



# Getting Started

## Description

The B1290 is housed in metal case with plug-in terminal blocks and jacks for field wiring. Table 1 and Figure 1 show the connection points to the B1290. Figure 3 shows how wiring connections are made to the unit.

**Table 1: ProTalk Wiring Connections**

**RADIO**

| | |
|---|---|
| 1 | Radio TX |
| 2 | Radio RX |
| 3 | PTT Output. |
| 4 | COS Input |
| 5 | Ground |
| 6 | ACK Input |
| 7 | Ground |
| 8 | +11.5 to +28 power |

**RELAYS**

| | |
|---|---|
| 1 | Relay 1 NC |
| 2 | Relay 1 Common |
| 3 | Relay 1 NO |
| 4 | Relay 2 NC |
| 5 | Relay 2 Common |
| 6 | Relay 2 NO |
| 7 | Relay 3 NC |
| 8 | Relay 3 Common |
| 9 | Relay 3 NO |
| 10 | Relay 4 NC |
| 11 | Relay 4 Common |
| 12 | Relay 4 NO |

**SERIAL**

| | |
|---|---|
| 2 | RXD |
| 3 | TXD |
| 4 | DTR |
| 5 | GND |
| 6 | DSR |

**ALARMS**

| | |
|---|---|
| 1 | Alarm 1 Input |
| 2 | Alarm 2 Input |
| 3 | Alarm 3 Input |
| 4 | Alarm 4 Input |
| 5 | Alarm 5 Input |
| 6 | Alarm 6 Input |
| 7 | Alarm 7 Input |
| 8 | Alarm 8 Input |
| 9 | Ground |
| 10 | Ground |

**POWER**
2.5mm power, center ground

**PHONE**
RJ11 Line 1

**PGM**
RJ11 Line 1

**EXP**
2.5mm mono, center data

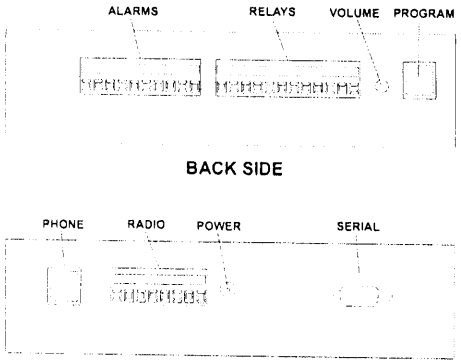



**Figure 1 Connector Locations**

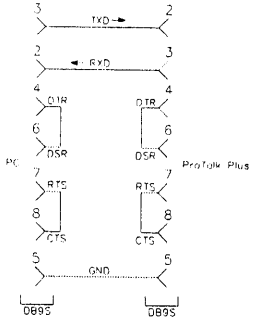



**Figure 2 Programming Cable Wiring**



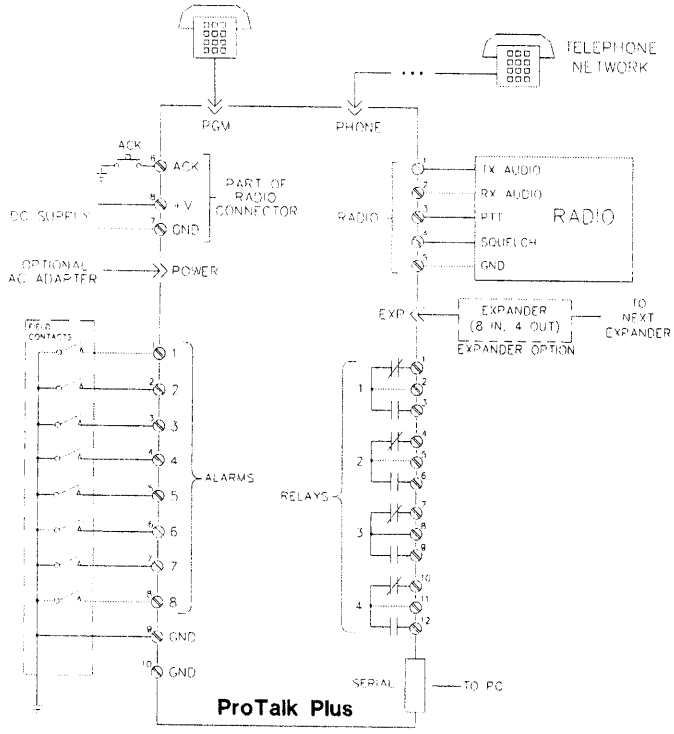



**Figure 3 ProTalk Plus Wiring Diagram**

## Power Requirements

The B1290 will operate from a supply of +11.5 VDC to +28 VDC. The typical current requirement is 100 mA plus 10 mA per relay. Each expander uses an additional 60 mA plus 25 mA per relay.

Connect power only to one of the two available inputs: the DC inputs on the Radio terminal block or the plug used with an AC adapter.

## Installation

*The B1290 should be installed in a clean, dry place suitable for electronic equipment. The unit will operate from -40°C to +60°C.*

*Caution: Power and the telephone line should not be connected until the rest of the installation is complete.*

Use a flat blade screwdriver to make connections to the screw terminals on the sides of the enclosure.

### Alarms

In its default condition, the B1290 looks for a normally open (NO) contact which closes to ground to indicate an alarm. The B1290 may also be programmed to accept inputs normally closed (NC) to ground which open on an alarm condition. To change this parameter, refer to the alarm format in I/O Configuration - Program Code 5. When using NC contacts, ensure that all unused alarm points are either disabled or connected to ground. Refer to Figure 4 for details on how to connect an alarm signal line.

All of the alarm inputs are optically isolated and are operated from the B1290's internal 12 volt supply.

Connect the alarm inputs to the positions labeled 1 through 8 on the ALARM terminal block.

*Caution: DO NOT connect a voltage source to the alarm inputs.*

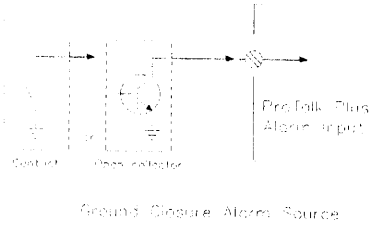


**Figure 4 Alarm Input Connection**



### Relays

Four form C relay outputs are available, rated for 1.0 A at 30 VDC, or 0.3 A at 120 VAC. Connect external devices to the contacts on the RELAY connector. When connecting to larger loads, connect an interposing relay between the B1290 and the load.

### Radio

If the alarms are to be announced over radio, connect TX to the transmit audio of the radio, and RX to the receive audio. *RX should always be connected to squelched audio.* Independent transmit level adjustments are available for voice, DTMF and tone signals. Adjust the levels of the transmit audio signals using the programming phone or the software setup. For the receive level adjustment, set the programmed level to match the level of the incoming signal: for a -10 dBm received signal from the radio the programmed value would be -10 dBm. The range of adjustment for both receive and transmit signals is -20 dBm to 0 dBm.

The PTT output provides a ground closure through an open collector to signal the radio to transmit. Connect this point to the radio's push-to-talk circuit. The maximum rating is 150 mA, 25V.

The COS input is used to indicate to the B1290 whether the radio channel is busy. Connect this point to the output of the radio's carrier-operated switch or relay (COS or COR). In its default condition, the B1290 looks for a high signal to indicate the channel is clear and a low signal when the channel is busy. The B1290 may also be programmed to recognize the reverse polarity. To change this parameter, refer to the squelch polarity in System Settings - Program Code 6. This input is internally pulled up to work with open collector radio outputs. In its default program condition, the input is pulled high when clear and driven low when busy.

### Local Acknowledge

This input is used to acknowledge an alarm locally at the B1290 without having to call in over the radio or telephone. Connect the ACK input to a normally open contact which will be grounded to acknowledge the alarm.

### Telephone

The telephone line is connected to the RJ11 jack labeled PHONE on the side of the B1290. The line should be using the inner (red/green) pair. Audio levels to the telephone line are fixed internally in conformance with FCC regulations.

The telephone should always be the last item connected.

*Caution: DO NOT plug the telephone line into the PGM jack, as damage could result to the B1290.*

### Expanders

Expanders are used to increase alarm and relay capacity of the B1290. They come in their own metal cases with all connectors clearly labeled. Expanders must be located in close proximity to the master B1290 unit for them to communicate properly. The shielded cables provided to connect between units are cut to accommodate the maximum allowable distance. Substituting cables is not recommended.

Make the alarm and relay connections to the expander in the same way as for the B1290. Use the shielded cable provided to connect between the EXP connector on the B1290 and SERIAL IN on the expander. On subsequent expanders, use the cable supplied with the expander to connect between SERIAL OUT on one board and SERIAL IN on the next.

Next set the DIPswitches on the expander to configure its ID number.

| Expander Number | Position 1 | Position 2 | Position 3 |
|---|---|---|---|
| 1 | OFF | ON | ON |
| 2 | ON | OFF | ON |
| 3 | OFF | OFF | ON |
| 4 | ON | ON | OFF |
| 5 | OFF | ON | OFF |
| 6 | ON | OFF | OFF |
| 7 | OFF | OFF | OFF |

DIPswitch positions 4 through 7 must remain on.

Position 8 is used to control the LEDs. It is normally ON, but if you wish to conserve power by disabling the LEDs, set this switch to the OFF position.

If the expander address is changed, the unit must have power removed and then reapplied in order for the master to recognize its new address. All the expander's programmed parameters, aside from the voice messages, are stored in the main ProTalk Plus and are downloaded on power-up.

The expander database will be automatically transferred from the ProTalk Plus if an expander address is changed or an expander is replaced.

The expander requires its own +12 VDC and GND connections. Be sure that all units, master and expander(s), are always powered up and down together. Do not connect or disconnect expander cables when the system is powered up.



The POWER LED lights when the power is on. The expander also has an RX LED which lights when it is being polled by the master B1290, and a RESPONSE LED which indicates when it is responding.

### Power-up Sequence

Once the installation is complete, DC power can be connected to the B1290. On start-up, the B1290 will go through the following self-test sequence:

1. LED Test
   - VOICE, TONE and, HOOK LEDs On.
   - PTT LED Off
   - RUN LED Flashing
2. Hardware Test
   - ALARM LEDs 1-8 On
   - Memory test
   - One second dwell time for this test
3. Vocabulary Voice Test
   - ALARM LEDs 1-7 On
4. User Voice Message Test
   - ALARM LEDs 1-6 On
5. Database Setup
   - ALARM LEDs 1-5 On
6. End of Test
   - ALARM LEDs 1-8 Off
   - One second dwell time
   - Software version spoken over the speaker
7. Normal Operation
   - RUN LED Steady

The telephone line may then be plugged in as the last connection. *Ensure that the telephone is connected into the PHONE port on the B1290.*

## Start-up Programming

### Introduction

Now you are ready to begin programming. When the B1290 is initially powered up, it will prompt you to input three parameters which must be entered before it can operate — the voice messages, a list of telephone numbers and the Acknowledge Code. Once these values have been entered, with its default settings, the unit will function as a straight telephone dialer when an alarm is present. If you require the B1290 to perform more advanced functions, continue on to the chapter where the Program Codes are explained in detail.

Before you start programming, there are a few points with which you must be familiar. First, although it is possible to program the B1290 remotely by calling it up over the telephone line, it is assumed that when you initially install the unit you will be using a local programming phone. The B1290 must be programmed with a phone which sends DTMF tones (Touch Tone); it will not recognize the signals from a phone which sends dial pulses.

The B1290 is designed to be user friendly. When you listen in the earpiece of the programming phone, you will hear spoken messages. These are called voice "prompts", and they tell you what information the B1290 is expecting you to enter. Whenever you program a new value, the B1290 will immediately speak that parameter back to you, so you will know right away whether the code was entered correctly. You can change a parameter as many times as you like before going on to the next one. If you make a mistake, such as entering a value outside the range for that parameter, the B1290 will immediately let you know by announcing *Error*. And if you get confused, just hang up the phone and start again. The B1290 will start again at the beginning when you pick up the handset.

The other feature you need to know is how to enter data. If you were entering information from a keyboard or other terminal, you would use the "Enter" key or a "Carriage Return". A telephone does not have this key, so we substitute the code ✱✱ for "Enter". The two "stars" (asterisks) must be entered one after the other, with no more than one second between the beginning of the first digit and the beginning of the second. This is a much longer time than most people think, and there is no need to rush when entering the code. If you enter the digits too fast, the telephone will only recognize one ✱. You may get an *Error* message if this happens or else the B1290 will ignore the entry and wait for another ✱✱. The ✱✱ code is used throughout the programming sequence to enter information or proceed to the next step. With practice you will soon determine the correct speed.

Where the # digit is used in a DTMF code or a telephone number it must be entered as two # digits. For example, the DTMF code #2# would be entered as ##2##.



The B1290 will not work the way you want it to until all three of the required parameters have been entered correctly, so if you hang up in the middle of this procedure, the B1290 will take you back to the beginning of the sequence the next time you come off hook.

Throughout the programming sequence, the unit will speak stored parameters using a prompt, followed by the word "is", then the stored data. For example, to tell you the Acknowledge Code is set to 1234, the B1290 says *Acknowledge Code is 1234.* Input from the telephone's keypad is expected following this message. Whenever voice messages are required, the unit will beep twice, prompting the user to speak into the telephone handset.

### Site ID and Voice Alarm Messages

Plug any standard tone telephone into the jack labeled "PGM".

Lift the handset to your ear. You will hear the B1290 speak the words *Program voice; site is* followed by silence since there is no voice message programmed.

B1290: Program voice.

Site is...

The B1290 is prompting you to enter the name of the site. The name you program will be announced at the start of every message along with the list of alarms.

To record the voice message, enter the record code (2).

*YOU:* 2✱✱

After you hit the second star, the B1290 will prompt you with a beep-beep tone.

B1290: beep-beep

As soon as you hear the tone, you can begin to record your message. The VOICE LED on the front panel will light while the B1290 is recording. Speak the name of the site, e.g. Ajax Compressor Station. The B1290 detects when you stop speaking and automatically plays back the message. Pauses between words may cause the recording to terminate. The VOICE LED will light while it is playing back.

*YOU: Ajax Compressor Station*

B1290: Site is Ajax Compressor Station.

Did the message played back sound acceptable? If you think it could be improved, enter the record code (2) followed by ✱✱ again and repeat the message as many times as you like. Once you are satisfied with the way the message sounds, hit the enter code (✱✱).

*YOU:* ✱✱

The B1290 will prompt you for the next entry.

B1290: Alarm One is...

Repeat the above steps to record the alarm message, e.g. power failure.

*YOU:* 2 * *

B1290: beep-beep

*YOU:* *Power Failure*

B1290: Alarm One is Power Failure.

Repeat the above steps until you are satisfied with the way the message sounds. Then continue.

*YOU:* * *

B1290: Alarm Two is...

Enter the voice message associated with the second alarm point, e.g. intrusion alarm.

*YOU:* 2 * *

B1290: beep-beep

*YOU:* *Intrusion Alarm*

B1290: Alarm Two is Intrusion Alarm.

*YOU:* * * *Next*

B1290: Alarm Three is...

Repeat the above steps until all the alarm points have been programmed. When you have entered all the voices, enter Quit (# ✱✱) at the announcement of the next empty alarm. If you use all eight alarms, the B1290 will automatically advance after you enter the last voice message. The next step in the startup process is to program the telephone numbers.

*YOU:* # * *

**Telephone Numbers**

B1290: Program Directory

B1290: Directory A, Line One is Radio Alert Voice. (default)

The B1290 has just spoken the actions that will occur from the commands on the first line in Directory A. The default radio announcement will now be replaced with a phone call-out command. Enter 2 to indicate you want to program the line with new commands.

*YOU:* 2 * * *Change line*



B1290: beep

Details on how directory commands are entered are shown in Program Code 2 Directories. The startup process described here provides only the basic auto-dialer configuration.

Enter the phone number using the pushbuttons on your telephone. The entry shown below will result in the B1290 dialing the selected number and then speaking the alarm messages. The #0 at the beginning is the DIAL command, followed by a #8 command for VOICE.

*YOU:* # 0 2 5 5 9 5 4 4 # 8 * *

B1290: Directory A, Line One is DIAL 2559544 VOICE.

If there is an error in the entry, hit the program code 2 followed by ✱✱ and try again. If the sequence is played back correctly, hit the enter code.

*YOU:* * * *Next*

B1290: Directory A, Line Two is empty

The B1290 is prompting you for the second directory line. The commands entered for line 2 are what will occur if there is no acknowledgement after the first line commands are completed during operation.

*YOU:* 2 * * *Change line*

B1290: beep

*YOU:* # 0 2 5 5 2 3 4 3 # 8 * *

B1290: Directory A, Line Two is DIAL 2552343 VOICE.

*YOU:* * *

B1290: Directory A, Line Three is empty.

The B1290 is prompting you for a third telephone number to dial if it cannot get an answer at the first two. Continue entering telephone numbers up to a maximum of twenty. If you are not using twenty numbers, enter the Quit code (#) at the prompt. If you hit the Enter code (✱✱) for an empty telephone number, the B1290 assumes that you have no more telephone numbers to enter and will jump to the next function.

*YOU:* * *

*or*

*YOU:* # * *

**Acknowledge Code**

B1290: Program Acknowledge Code.

B1290: Acknowledge Code is 1234.

The B1290 is prompting you to enter an acknowledge code. This is the code you send to the B1290 when it calls you up to announce an alarm, to acknowledge that you have received the message. Otherwise the unit will keep on dialing. 1234 is the default code. You may use this code or enter a different one from 1 to 8 digits in length. It should be something easy to remember.

*YOU:* 2 4 6 8 * #

B1290: Acknowledge Code is 2468.

*YOU:* * #

B1290: Enter Program Code.

The B1290 is prompting you to enter a Program Code if you need to program more advanced functions into the unit. If you require them, proceed to the chapter where Program Codes are explained in detail. Otherwise, hang up the programming phone.

At this point the B1290 will function as an alarm reporting unit over the telephone, dialing through the numbers you have programmed into Directory A until it is answered, then announcing the voice messages you have recorded to report an alarm.

Unless something happens to corrupt the memory of the B1290, these parameters will be stored indefinitely and you will not be prompted to enter them again.

The next time you lift the programming phone off hook, the B1290 will announce its status and prompt you to *Enter Control Code.* DO NOT enter any codes from the telephone. WAIT five seconds; the B1290 will time out and automatically enter the programming mode. When you hear the prompt *Program Access; Enter Program Code,* you may begin programming.

***Do not remove power from the B1290 while you are programming. Always put the telephone handset back on-hook before removing power.***



## Front Panel

The front panel of the B1290 is shown in Figure 5. The description of the front panel indicators will assist you in verifying the correct operation of the unit.

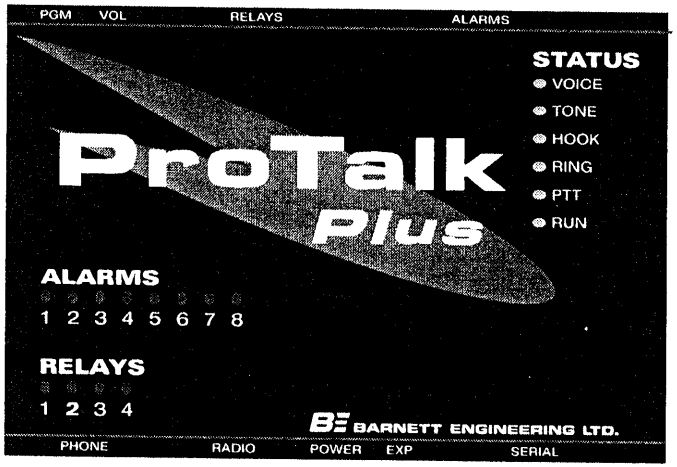



**Figure 5 ProTalk Plus Front Panel**

### Alarm LEDs

The Alarm LEDs light when the associated alarm input is in the alarm state. Unacknowledged alarms will be flashing and any that have been acknowledged will be on solid.

### Relay LEDs

The Relay LEDs light whenever the associated relay is on.

### Voice

The Voice LED is on whenever the B1290 is recording or playing user messages. It flashes when vocabulary messages are being played or when there is an error in the user voices.

### Tone

The Tone LED is on for the duration of a transmitted DTMF digit or other generated tone. It will also be on when call progress tones are detected on the phone line. It will flash once for each received DTMF digit.

### Hook

The Hook LED comes on whenever the B1290 goes off hook, to dial or answer the telephone. It will flash if a phone port error is detected (no dial tone or other expected call progress signal). The hook LED will also flash during pulse dialing.

### Run

The Run LED will be on steady when the B1290 is operating correctly. This LED will flash if an error condition is present.

### Ring

When ringing is detected on the telephone line, the Ring LED illuminates. Since answering the telephone is a low priority task to the B1290, it may ignore the ringing if it is processing other tasks (e.g. speaking on the radio).

### PTT

The PTT LED will light when the B1290 generates a push-to-talk signal to the radio.



# Operation

This chapter gives a detailed description of exactly how the B1290 will operate after the start-up programming has been completed. Parameters which may be altered are pointed out, with reference to the appropriate Program Code section.

## Alarm Sequence

When the B1290 receives an alarm on one of its inputs, it goes off hook and listens for dial tone. If dial tone is not present, the B1290 will hang up and try again. After three unsuccessful attempts to detect dial tone, the B1290 will conclude there is a problem with the line and stop dialing. When this occurs the unit will report *Telephone Access Error* over the radio, set the error relay and flash the RUN and HOOK LEDs.

If dial tone is detected, the B1290 dials the first telephone number stored in Directory A using tone dialing. When the telephone line is answered, the B1290 will announce its Site ID, the list of any alarms present, and prompt the user to *Enter Acknowledge Code.* It will repeat this message a minimum of three times, pausing five seconds after each announcement to wait for an acknowledgment. When the Acknowledge Code is detected, the B1290 will announce *Alarms Acknowledged* and then prompt "Enter Control Code".

If the line is busy, if there is no answer, or if the B1290 does not receive the Acknowledge Code after announcing the alarm, it will hang up the telephone line, then go off hook again and dial the next number in the directory. If the B1290 dials all the way through the directory without being acknowledged, it will wait two minutes (Interval Timer A), then start dialing again from the top of the directory. After three tries (Times A) at two minute intervals, the B1290 will retry the list every ten minutes (Interval Timer B) thereafter, not stopping until it is acknowledged.

All of the timers and intervals mentioned above are adjustable. In addition, the B1290 may be programmed to announce the alarm a number of times over radio, or a public address system, as well as dialing on the telephone.

## Acknowledging an Alarm

When the B1290 calls you on the telephone, it may take up to five seconds before it starts speaking. After it announces the alarms, it prompts you to *Enter Acknowledge Code.* You have five seconds to begin entering the digits.

If the B1290 has been programmed to operate its relays (Program Code 3, DTMF Codes), you may send a relay code over the telephone before acknowledging the alarms. The B1290 will actuate the relay, speak the associated voice message, then prompt you again to *Enter Acknowledge Code.* After the B1290 has detected the Acknowledge Code, it will speak the

phrase *Alarms Acknowledged* and return to the "Enter Program Code" level. If no activity occurs for 5 seconds it will hang up.

Appending the # digit at the end of the Acknowledge code allows you to acknowledge the alarm for sixty minutes only. After one hour, the B1290 will check the alarm inputs again, and if the same alarm is still present, it will begin the reporting cycle just as if it was a new alarm.

Any series of digits entered immediately after the acknowledge code will be echoed back to the user. This feature is sometimes used in systems applications.

To acknowledge the B1290 locally, activate the local acknowledge switch connected to the unit (see the section on "Installation - Local Acknowledge"). The alarms may be acknowledged at any time. The *Alarms Acknowledged* announcement will occur whenever the B1290 is available to speak.

## Telephoning the B1290

When you call the B1290 on the telephone, it will answer after four rings (Rings before Answer) and announce its site ID, any alarms which are present, and the status of any relays which have been assigned codes. After this announcement, the B1290 will prompt you to *Enter Control Code.* The B1290 then waits ten seconds for you to enter a code. This could be a code to operate one of the relays, an Acknowledge Code, an Interrogate Code, or an Access Code which would allow you to go into the programming mode. If an Access Code (password) has not been programmed, the B1290 will automatically go into the programming mode after five seconds, prompting you to *Enter Program Code.* You may then program the B1290 from your telephone, the same as you would from a local programming phone.

The B1290 will hang up whenever it has waited for more than ten seconds without receiving a DTMF code.

## Changing Telephone Directories

Telephone directories can be changed remotely without entering the programming mode. The directory can be changed by entering the Directory Control Code over the telephone system, local programming telephone, or two-way radio.

Refer to the Directory section, Program Code 2, for a description of the directory format and its uses.

This example uses the local programming phone to change the telephone format from DIRECTORY A to DIRECTORY B and then to DIRECTORY C. A typical installation may use a programming telephone mounted permanently at the site to make this procedure as simple as possible.



B1290: Enter Control Code

*YOU:* 0 0 0

B1290: Telephone Format is Directory B

*YOU:* 0 0 0

B1290: Telephone Format is Directory C

It is also common to enter this code using a DTMF keypad over the radio system when the operators at the site change shift.

The B1290 will not allow an empty directory to be selected.

## Error Messages

The B1290 will speak error messages when it is called on the phone line, interrogated over the radio port or when the local program phone is used.

**Hardware Error**

The B1290 speaks *Alert - Site Error* when either the user voices or the vocabulary memory space is corrupt.

**Database Error**

The B1290 speaks *Alert - Program Error* when either the configuration database is corrupt.

**Phone Error**

The B1290 speaks *Alert - Telephone Access Error* when there has been a call progress error such as no dial tone during a phone call.

**Expander Error**

The B1290 speaks *Alert - Expander Error* when a communication error is experienced with an expander.

# Program Codes

## How to Enter the Programming Mode

To begin programming, you must hear the prompt *Enter Program Code* from the B1290. One way to get to this prompt was discussed in the chapter on **Getting Started**. After you have entered the initial voice messages, telephone numbers and an Acknowledge Code, the B1290 will prompt you to begin programming. A local programming phone may be used at any time to alter parameters. It is also possible to program the B1290 remotely by dialing it up over the telephone line.

If you call up a B1290 over the phone once it has been programmed, it will answer after four rings (default) and announce its site ID, any alarms present, the status of the relays (if they have been programmed) and any error status messages. Then it will prompt you to *Enter Control Code.* If the unit has been programmed to operate with a password, you must enter the Access Code at this time. The B1290 will reply with *Program Access* and prompt you to *Enter Program Code.* If an Access Code has not been programmed, the B1290 will time out after five seconds and automatically enter the programming mode. You will hear the prompt *Program Access; Enter Program Code.*

When you connect a local programming phone, the B1290 goes through a similar sequence. It will announce its site ID, any alarms present, the status of any programmed relays and any error status messages. Then it will prompt you to *Enter Control Code.* It is not necessary to know the Access Code to program from the local phone. Wait five seconds, and the B1290 will automatically prompt you with *Program Access; Enter Program Code.*

*IMPORTANT: Remember that all programming codes must be followed by the* "**" code to enter them.

The following chapter, **Programming Reference**, divides the programming parameters into functional blocks. Refer to that chapter to determine the parameter changes required for a specific function.

Appendix C is a **Programming Tree** for the B1290. It gives an overview of the parameters which may be programmed and how they are organized. The Program Codes are explained in detail in the next section.



## Program Code 1 **: Voices

When you enter Program Code 1, you will hear the following prompt:

B1290: Enter Voice Code

*YOU:* [1][*][*] *Record Site ID and alarm messages*

[2][*][*] *Record relay messages*

[3][*][*] *Erase all messages*

[*][*] *Exit to Enter Program Code prompt*

### 1**: Record Alarm Voices (includes Site ID)

Record the voice messages associated with the unit (site ID) and each individual alarm point. These are the messages which will be announced over the radio or telephone whenever the alarm is present.

B1290: Site is Ajax Compressor Station

*YOU:* [2][*][*] *Record*

[#][*][*] *Quit*

[*][*] *Enter/Next*

Default: empty

If the message is OK, continue by hitting Enter. If you would like to record a new message, enter 2** to record. As soon as you hit the second asterisk of the Enter code, the B1290 will prompt you to record a voice message. When you stop speaking, the B1290 will immediately play back the message that you recorded. Pauses between words may cause the recording to terminate. Repeat as many times as you need until the voice message sounds acceptable. Then hit Enter (**) to proceed, or # ** to exit back to the Enter Voice Code prompt.

Entering Next advances to the alarm message section and the first alarm message will be spoken

B1290: Alarm One is ...

*YOU:* [2][*][*] *Record*

[#][*][*] *Quit*

[*][*] *Enter/Next*

If you enter messages for all eight alarms, the B1290 will automatically exit to the Enter Voice Code prompt.

Default: empty

### 2**: Record Relay Voices

Record the voice messages associated with each relay. Note that the messages will only be announced if the relays have been programmed to operate from a string (see Program Code 3, Relay On/Off Codes). When a relay is operated, the B1290 will speak the voice message followed by the word "On" or "Off" to verify that the action was taken.

In some applications, it is not necessary to have voice confirmation when a relay is operated. To disable this feature, refer to Program Code 6 - Relay Voices.

The B1290 will always announce the condition of the relays when it is called up or interrogated for status.

B1290: Relay Number One is ...

*YOU:* [2][*][*] *Record*

*YOU:* [#][*][*] *Quit*

[*][*] *Enter/Next*

Default: empty

### 3**: Erase All Voices

B1290: Enter Voice Empty Code

*YOU:* . [#][3][1][*][*] *Erase (exit with any other entry)*

1290: Voice is Empty

[*][*] *Enter/Next*

## Program Code 2 **: Directories

There are four directories in the B1290. To allow different alarms to perform different actions when they are active, each alarm can be selected to use any one of the directories. Each directory defines a unique sequence of actions. There is also a Directory Control Code that modifies the directory selection that the alarms are programmed for. When this code is used there are restrictions placed on how the alarms are assigned to directories. There are three possible ways that the directories can be used.

1. If there is No Directory Control Code:

   Alarms can be assigned to any of the four directories and will always use the one that has been assigned.

2. If there is a Directory Control Code (method 1):

   Alarms can only be assigned Directory A. When the Directory Control Code is received, the directory usage is modified such that the alarms now use the next directory with commands in it. If Directory B has commands then it will be used. When the Directory Control Code is received again, directory usage advances to the next directory with commands in it.

   If all four directories have commands in them, then the Directory Control Code will simply advance to the next directory each time it is received. If the current setting is Directory D when the code is received, then it will return to Directory A.

   If the next directory is unused, it will be skipped.

2. If there is a Directory Control Code (method 2):

   If the alarms are assigned only to Directory A and Directory C, when the Directory Control Code is received, all of the alarms that are assigned to Directory A will switch to use Directory B and all of the Alarms assigned to Directory C will switch to use Directory D. When the Directory Control Code is received again, directories A and C will become the active directories.

   Alarms cannot to assigned to Directory B or Directory D when this mode of operation is selected.

The directory structure is made up of a list of lines with each line containing a sequence of instructions. The B1290 performs the actions defined in each line then waits for a response. If the expected response is not received, the actions in the next line are carried out

Commands are placed into the directory line-by- line with a series of digits representing the required actions.

Commands that can be used in the directory and the digits used to select them are:

[#][0] Dial + digits

[#][1] Radio

[#][2] Wait + 1-3 digits (seconds)

[#][3] Alert

[#][4] Two Tone Paging + (4 or 5 digits) + *+ (4 or 5 digits)
(frequencies in .1 Hz. ie: 12345 would be 1234.5 Hz)

[#][5] Five Tone Paging + 5 digits (5 digit cap code)

or Five Tone Paging + 1digit + * + 5 digits (preamble+ cap code)

[#][6] Single tone + (4 or 5 digits)
(frequency in .1 Hz. ie: 12345 would be 1234.5 Hz)

[#][7] DTMF + 1-16 digits

Voice

Answer

When Program Code 2 is selected the B1290 responds with the prompt:

B1290: Enter Directory

*YOU:* *Directory A*

*Directory B*

*Directory C*

*Directory D*

*Help (speaks a summary of commands)*

*Quit*

If one of the directories is selected a typical response would be:

B1290: Directory A, Line One is DIAL 2559544 WAIT 3 SEC VOICE

This is the command sequence in the first line of the directory and would result in the B1290 dialing the number 2559544, waiting for 3 seconds and then speaking the voice messages. At this time the following options are available:

Change this line

Delete this line

Insert a new line before the current line

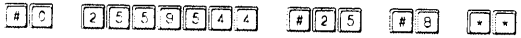
Quit

Next

*YOU:* *Change this line*

B1290: 'beep'

To change the line, a complete sequence of commands and values must be entered. For example, if the setting was to be changed so that the wait time was 5 seconds instead of 3, the entry would be:

*YOU:* 

B1290: Directory A, Line One is DIAL 2559544 WAIT 5 SEC VOICE

Which is the same as [DIAL]2559544 [WAIT]5 [VOICE] for this line in the PC programming software.

For an invalid entry, the B1290 will speak the word "Error" at the end.



*YOU:* *Delete this line*

B1290: 'beep' if the next line in the directory is empty
or

B1290: Directory A, Line One is DIAL 2559544 DTMF 1234 VOICE

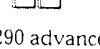
if there is another line in the directory. This was the content of line 2 before the current line was removed. All of the lines move up one line. You can either accept this entry or edit the line.

*YOU:* *Insert a new line*

B1290: 'beep'

*YOU:* *(new entry)*

B1290: Directory A, Line One is DIAL 2559544 VOICE

*YOU:*  *Next*

The B1290 advances to the next line in the directory

*YOU:* *Quit*

The B1290 returns to the Enter Directory Code prompt.

Limits: Each phone number may contain up to 39 digits.

Default: Directory A has the single command to turn on the radio and speak the voice messages; the other three directories are empty.

If a pause is required when dialing, use the Wait command to insert a delay interval followed by a DTMF command with more digits. This feature is most often used when communicating with devices which require special signaling, such as paging terminals. The #, or pound digit, has no special meaning and is dialed as a pound.

When calling a paging terminal or someone who cannot acknowledge the call from their phone, it may be useful to wait before starting the next telephone call. This allows the called party to get to a phone and call the B1290 to acknowledge it before it calls out again. To do this, put a Wait command with the required delay on the next directory line and then a Dial command on the following line.

To send a group call with 2 Tone Paging, set tone A equal to tone B.

Do not use the Answer command immediately following a Dial command in the directories when Call Progress is enabled. This is the equivalent of two Answer commands and may result in unreliable operation.

## Program Code 3 ✱✱: DTMF Codes

The B1290 is capable of decoding, storing, and transmitting all DTMF codes, including codes received from a 4x4 keypad. Enter #✱✱ to clear a DTMF Code.

B1290: Enter DTMF Code

*YOU:* [*][*][*] *Acknowledge Code*

[2][*][*] *Access Code*

[3][*][*] *Relay On/Off Codes*

[4][*][*] *Alarm On/Off Codes*

[5][*][*] *Remote Alarm Input Codes*

[6][*][*] *Interrogate Code*

[7][*][*] *Directory Control Code*

[*][*] *Exit to Enter Program Code prompt*

### 1 **: Acknowledge Code

The Acknowledge Code is sent by the called party to indicate that the alarm message has been received. This stops the calling sequence of the B1290.

B1290: Acknowledge Code is ...

*YOU:* [X][*][*] *( x = 1 to 8 DTMF digits )*

Default: 1234

### 2 **: Access Code

The Access Code is used as a password to prevent unauthorized callers from altering the programming of the B1290. If an Access Code has been programmed, it must be entered before a telephone caller will receive the *Enter Program Code* prompt. The Access Code is not required for local programming.

B1290: Access Code is ...

*YOU:* [X][*][*] *( x = 1 to 8 DTMF digits, # = clear )*

Default: empty

### 3 **: Relay On/Off Input Codes

The relay codes allow users to perform remote control functions at the unattended site. Callers can operate relays on the B1290 by sending DTMF codes from their telephone or radio keypads. Each relay has one code to turn it on and a separate code to turn it off. When a relay is operated, the B1290 speaks a voice message associated with that relay followed by the word "On" or "Off" (see Program Code 1 - Record Relay Voices).



B1290: Relay One On Code is ...

Relay One Off Code is ...

*YOU:* [X][*][*] *( x = 1 to 8 DTMF digits, # = clear )*

Default: empty

### 4 **: Alarm On/Off Output Codes

These codes are used to control DTMF-operated devices at the receiving end when an alarm is reported. A typical example would be sending a message to a pager with a digital display. The DTMF On string is sent during the alarm announcement, preceding the voice announcement for that alarm. The DTMF Off string is sent only over the radio port when the alarm returns to normal, and is not accompanied by a voice message. This feature might be used to turn the lamps of an annunciator panel on or off depending on the condition of the alarm. In simple system applications, the alarm On/Off codes of one B1290 might be programmed to be the same as the relay On/Off codes or remote alarm input codes of another B1290.

B1290: Alarm One On code is ...

Alarm One Off code is ...

*YOU:* [X][*][*] *( x = 1 to 8 DTMF digits, # = clear )*

Default: empty

### 5 **: Remote Alarm Input Codes

If a remote alarm input code has been programmed, when it is received by the B1290 it will be interpreted exactly the same as an alarm on that input. The most common application is to obtain an alarm report from a remote site via radio. The Alarm LED will show the status for remote alarms.

**Do not** connect an alarm signal line to an input that has been programmed with a remote alarm input code.

B1290: Alarm One Remote Alarm Code is ...

*YOU:* [X][*][*] *( x = 1 to 8 DTMF digits, # = clear )*

Default: empty

### 6 **: Interrogate Code

The Interrogate Code is used to find the current status of the B1290. When it receives the code, the unit reports its site ID, any alarms which are present, the status of any relays which have been programmed to operate and any error status messages. Only the voice messages are repeated; no signaling is sent. As the B1290 always announces its status when it is telephoned, this code is used primarily for querying over radio.

B1290: Interrogate Code is ...

*YOU:* [X][ ][ ] *( x = 1 to 8 DTMF digits, # = clear )*
Default: 5678

### 7 **: Directory Control Code

The Directory Control Code is used to call up the B1290 and change the way that the alarms are using the directories. When it receives the code, the directory usage is modified. If the Directory Control Code is used there are restrictions on what directories are available - refer to Program Code 2 Directories for details.

B1290: Directory Control Code is ...

*YOU:* [X][ ][ ] *( x = 1 to 8 DTMF digits, # = clear )*
Default: 5678

## Program Code 4 **: Timer Configuration

When you enter Program Code 4, the B1290 will automatically cycle through the following parameters. After the last one, "Times A", it will go back to the *Enter Program Code* prompt.

### Rings Before Answering

When the B1290 is dialed, this parameter sets the number of times it will let the telephone ring before it answers.

B1290: Answer rings is ...

*YOU:* [0][ ][ ] *no answer*

[X][ ][ ] *number of rings ( x = 1 to 8 )*

[#][ ][ ] *answer and automatically acknowledge after 8 rings*

Default: 4 (answer after 4 rings)

If the B1290 is on its own telephone line, it will normally be programmed to answer right away, after one or two rings. However, if the line is shared with other users, it should be programmed to answer after 6 to 8 rings, giving people lots of time to pick up the phone before the B1290 automatically answers.

The # is used when the called parties have dial pulse phones. They cannot acknowledge receipt of an alarm using a code. Instead the B1290 recognizes 8 rings on the telephone line as an Acknowledge Code. In the directory, a Wait command with the required delay, is placed on the line following the Dial command. This gives the called party time to hang up the phone, call the B1290 back and let the phone ring 8 times to acknowledge receipt of the alarm (refer to Program Code 2 - Phone Directory).



### Interval Timer A

If an alarm is not acknowledged after one pass through the directory, this timer determines how often the B1290 will repeat the reporting sequence.

B1290: Timer A is 2 minutes

*YOU:* [X][ ][ ] *minutes ( x = 1 to 249)*

Default: 2 minutes

### Interval Timer B

After the Timer A cycle has completed, this timer determines how often the B1290 goes through its alarm reporting sequence.

B1290: Timer B is 10 minutes

*YOU:* [0][ ][ ] *automatically acknowledge after Interval A*

[X][ ][ ] *minutes ( x = 1 to 249)*

0 would be selected if the alarms were announced over a public address system, for example, where there is no way for the alarms to be acknowledged.

Default: 10 minutes

### Cycles Through Timer A (Times A)

This number determines how many times the B1290 will cycle through its alarm reporting sequence at A intervals before switching to B intervals. With its default settings, the B1290 will try 3 times at 2 minute intervals, then switch to reporting at 10 minute intervals. The switch to the B interval is primarily to conserve air time on busy radio systems.

B1290: Times A is ...

*YOU* [X][ ][ ] *times ( x = 0 to 8 )*

Default: 3

## Program Code 5 **: I/O Configuration

After you enter Program Code 5, the B1290 prompt for the Configuration Code. If you wish to go back to the *Enter Program Code* prompt without going through all of the codes, enter **.

B1290: Enter Configuration Code

*YOU:* [1][ ][ ] *Alarm Input Setup*

[2][ ][ ] *Using Directory*

[3][ ][ ] *Relay Setup*

[ ][ ] *Exit to Enter Program Code prompt*

### 1 **: Alarm Input Setup

#### Alarm Format

This parameter changes the format of the B1290 alarm inputs to match the output of your monitoring devices in the field. Normally open inputs indicate an alarm when the input is grounded, and when the ground signal is removed, the alarm is interpreted as having cleared. Normally closed inputs are grounded in their normal state, and open when an alarm occurs. Latched inputs recognize a pulse as an alarm. After the pulse has disappeared, the input is deemed to be in the alarm condition until it is acknowledged.

*Note*: A latched alarm should provide a short, predictable pulse to the input of the ProTalk Plus; otherwise, it may have to be acknowledged twice. If the alarm is acknowledged while the input is active, the alarm will not be cleared and new alarms will not activate that input.

B1290: Alarm Format is ...

*YOU:* [0][ ][ ] *Normally Open*

[1][ ][ ] *Normally Closed*

[2][ ][ ] *Normally Open, Latched*

[3][ ][ ] *Normally Closed, Latched*

[ ][ ] *Next*

Default: 0 (normally open)

#### Alarm Timer (Debounce) Timescale

The debounce timers on the alarm inputs can operate with a resolution of .1 seconds or .1 minutes. When the B1290 speaks 'seconds' for this value it is indicating that the timer is counting in .1 second steps and when it speaks 'minutes' it is counting in .1 minute steps.

B1290: Alarm Timer is seconds

*YOU:* [0][ ][ ] *Seconds*

[1][ ][ ] *Minutes*

[ ][ ] *Next*

Default: 0 ( seconds)



#### Alarm Delay (Debounce)

This parameter controls the amount of time an alarm must be present before it actually registers as an alarm. This feature is often used to eliminate fleeting alarms, where the device in the field does not present a clean closure to indicate an alarm, but a series of bounces on the contacts. Another example might be to overcome momentary power fluctuations which cause false alarms to be reported. The debounce on each alarm may be individually set.

B1290: Alarm One Delay is _ _ point _ seconds

*YOU:* [X][ ][ ] *( x = 0.1 to 19.9 )*

The value must be entered in tenths of a second, from 1 to 3 digits. The last digit entered is interpreted as the least significant, i.e. tenths of a second.

Default: 0.5 seconds

### 2 **: Using Directory

B1290: Alarm One is Directory A

*YOU:* [0][ ][ ] *Off*

[ ][ ][ ] *Directory A*

[2][ ][ ] *Directory B*

[3][ ][ ] *Directory C*

[4][ ][ ] *Directory D*

[ ][ ] *Next*

Default: 1 (Directory A)

The selected directory will determine which sequences of actions is performed when this alarm is active. Each alarm can use any directory. If the Directory Control Code is used there are restrictions on what directories should be used - refer to Program Code 2 Directories for details.

### 3 **: Relay Setup

#### Relay Timer Timescale

The interval timers on the relay outputs can operate with a resolution of 1 second or 1 minute. When the B1290 speaks 'seconds' for this value it is indicating that the timer is counting in 1 second steps and when it speaks 'minutes' it is counting in 1 minute steps.

B1290: Relay Timer is seconds

*YOU:* [0][ ][ ] *Seconds*

*Minutes*

*Next*

Default: 0 ( seconds)

### Relay On Time

The B1290 has four relays that are turned On with the relay On codes and turned Off with the relay Off codes. The relay timer may be used to turn On a relay for a specified duration and then turn it Off automatically. The timer controls the period of time the relay is On. The interval is programmable from 1 to 199 seconds or from 1 to 199 minutes depending on the setting of the relay timescale. The timers for each relay are programmed separately and operate independently.

Setting the time to zero makes the relay an On/Off type. Setting the timer with the # digit makes the relay operate as a 'special function' output. This function is only available on the main ProTalk Plus unit and not on the expanders. The special functions are:

| | |
|---|---|
| Relay 1 | Unacknowledged Alarm Present |
| Relay 2 | Any Alarm Present |
| Relay 3 | Alarm Acknowledge Received - pulsed when the unit is acknowledged. |
| Relay 4 | Error |

B1290: Relay One On Timer is _ _ seconds

*YOU:* *Not timed, uses the Relay Off Code*

*( x = 1 to 199 )*

*( Special function )*

Default: 0 (On until turned Off)

## Program Code 6 **: System Settings

When you enter Program Code 6, the B1290 will automatically cycle through the following parameters as you hit Enter (**). When it has completed the whole list, it will return to the *Enter Program Code* prompt.

### Dial Format

This parameter determines the method of dialing telephone numbers. Tone format dials using DTMF tones ( Touch-Tone). Pulse format dials using pulses as a rotary phone would.

B1290: Dial Format is ...

*YOU:* *Tone dialing*



*Pulse dialing*

*Next*

Default: 0 (tone dialing)

### Squelch Polarity

This setting changes the polarity of the signal used to indicate a busy radio channel.

B1290: Squelch is ...

*YOU:* *Busy when the input is low*

*Busy when the input is high*

*Next*

Default: 0 (transmit on high)

### Relay Voices

This setting enables or disables the B1290's spoken response to a relay operation. If the B1290 is used in a control situation where monitoring the relay operation is not required, the B1290 would be programmed with the relay voices muted. The B1290 relay voices should be enabled where verification of a relay operation is required.

B1290: Relay is ...

*YOU:* *Relay voices are not used*

*Relay voices are used*

*Next*

Default: 1 (voices on)

### Acknowledge Request

This setting enables or disables the B1290's voice prompt *Enter Acknowledge Code.* If the alarm announcement is over a public address system, for example, acknowledgment is not possible. The B1290 would be programmed for automatic acknowledge (see Interval Timer B, Program Code 4) and the request for an Acknowledge Code would be disabled.

The B1290 will continue transmitting its alarms until it receives some form of acknowledgment, automatic or otherwise, even if it does not request one.

B1290: Acknowledge Voice is ...

YOU: *Acknowledge request is not used*

*Acknowledge request is used*

*Next*

Default: 1 (enabled)

### Call Progress (Dial Tone Enable)

This setting enables or disables the feature where the B1290 monitors the audio activity on the phone line when it places a call. If enabled, Call Progress will cause the B1290 to look for dial tone before dialing, watch for a busy signal on the called line and then wait until the called party speaks before the alarm announcement begins. Without Call Progress enabled, the B1290 will perform the dial-out operation and speak regardless of the signals encountered on the phone line.

Do not use the Answer command immediately following a Dial command in the directories when Call Progress is enabled. This is the equivalent of two Answer commands and may result in unreliable operation.

B1290: Dial Tone is ...

YOU: *Call Progress is not used*

*Call Progress is used*

*Next*

Default: 1 (enabled)

## Program Code 7 **: Expanders

When Program Code 7 is entered, the B1290 gives you the following parameters.

### Number of Expanders

Increase the capacity of a basic B1290 by adding up to 7 expanders, each with an additional 8 alarm inputs and 4 relay outputs.

B1290: Expander Number is . . .

YOU: *Expanders ( x = 0 to 7 )*

*Next*

Default: 0



### Site Voice Enable

This setting enables or disables the announcement of a site ID from the expander unit. If the expander is being used to increase the number of alarms to be reported from a single site, you probably don't need to announce the site ID again. However, the site ID might be useful to differentiate between alarms from different areas or pieces of equipment.

B1290: Expander Site is . . .

YOU: *Site voice is not used*

*Site voice is used*

*Next*

Default: 0 (expander site ID disabled)

To program the parameters within the expander, the PGM port on the B1290 is used. Programming is done exactly as though the main unit itself was being programmed, except that the expander number precedes the program code. Refer to Example 10 - Adding an Expander for a specific description of this procedure.

## Program Code 8 **: Reset Database

This code is used to reset all of the programmed parameters (excluding voices) to their default values.

B1290: Enter Empty Code

YOU: *Clear Database*

*Next*

Any other entry will leave the database unchanged.

## Program Code 9 **: Audio Levels

This code is used to adjust audio levels for specific signals. For receive levels the setting should correspond to the level of the signal that is coming from the attached equipment. Receive levels can be in the range between -20 dBm and 0 dBm. For transmit levels the setting determines the amplitude of the signal that will be produced at the output of the B1290. Transmit levels can be set in the range between -20 dBm and 0 dBm. The negative sign is automatically applied to any non-zero value.
The settings for the audio levels are presented in the following order for modification

B1290: Radio Code One is . . .(Radio Transmit Tone Level)

YOU: [X][X][-][-] *Level setting ( x = 20 to 0 )*

[-][-] *Next*

Default: 0

B1290: Radio Code Two is . . .(Radio Transmit DTMF Level)

YOU: [X][X][-][-] *Level setting ( x = 20 to 0 )*

[-][-] *Next*

Default: 0

B1290: Radio Code Three is . . .(Radio Transmit Voice Level)

YOU: [X][X][-][-] *Level setting ( x = 20 to 0 )*

[-][-] *Next*

Default: 0

B1290: Radio Code Four is . . .(Radio Receive Level)

YOU: [X][X][-][-] *Level setting ( x = 20 to 0 )*

[-][-] *Next*

Default: 0

B1290: Telephone Code Five is . . .(Telephone Receive Level)

YOU: [X][X][-][-] *Level setting ( x = 20 to 0 )*

[-][-] *Next*

Default: 0



# Programming Reference

The ProTalk Plus is capable of performing many functions other than those set by its default values. If you require these extended capabilities, they are accessed through the program codes. If the default operation of the unit as described in the **Getting Started** chapter of this manual is sufficient, then you may ignore this section.

This chapter organizes the programming parameters by their functions. See the chapter on **Program Codes** for more detail on the use and meaning of the referenced parameters.

## 1. Alarm Announcement

This section identifies all of the parameters that determine WHAT is sent when an alarm occurs. By programming these parameters, you may send voice, signaling, and paging tones.

*Directory Used (Program Code 5.2)*

*Directories (Program Code 2)*

*Record Alarm Voices (Program Code 1.1)*

*Alarm On/Off Output Codes (Program Code 3.4)*

*Acknowledge Request (Program Code 6)*

*Speak Messages (Program Code 2)*

## 2. Alarm Operation

This section identifies all of the parameters that determine WHEN an alarm will be announced. By programming these parameters, you control when an alarm is recognized and announced by the ProTalk Plus.

*Alarm Format (Program Code 5.1)*

*Alarm Delay Timebase (Program Code 5.1)*

*Alarm Debounce (Program Code 5.1)*

*Interval Timer A (Program Code 4)*

*Interval Timer B (Program Code 4)*

*Cycles Through Timer A (Program Code 4)*

## 3. Operation Codes

These parameters control how the unit operates. When one of these codes is received, the B1290 performs the required function.

*Acknowledge Code (Program Code 3.1)*

*Access Code (Program Code 3.2)*

*Interrogate Code (Program Code 3.6)*

*Remote Alarm Input Code (Program Code 3.5)*

*Directory Control Code (Program Code 3.7)*

## 4. Relay Control

The parameters required to control a relay are listed here. You may use any number of relays, but the ON/OFF input codes, voice message and relay ON time must be programmed for each relay used. The relay voice code enables or disables the voice confirmation for all relays.

*Relay ON/OFF Control Codes (Program Code 3.3)*

*Record Relay Voices (Program Code 1.2)*

*Relay Timer Timebase (Program Code 5.3)*

*Relay On Time (Program Code 5.3)*

*Relay Voice (Program Code 6)*

*Relay Special Functions (Program Code 5.3)*

## 5. Telephone Specific Parameters

This section describes the parameters used when the unit is required to transmit alarms or signaling over the telephone system.

*Using Directory (Program Code 5.2)*

*Directory Telephone Numbers (Program Code 2)*

*Access Code (Program Code 3.2)*

*Rings Before Answering (Program Code 4)*

*Dial Format (Program Code 6)*

## 6. Radio Specific Parameters

These parameters control the operation of the unit when it is connected to a two-way radio. Refer to the installation section in Getting Started for the required connections to the radio.

*Using Directory (Program Code 5.2)*

*Directory Radio Command (Program Code 2)*



*Squelch Polarity (Program Code 6)*

*Radio Warmup (Program Code 2)*

## 7. Expander Attachment

When an expander is added to the system, these parameters must be set. They configure the main B1290 unit to accept the expander. The parameters within the expander must also be programmed. Refer to the Advanced Programming Examples for an example of how this is done.

*Number of Expanders (Program Code 7)*

*Site Voice Enable (Program Code 7)*

## 8. Audio Levels

*Audio Levels (Program Code 9)*

# Programming Examples

### Example 1: Reporting Alarms over Radio and Telephone

In this example, assume that your company has a mobile radio system which is monitored by field personnel. Radio operators have DTMF pads on their mics so they can acknowledge an alarm from the B1290. They would like to have the alarm reported over the radio system three times with a 2 minute interval between transmissions, then dialed out over the telephone if it is not acknowledged. If the alarm is not acknowledged, the B1290 should try again in ten minutes. After six tries at ten minute intervals, the B1290 should switch to trying once an hour. The COS on the radio used with the B1290 gives a high signal when the channel is busy.

B1290: Enter Program Code

*YOU:* *Directory Code*

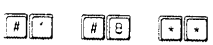
B1290: Enter Directory

*YOU:* *Directory A*

B1290: Directory A, Line One is...

*YOU:* *Change*

B1290: 'beep'

*YOU:*  *[RADIO] [VOICE]*

B1290: Directory A, Line One is RADIO VOICE

*YOU:* *Next*

B1290: Directory A, Line Two is...

*YOU:* *Change*

B1290: 'beep'

*YOU:* *[WAIT]120 (seconds)*

B1290: Directory A, Line Two is WAIT 120

*YOU:* *Next*

B1290: Directory A, Line Three is...

*YOU:* *Change*

B1290: 'beep'

*YOU:* *[RADIO] [VOICE]*

B1290: Directory A, Line Three is RADIO VOICE



*YOU:* *Next*

B1290: Directory A, Line Four is...

*YOU:* *Change*

B1290: 'beep'

*YOU:* *[WAIT]120 (seconds)*

B1290: Directory A, Line Four is WAIT 120

*YOU:* *Next*

B1290: Directory A, Line Five is...

*YOU:* *Change*

B1290: 'beep'

*YOU:* *[RADIO] [VOICE]*

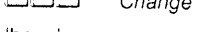
B1290: Directory A, Line Five is RADIO VOICE

*YOU:* *Next*

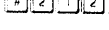
B1290: Directory A, Line Six is...

*YOU:* *Change*

B1290: 'beep'

*YOU:*  *[WAIT]120 (seconds)*

B1290: Directory A, Line Six is WAIT 120

*YOU:*  *Next*

B1290: Directory A, Line Seven is...

*YOU:* *Change*

B1290: 'beep'

*YOU:*

*[DIAL]2559544 [VOICE]*

B1290: Directory A, Line Seven is DIAL 2559544 VOICE

*YOU:* *Next*

B1290: Directory A, Line Eight is...

*YOU:* *Quit*

B1290: Enter Directory

*YOU:* [#][*][*] *Quit*

B1290: Enter Program Code

*YOU:* [4][*][*] *Configuration*

B1290: Answer Rings is 4

*YOU:* [*][*] *Next*

B1290: Timer A is 2 minutes

*YOU:* [1][0][*][*] *Enter 10 minutes*

B1290: Timer A is 10 minutes

*YOU:* [*][*] *Next*

B1290: Timer B is 10 minutes

*YOU:* [6][0][*][*] *Enter 60 minutes*

B1290: Timer B is 60 minutes

*YOU:* [*][*] *Next*

B1290: Times A is 3

*YOU:* [6][*][*] *Enter 6 times*

B1290: Times A is 6

*YOU:* [*][*] *Next*

B1290: Enter Program Code

*YOU:* [2][*][*] *Select System Settings*

B1290: Dial Format is 1

*YOU:* [*][*] *Next*

B1290: Squelch is 0

*YOU:* [1][*][*] *Enter busy when high*

B1290: Squelch is 1

*YOU:* [*][*] *Next*

B1290: Relay Voice is On

At this point you are finished programming and may hang up the telephone. The directory is programmed with the voice message repeated three times on the radio and then once on the phone line. Another method of programming the radio announcement would be to have an alert tone



followed by the message repeated twice. In this case the entry for each of the radio related commands would be:

B1290: Directory A, Line One is...

*YOU:* [#][1] [#][3] [#][8] [#][9] [*][*]

*[RADIO][ALERT] [VOICE][VOICE]*

B1290: Directory A, Line One is RADIO ALERT VOICE VOICE

Over the telephone, the message will be repeated only once.

If this programming is used, when the B1290 registers an alarm, the reporting cycle will be as follows:

Over radio:
Alert tone
Ajax Compressor Station; Power Failure
Ajax Compressor Station; Power Failure
Enter Acknowledge Code
pause for 2 minutes

Alert tone
Ajax Compressor Station; Power Failure
Ajax Compressor Station; Power Failure
Enter Acknowledge Code
pause for 2 minutes

Alert tone
Ajax Compressor Station; Power Failure
Ajax Compressor Station; Power Failure
Enter Acknowledge Code
pause for 2 minutes

Over telephone: dial 2559544
Ajax Compressor Station; Power Failure
Enter Acknowledge Code
pause for 5 seconds -waiting for acknowledge code
Ajax Compressor Station; Power Failure
Enter Acknowledge Code
pause for 5 seconds -waiting for acknowledge code

This sequence repeats for 60 seconds.

If the Acknowledge Code is not received over the telephone, the B1290 will wait ten minutes and try the complete sequence again, starting with the radio cycle. If no Acknowledge Code is received after six tries at ten minute intervals, the B1290 will switch to reporting every hour until the alarm is acknowledged.

### Example 2: Dialing from Two Different Telephone Directories

In this example, the B1290 is programmed to telephone whoever is on call if there is an alarm. The company has two groups of employees which take turns being on call alternate weeks. Instead of reprogramming the B1290 directory every week, two directories are programmed. When the Directory Control Code is received, the B1290 is directed to dial from the other directory. The directory may be switched with the Directory Control Code over the telephone, local programming phone, or two-way radio. There are specific rules governing how the alarms can be assigned to directories if the Directory Change Code is used. Refer to Program Code 2 Directories for more information concerning these rules. This example starts by setting the telephone numbers in the two directories.

B1290: Enter Program Code

*YOU:* 2 * * *Directory Code*

B1290: Enter Directory

*YOU:* 1 * * *Directory A*

B1290: Directory A, Line One is...

*YOU:* 2 * * *Change*

B1290: 'beep'

*YOU:* # 0 2 5 5 9 5 4 4 # 6 * *

*[DIAL]2559544 [VOICE]*

B1290: Directory A, Line One is DIAL 2559544 VOICE

*YOU:* * * *Next*

B1290: Directory A, Line Two is...

*YOU:* # 0 2 5 5 9 5 9 8 # 6 * *

*[DIAL]2559598 [VOICE]*

B1290: Directory A, Line Two is DIAL 2559598 VOICE

*YOU:* * * *Next*

B1290: Directory A, Line Three is...

*YOU:* # * * *Quit*

B1290: Enter Directory

*YOU:* 2 * * *Select Directory B*

B1290: Directory B, Line One is...



*YOU:* 2 * * *Change*

B1290: 'beep'

*YOU:* # 0 7 6 6 4 4 2 2 # 6 * *

*[DIAL]7664422 [VOICE]*

B1290: Directory B, Line One is DIAL VOICE

*YOU:* * * *Next*

B1290: Directory B, Line Two is...

*YOU:* # 0 7 6 6 8 9 0 1 # 6 * *

*[DIAL]7668901 [VOICE]*

B1290: Directory B, Line Two is DIAL 7668901 VOICE

*YOU:* * * *Next*

B1290: Directory B, Line Three is...

*YOU:* # * * *Quit*

B1290: Enter Directory

*YOU:* # * * *Quit*

The telephone numbers have now been programmed. Now enter the Directory Control Code

B1290: Enter Program Code

*YOU:* 3 * * *DTMF Codes*

B1290: Enter DTMF Code

*YOU:* 7 * * *Directory Control Code*

B1290: Directory Control Code is...

*YOU:* 7 8 * * *Enter Control Code*

B1290: Directory Control Code is 78

*YOU:* * * *Next*

B1290: Enter Program Code

Right now the B1290 is programmed with dialing commands in Directory A and Directory B. Any alarms that are to be switched between these two directories should be programmed to use Directory A or the control code will have no effect. Each alarm has its own setting for the directory it is using. Make sure that the alarms you want to have changed are set properly.

*YOU:* 5 * * *Select Configuration*

B1290: Enter Configuration Code

*YOU:* 2 * * *Select Using Directory*

B1290: Alarm One is Directory is...

*YOU:* 1 * * *Select Directory A*

B1290: Alarm One is Directory is A

*YOU:* * * *Next*

Repeat this for all of the alarms

When you wish to dial from the B directory, call up the B1290 and follow these steps:

B1290: Enter Control Code

*YOU:* 7 8 *Directory Control Code*

B1290: Telephone Format is Directory B

And to change it back:

B1290: Enter Control Code

*YOU:* 7 8 *Directory Control Code*

B1290: Telephone Format is Directory A

**Example 3: Different Alarms Dialing Different Telephone Numbers**

A B1290 is used in an application where there are two different types of related alarms. Some are building alarms, such as intrusion alarms, building temperature, power failure, etc. Others are alarms relating to specific equipment failures, such as compressor failure, high tank level or sump overflow. It is desirable to have the maintenance personnel alerted if there is a building alarm, but if there is a problem with the equipment, it would be preferable to alert the operations technicians.

In this example, alarms 1 and 2 are connected to intrusion alarm and building high temperature respectively. These are building alarms, and are to dial the building maintenance people at 255-9544 and then 255-9598. Compressor failure and high tank level are fed to alarms 3 and 4. Since these are equipment problems, operations technicians at 766-4422 and then 766-8901 are to be alerted. Follow the previous example to enter the telephone numbers in Directory A and Directory B then set the alarms to use these two directories

B1290: Enter Program Code

*YOU:* 5 * * *Select I/O Configuration*



B1290: Enter Configuration Code

*YOU:* 2 * * *Select Using Directory*

B1290: Alarm One is Directory...

*YOU:* 1 * * *Select Directory A*

B1290: Alarm One is Directory A

*YOU:* * * *Next*

B1290: Alarm Two is Directory...

*YOU:* 1 * * *Select Directory A*

B1290: Alarm Two is Directory A

*YOU:* * * *Next*

B1290: Alarm Three is Directory A

*YOU:* 2 * * *Select Directory B*

B1290: Alarm Three is Directory B

B1290: Alarm Four is Directory A

*YOU:* 2 * * *Select Directory B*

B1290: Alarm Four is Directory B

*YOU:* # * * *Quit*

The B1290 is now programmed to dial Directory A when alarms 1 or 2 occur, and Directory B when alarms 3 or 4 occur.

**Example 4: Actuating Relays**

In this example, when you receive the alarm "High Pressure" from the B1290, you would like to be able to operate a bypass valve for up to ten minutes. The valve can be controlled by one of the relays on the B1290 using Relay On and Relay Off codes.

B1290: Enter Program Code

*YOU:* 1 * * *Select Voices*

B1290: Enter Voice Code

*YOU:* 2 * * *Select Relay Voices*

B1290: Relay One is...

*YOU:* 2 * * *Change*

B1290: beep-beep

*YOU:* *Bypass Valve*

B1290: Relay One is Bypass Valve

*YOU:* [ ][ ] *Next*

B1290: Relay Two is...

*YOU:* [#][ ][ ] *Quit*

B1290: Enter Voice Code

*YOU:* [#][ ][ ] *Quit*

B1290: Enter Program Code

*YOU:* [3][ ][ ] *Select DTMF Codes*

B1290: Enter DTMF Code

*YOU:* [3][ ][ ] *Select Relay On and Off Codes*

B1290: Relay One On Code is empty

*YOU:* [5][5][5][ ] *(pause)* [ ][ ] *Enter On code*

B1290: Relay One On Code is 555*

*YOU:* [ ][ ] *Next*

B1290: Relay One Off Code is empty

*YOU:* [5][5][5][#] [ ][ ] *Enter Off code*

B1290: Relay One Off code is 555#

*YOU:* [ ][ ] *Next*

B1290: Relay Two On Code is empty

*YOU:* [ ][ ] *Next*

B1290: Relay Two Off Code is empty

And so on until all of the Relay Codes are done...

B1290: Enter DTMF Code

*YOU:* [ ][ ] *Next*

B1290: Enter Program Code

*YOU:* [5][ ][ ] *I/O Configuration*

B1290: Enter Configuration Code

*YOU:* [3][ ][ ] *Next*



B1290: Relay Timer is seconds

*YOU:* [ ][ ][ ] *Select minutes for the timebase*

B1290: Relay Timer is minutes

*YOU:* [ ][ ] *Next*

B1290: Relay One On Timer is 00 minutes

*YOU:* [ ][0][ ][ ] *Select 10 minutes for the time*

B1290: Relay One On is 10 minutes

*YOU:* [ ][ ] *Next*

B1290: Relay Two On timer is 00 minutes

At this time you are finished programming and can hang up the phone. When the B1290 calls you with an alarm, the sequence will be as follows:

B1290: Ajax Compressor Station; High Pressure.
Enter Acknowledge Code

*YOU:* [5][5][5][ ] *Send the Relay On Code*

Ajax Compressor Station;
Bypass Valve On (and Alarm - Enter Acknowledge Code).

*YOU:* [ ][2][3][4] *Send the Acknowledge Code*

B1290: Ajax Compressor Station;
Alarms Acknowledged

**Example 5: Operating a Radio Pager**

In this example, when an alarm is received you want to contact the person on call, who is carrying a two-tone radio pager which operates on the company's private radio system. If the person does not call back to acknowledge the alarm, you want the B1290 to start dialing telephone numbers.

B1290: Enter Program Code

*YOU:* [2][ ][ ] *Directory Code*

B1290: Enter Directory

*YOU:* [ ][ ][ ] *Directory A*

B1290: Directory A, Line One is...

*YOU:* [2][ ][ ] *Change*

B1290: 'beep'

*YOU:*

*[RADIO][2TONE]855.5/1433.4 [VOICE]*

*B1290: Directory A, Line One is RADIO 2 TONE 855.5 Hz 1433.4 Hz VOICE*

*YOU:* *Next*

B1290: Directory A, Line Two is...

*YOU:* *Change*

B1290: 'beep'

*YOU:*

B1290: Directory A, Line Two is DIAL 2559544 VOICE

*YOU:* *Next*

B1290: Directory A, Line Three...

You are finished programming and may hang up the phone.

### Example 6: Dialing a Paging Terminal

In this example, rather than using a private radio system, the company's employees utilize a city-wide paging service. Normally when you dial the paging terminal, you are prompted to enter your own telephone number. Your number is then displayed on the digital read-out of the pager, so the paged party knows what number to call back. We are going to program the B1290 to call this paging terminal when it reports an alarm.

B1290: Enter Program Code

*YOU:* *Directories*

B1290: Enter Directory

*YOU:* *Directory A*

B1290: Directory A, Line One is...

*YOU:*

*[DIAL]2559544 [WAIT]4 [DTMF]734*

B1290: Directory A Line One is DIAL 2559544 WAIT 4 seconds DTMF 734

*YOU:* *Next*

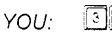
You are finished programming and may hang up the phone.



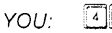
When an alarm occurs, the B1290 will dial the number of the paging terminal, 255-9544; wait for the terminal to answer, wait 4 seconds while the terminal is prompting, then send the DTMF string 734 which represents the calling site. Any alarm will result in the paging message 734.

If you want to distinguish between one alarm and another, use the Alarm On Codes that can be assigned to each input.

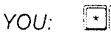
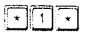
B1290: Enter Program Code

*YOU:*  *DTMF Codes*

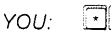
B1290: Enter DTMF Code

*YOU:*  *Select Alarm On/Off Codes*

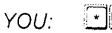
B1290: Alarm One On Code is...

*YOU:*  *(pause)*  *Code for alarm 1*

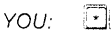
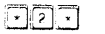
B1290: Alarm One On Code is ✱1✱

*YOU:*  *Next*

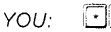
B1290: Alarm One Off Code is...

*YOU:*  *Next*

B1290: Alarm Two On Code is...

*YOU:*  *(pause)*  *Code for alarm 2*

B1290: Alarm Two On Code is ✱2✱

*YOU:*  *Next*

With this Alarm ON code programmed, the DTMF string ✱1✱ will be sent immediately preceding the alarm one message when alarm one is active. The message displayed on the pager will be: 734✱1✱

The string ✱2✱ will be sent with alarm two.

In this example, the same result could have been achieved by sending 734 as part of the alarm ON DTMF code. The 734 is included as part of the telephone number and is sent with every alarm. It appears much like a site identifier.

This example also assumes that the pager could be dialed directly. Sometimes a separate number for the pager must be dialed after the number for the paging terminal. In that case, you might need to insert another delay, and there might not be room to include the site identifier as part of the telephone number.

Another way the B1290 could be programmed to dial a paging terminal would be to make the alarm On DTMF code the same as the telephone num-

ber of the B1290. The telephone number would then be displayed on the pager, and the called party would receive the alarm message when he called the B1290 back. The B1290 would have to be programmed to wait some time for an acknowledgment before it continued dialing.

**Example 7: Announcing Alarms over a Public Address System**

In this example, the B1290 is used to announce alarms from an unattended location over a building's public address system. You want the alarms to be announced twice, repeated again one minute later then repeated for the last time one minute after this. To make the process stop after the third repetition, program Timer B to zero. A zero value in Timer B means that the alarm is automatically acknowledged after A Times.

Connect the radio port, TX Audio and PTT, from the B1290 to the PA inputs.

Starting with the timer setup.

B1290: Enter Program Code

*YOU:* [4][*][*]

B1290: Answer Rings is 4 (No effect on operation)

*YOU:* [*][*] *Next*

B1290: Timer A is 2 minutes

*YOU:* [1][*][*] *Change the timer to 1 minute*

B1290: Timer A is 1 minutes

*YOU:* [*][*] *Next*

B1290: Timer B is 10 minutes

*YOU:* [0][*][*] *Change the timer to zero*

B1290: Timer B is 0 minutes

*YOU:* [*][*] *Next*

B1290: Times A is 3

*YOU:* [2][*][*] *Change the times A to 2*

B1290: Times A is 2

*YOU:* [*][*] *Next*

The timers are now set, now put the commands into the directory.

B1290: Enter Program Code

*YOU:* [2][*][*] *Directory Code*



B1290: Enter Directory

*YOU:* [*][*][*] *Directory A*

B1290: Directory A, Line One is...

*YOU:* [2][*][*] *Change*

B1290: 'beep'

*YOU:* [#][1] [#][3] [#][8] [#][6]

*[RADIO][ALERT][VOICE][VOICE]*

B1290: Directory A, Line One is RADIO ALERT VOICE VOICE

*YOU:* [*][*] *Next*

B1290: Directory A, Line Two is..

*YOU:* [#][*][*] *Quit*

B1290: Enter Directory

*YOU:* [#][*][*] *Quit*

*Now remove the acknowledge request prompt.*

B1290: Enter Program Code

*YOU:* [6][*][*]

B1290: Dial Format is Zero

*YOU:* [*][*] *Next*

B1290: Squelch is 0

*YOU:* [*][*] *Next*

B1290: Relay voice is On

*YOU:* [*][*] *Next*

B1290: Acknowledge Voice is On

*YOU:* [0][*][*]

B1290: Acknowledge Voice is Off

*YOU:* [*][*] *Next*

B1290: Dial Tone is on

At this point you are finished programming and may hang up.

*YOU:* [*][*] *Next*

### Example 8: Activating an Annunciator Panel

In this system application, a B1290 is used to report alarms from a number of remote locations by turning the lamps of an annunciator panel on and off.

Figure 6 shows a system where two remote sites are transmitting DTMF codes to a central site. The Alarm On code associated with the remote alarms is the same as the Relay On code at the central site. Similarly, the Alarm Off codes at the remote locations are the same as the Relay Off codes at the central site.

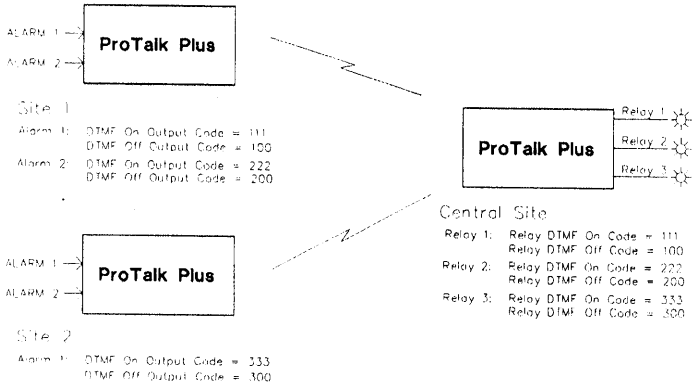



**Figure 6 Activating an Annunciator Panel**

When a remote alarm occurs, the DTMF code for that alarm is transmitted to the central site. On receiving this code, the central site activates the relay associated with that alarm. When the alarm clears, the Off code is transmitted from the remote, and the cental site's associated relay is released.

### Example 9: Concentrating Alarms from Remote Sites

In the following example, a number of remote sites report their alarms over radio to a B1290, which concentrates the alarms and reports them over the telephone.

Figure 7 is an example of two remote sites communicating with a central site to have their alarms announced over the telephone. At the remote site, the B1290s are programmed to operate over radio. They are programmed



with an alarm On output code and an Acknowledge Code. At the central site, the B1290 is programmed to accept remote alarm inputs on alarms 1, 2, and 3, and is connected to a telephone.

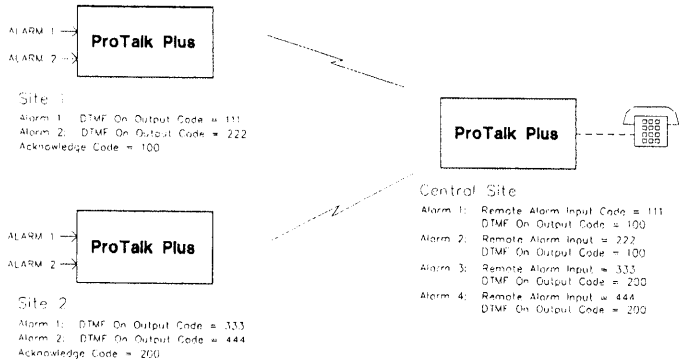



**Figure 7 Concentrating Remote Alarms**

When one of the remote units is alarmed, it will send its alarm ON output code over the radio. This code will be interpreted as a remote alarm input code at the central unit. This will initiate the B1290 to send its alarm report over radio and telephone. As part of its alarm sequence over radio, the B1290 will send its alarm On output code. This code will be interpreted as an acknowledgment by the remote, and it will stop sending the alarm. The central unit will continue to report over radio and telephone until it is acknowledged.

### Example 10: Adding an Expander

In this example, you are adding an expander to a B1290 to increase the number of alarm inputs and relay outputs.

Install and program the main B1290 unit as per the instructions in this manual. Install the expander in a location very close to the B1290. Complete the wiring to all the alarms and relays, then apply power to the expander. Connect the cable supplied with the expander from the auxiliary connector on the B1290 to the SERIAL IN connector on the expander.

The expander is programmed from the B1290. Note that when the Program Code is entered, it is preceded by the number of the expander.

B1290: Enter Program Code

*YOU:* 7 * * *Expanders*

B1290: Expander Number is 0

*YOU:* 1 * * *Enter 1 for the number of expanders*

B1290: Expander Number is One

*YOU:* * * *Next*

B1290: Expander Site Voice is 0 (default is not to announce the expander ID)

*YOU:* * * *Next*

B1290: Enter Program Code

*YOU:* 1 * * * *Expander 1, Voices*

B1290: Enter Voice Code

*YOU:* 1 * * *Record Alarm Voices*

B1290: Expander One Site is...

*YOU:* * * *Next (Site ID is disabled - don't need a voice message)*

B1290: Expander One, Alarm One is...

*YOU:* 2 * * *Change this voice*

B1290: beep-beep

*YOU:* *Intrusion*

B1290: Expander One, Alarm One is Intrusion

*YOU:* * * *Next*

B1290: Expander One Alarm Two is...

*YOU:* 2 * * *Change this voice*

B1290: beep-beep

*YOU:* *High Temperature*

B1290: Expander One, Alarm Two is High Temperature

*YOU:* * * *Next*

B1290: Expander One, Alarm Three is...



Continue programming in the normal fashion, remembering to enter the number of the expander before the Program Code. Only the voices MUST be programmed; the other parameters have their standard defaults. Not all parameters are accessible in the expander. The following is a list of those which may be programmed:

Voices
Relay On/Off codes
Alarm On/Off codes
Remote alarm input codes
Alarm format
Relay On time
Alarm delay (debounce)
Expander Site ID enable

If you try to change any other parameters, the B1290 will announce *Error*. To solve this problem, define all of the expanders in the system in the B1290 using program code 7 (number of expanders).

To change the Alarm On code for the first alarm on the second expander, you would program the following (the example assumes that the number of expanders has already been set to 2 as shown above):

B1290: Enter Program Code

*YOU:* 2 3 * * *Expander 2, DTMF Codes*

B1290: Enter DTMF Code

*YOU:* 4 * * *Alarm On/Off Output codes*

B1290: Expander Two Alarm One On Code is Empty

YOU: 3 6 7 8 * * Enter code 9678

B1290: Expander Two Alarm One On Code is 9678

*YOU:* * * *Next*

etc.

# Troubleshooting

**Problem: I've hooked up the B1290 as per the installation instructions but nothing happens.**

- Use a voltmeter to check that the power supply is properly connected. If an AC adapter is being used, it should have an output of at least 12 volts DC with a center-negative power connector. If the DC power source is connected to the RADIO terminal block, it should have the positive lead connected to terminal 8 and the negative lead to terminal 7 .

- Do not attach power to both inputs at the same time.

**Problem: The B1290 will not program from a local programming phone.**

- If you do not hear the voice prompt to begin programming, check that the programming phone is plugged into the PGM jack and not the PHONE jack.

- If you hear the voice prompt to begin programming, but the B1290 does not register your entries, check that you are using a tone phone. Sometimes a pushbutton phone actually sends dial pulses rather than DTMF. You can tell the difference by listening in the earpiece; pulse dialing sounds like clicking, DTMF like tones.

- Check for the TONE LED on the front panel when a digit is being received. Some phones send short bursts of tone rather than continuous tone while the key is depressed. If the B1290 is not detecting DTMF, try another phone.

- Check the setting of the receive level for the phone port. Since it is not possible to do this using the programming phone, it will have to done with the programming software.

- Disconnect the RX input from the radio. Audio received from this input is summed with the audio from the programming phone. If noise is being received, it will affect the decoding of tones and the programming of the voices. The RX input should always be connected to squelched audio.

**Problem: The B1290 does not dial out over the telephone line when an alarm occurs.**

- Check that the phone line is plugged into the correct jack. The jack labeled PGM is for a local programming phone; the telephone line should be plugged into the PHONE jack.

- Check that the telephone is dialing from the correct directory (Program Code 2). The B1290 has four separate directories: A, B, C and D. Check that the telephone numbers are entered correctly in the selected directory, and that the directory is not empty.



- Check that an alarm is actually present, as indicated by the LEDs on the front panel. In its default condition, the B1290 expects to see a closure to ground at the alarm input. If your alarm inputs are normally closed contacts which open on an alarm condition, this parameter may be adjusted using Program Code 5. The debounce can also be set in this section. This parameter may be set to delay reporting an alarm until it has been present for a certain number of seconds, in which case it will not recognize a momentary closure.

**Problem: The B1290 waits a long time before announcing the alarm over the radio.**

- The B1290 will wait for one minute when the COS input is busy and then transmit anyway. This is done to ensure that an open squelch on the radio does not disable the reporting operation. Check the Squelch Polarity setting to make sure that it matches the operation of the radio's COS output. If the COS input to the B1290 is left open the Squelch Polarity should be set to 0 using Program Code 6.

- Check the alarm delay (debounce) parameter using Program Code 5. If a delay has been programmed, the B1290 will wait until the alarm has been present for that interval before reporting it.

- Check the directory programming to make sure that there is not an unwanted Wait command present.

**Problem: The B1290 continues dialing even after the alarms have been acknowledged.**

- The most common cause of this problem is fleeting alarms. They occur when the device reporting an alarm to the B1290 gives a series of pulses on the contacts instead of a clean closure. If the problem cannot be corrected in the field wiring, one option is to "debounce" the alarms using the B1290 alarm delay parameter using Program Code 5. When this value is set, contacts must be closed for a specific period of time before they are recognized as alarms.

- Check if any new alarms are announced when the B1290 continues to dial after it has been acknowledged. Sometimes alarms at a remote site are related, occurring in a chain reaction from a single cause. The B1290 will start dialing when it receives the first alarm, but if another alarm occurs in the meantime, it will keep dialing until all the alarms are acknowledged.

**Problem: The B1290 won't answer the phone.**

- Check that the phone line is plugged into the PHONE jack and not the PGM jack.

- Check that the phone line is using the inner red/green pair, and not the outer black/yellow pair (normally reserved for line 2).

- Check that the B1290 is configured to answer the phone, using Program Code 4. If the number of rings before answering is set to 0, the B1290 will never answer the phone.

- Answering the telephone will not occur if the B1290 is engaged in any of these activities: speaking on the radio, in local programming mode and when it is using the phone line to call out. Counting of rings only begins once the unit is in its idle state.

- Check that the ringing voltage on the telephone line exceeds 40 VAC at 20 Hz. The RING LED located on the front panel will indicate if proper ringing voltage is being received.

- Check that the telephone line has a standard ringing cadence of two seconds on, four seconds off. If the ringing cadence is greatly different, it may not be detected.

**Problem: The B1290 will not acknowledge.**

- Check that you are sending the correct digits. The acknowledge code can be changed using Program Code 3.

- If the B1290 is not acknowledging over radio, it may be necessary to adjust the receive level setting for the radio port.

- If the B1290 is not acknowledging over the telephone line, it may be necessary to adjust the receive level setting for the phone port.

- Check that the TONE LED on the front panel of the B1290 lights when a DTMF digit is received.

**Problem: The B1290 does not activate its relay when I send the DTMF On code.**

- Check that you are sending the right digits. The relay On/Off codes can be changed by using Program Code 3.

- Check the relay On time using Program Code 5. If the setting is 0, the relay will stay On until it is commanded Off. For any other setting, the relay will only operate for the programmed number of seconds.

- If the relays do not operate from codes sent over the radio, it may be necessary to adjust the receive level setting for the radio port.

- If the relays do not operate from codes sent over the telephone, it may be necessary to adjust the receive level setting for the phone port.

- Check that the TONE LED on the front panel of the B1290 lights when a digit is received.



**Problem: Our operators live in an area which has a dial pulse exchange. How can they acknowledge the B1290 when it calls?**

- Even though the operators have rotary phones, they can still send tone codes if they have a DTMF pad, purchased separately, which sits by the phone.

- The B1290 may be programmed to automatically acknowledge after eight rings. Thus if the B1290 calls an operator with a dial pulse phone, the operator can hang up after he hears the message, call the B1290 right back, let the phone ring eight times, and the B1290 will recognize that as an acknowledgment. Set the number of rings before answering to # in the Configuration section (Program Code 4), and put a Wait command in the next directory line to allow time for them to call the B1290 back.

**Problem: How can I prevent unauthorized personnel from calling up the B1290 and altering its programming?**

- In its default condition, the B1290 does not require any type of password. If you wish to enter one, refer to the Access Code in the DTMF Codes section (Program Code 3). If an Access Code is programmed, anyone calling the B1290 will receive a report of its status, but it will prompt the caller to enter the Access Code before allowing them into the programming mode.

**Problem: Can I use the * character as part of my DTMF strings? Won't this be confused with the "Enter" code?**

- The # and* characters may be used as a part of any programmable DTMF string. The only time you must be careful is when entering an asterisk (*) as the last digit in a string. Be sure to wait more than one second after entering the last digit before hitting Enter (**); otherwise the last * will be interpreted as part of the Enter code.

**Problem: The B1290 has lost its programming.**

- As it runs, the B1290 is constantly performing internal self-checks, and on rare occasions it may find that a memory location has been corrupted. If that happens, the B1290 resets all programmed parameters (except the voice messages) to the default values. At the same time, it will announce *Program Code Error* over the radio. As the telephone directories have been lost, the B1290 cannot dial out to report the failure over the phone. The only way you will be able to tell that something has gone wrong is by phoning the B1290; it will announce a *Program Code Error* as soon as it answers the phone. In order to have some local indication that an error has occurred, hook a local speaker into the radio connections.

The most common causes of a memory loss are power spikes which enter the board through the power, ground, telephone line, or radio connections.

**Problem: I tried to change the telephone numbers and now the B1290 will not dial out at all.**

- Check the programming for Directory A to be sure that the correct command sequence is entered. If a Directory Control Code is being used, make sure that the B1290 has not been changed to a directory that disables the alarm reporting. This would be the case where a directory contains the single Wait command or possibly commands for only the radio port.



## Warranty Statement

Barnett Engineering Ltd. warrants that all equipment supplied shall be free from defects in material or workmanship at the time of delivery. Such warranty shall extend from the time of delivery for a period of one year. Buyer must provide written notice to Barnett Engineering Ltd. within this prescribed warranty period of any defect. If the defect is not the result of improper usage, service, maintenance, or installation and equipment has not been otherwise damaged or modified after delivery, Barnett Engineering Ltd. shall either replace or repair the defective part or parts of equipment or replace the equipment or refund the purchase price at Barnett Engineering Ltd.'s option after return of such equipment by buyer to Barnett Engineering Ltd. Shipment to Barnett Engineering Ltd.'s facility shall be borne on account of buyer.

(1)Consequential Damages: Barnett Engineering Ltd. shall not be liable for any incidental or consequential damages incurred as a result of any defect in any equipment sold hereunder and Barnett Engineering Ltd.'s liability is specifically limited to its obligation described herein to repair or replace a defective part or parts covered by this warranty.

(2)Exclusive Warranty: The warranty set forth herein is the only warranty, oral or written, made by Barnett Engineering Ltd. and is in lieu of and replaces all other warranties, expressed or implied, including the warranty of merchantability and the warranty of fitness for particular purpose.

## Specifications

| | |
|---|---|
| ***Alarm Inputs*** | 8, optically isolated, 2mA to operate, ground closure required. |
| ***Control Outputs*** | 4 independent form C outputs controlled by programmable codes or used as special function outputs. Rated: 1 Amp at 30 Volts |
| ***Telephone Connection*** | RJ11; tone or pulse line. |
| ***Programming Connection*** | RJ11; accepts a standard telephone. |
| ***Receive Audio*** | -20 dBm to 0 dBm, 10 k ohm impedance; unbalanced, AC coupled. |
| ***Transmit Audio*** | -20 dBm to 0 dBm, 600 ohm impedance, unbalanced, AC coupled. |
| ***Channel Busy (COS)*** | Ground closure. |
| ***PTT*** | Open collector, 25 V max, 150 mA max. |
| ***Acknowledge Input*** | Ground closure. |
| ***Voice Quality*** | Digitized, toll quality, 32 kbps. |
| ***Power*** | +11.5 VDC to +28 VDC, 100 mA standby current, 10 mA per active relay. |
| ***Environment*** | -40°C to + 60°C, 95% relative humidity, non-condensing. |
| ***Physical*** | 6.5" x 8.5" x 2" Plug-in terminals |
| ***Approvals*** | FCC Part 68, FCC Part 15 - Class A, Industry Canada CS-03 Part I Issue 7, CSA C22.2 No 60950-00 / UL 60950, 3rd Edition |



## Appendix A - Programmable Features

| | |
|---|---|
| Alarm Messages | Unique Site ID plus individual messages for each input. Message length is variable |
| Alarm Polarity | Selects NO or NC input format |
| Alarm Latch | Latches fleeting alarm inputs |
| Alarm Debounce | Selects the delay time before a change of state on the input is valid. Range is 0.1 to 19.9 in either seconds or minutes |
| Alarm Directory | Selects one of four directories that contain command actions to be taken when the alarm is active. |
| Interval Timer | Two stage timer that uses 'A' interval 'A' times before switching to 'B' interval. Both 'A' and 'B' interval are adjustable up to 249 minutes. |
| Acknowledge Code | Stops the reporting sequence: 1 to 8 digits |
| Interrogate Code | Speaks alarms and relay state: 1 to 8 digits |
| Alarm On/Off Output Codes | Sent when an alarm becomes active (on) or when it returns to normal (off). Different codes for each alarm. 1 to 8 digits |
| Remote Alarm Input Codes | Simulate an alarm condition when received. Different codes for each alarm. 1 to 8 digits |
| Directory Control Code | Changes the alarms to use different directories; also referred to as shift change. Two modes are available: one where all alarms are assigned to Directory A and can be controlled to alternately use the other three directories and another where Directory A alternates with Directory B and Directory C alternates with Directory D. |
| Directory Commands | Each directory can have up to 20 lines of command sequences. The commands are executed when an alarm using the directory is active. The commands are:<br>‣ Dial - phone the programmed number.<br>‣ Voice - Speak the alarm messages<br>‣ Radio - turn on the radio transmitter<br>‣ Wait - Insert a pause: 1 to 249 seconds.<br>‣ 2 Tone - send a two tone page<br>‣ 5 Tone - send a five tone page |

| | |
|---|---|
| | ▸ 1 Tone - send a single tone<br>▸ Alert - send a beeping tone<br>▸ DTMF - send a string of digits<br>▸ Answer - monitor the call progress signals and wait for the called party to speak before announcing the alarm message. |
| Access Code | Password for dial-up access to programming:1 to 8 digits |
| Acknowledge Request | The acknowledge request at the end of the alarm annunciation can be disabled for use with public address systems. |
| Number of Rings | Sets the number of rings before the B1290 will answer the line: 1 to 8 rings or never. |
| Squelch Polarity | Sets the radio busy monitor to either high or low when busy. |
| Relay Voices | Voice messages that are returned when a relay is operated. |
| Disable Relay Voices | Relay voices are not spoken. |
| Relay On/Off Codes | DTMF codes that turn the relay on and off. Independent for each relay: 1 to 8 digits |
| Relay Timer | Makes the relay a timed type where it will remain on for the specified time after the On code is received. Range is 1 to 199 in either seconds or minutes |
| Relay Special Function | These automatic functions can be assigned to the relays:<br>▸ Relay 1: New (unacked) alarm on<br>▸ Relay 2: Any alarm on<br>▸ Relay 3: Alarm acknowledged (timed)<br>▸ Relay 4: Error |
| Pulse Dial | Forces dialing to be pulse instead of tone. |
| Number of Expanders | Sets the number of connected expanders. |
| Disable Expander ID | Stops the site ID in the expander from being spoken. |
| Audio Levels | Sets the gain for audio signals in the B1290 |



# Appendix B - Options

| | |
|---|---|
| B1256 | AC Adapter |
| B1290E | Expander module. Adds 8 inputs and 4 relays. Maximum of 7 expanders |
| Option 004 | External power pack with 120 VAC power supply, sealed battery and charger. 12 hour capacity in standby. Connection of the Option 004 power supply is shown in Figure 8. |

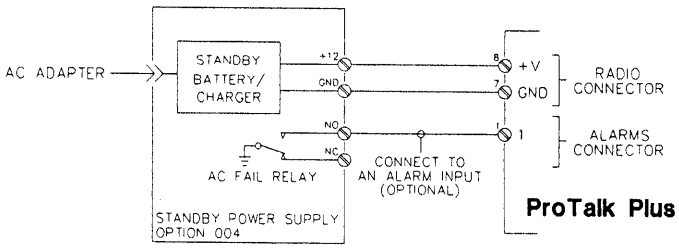
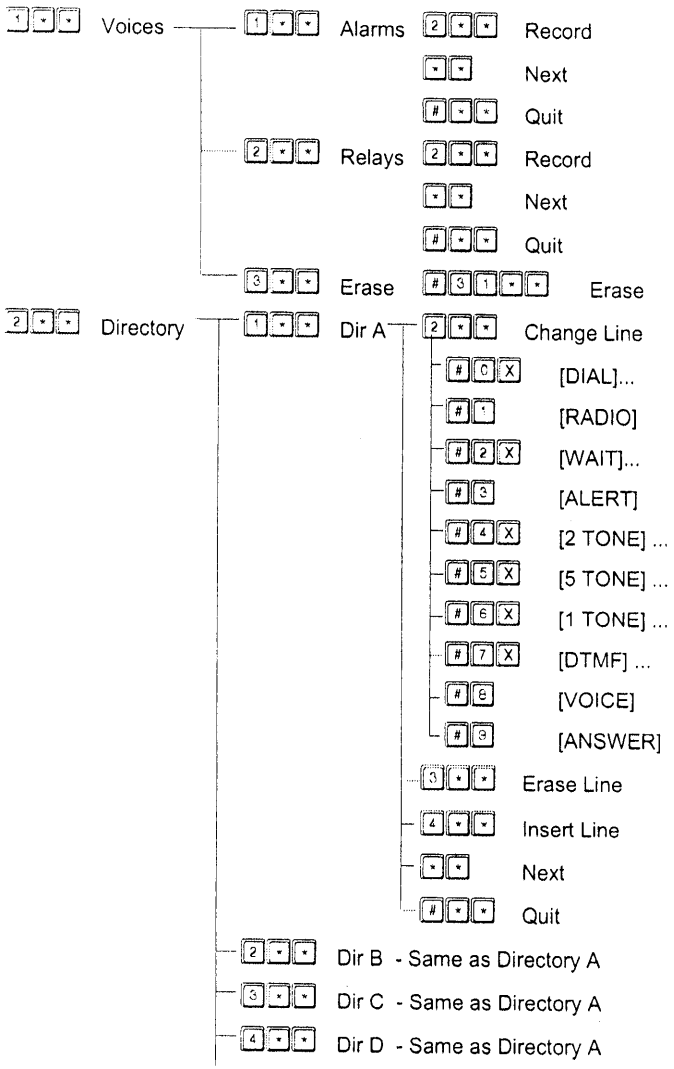


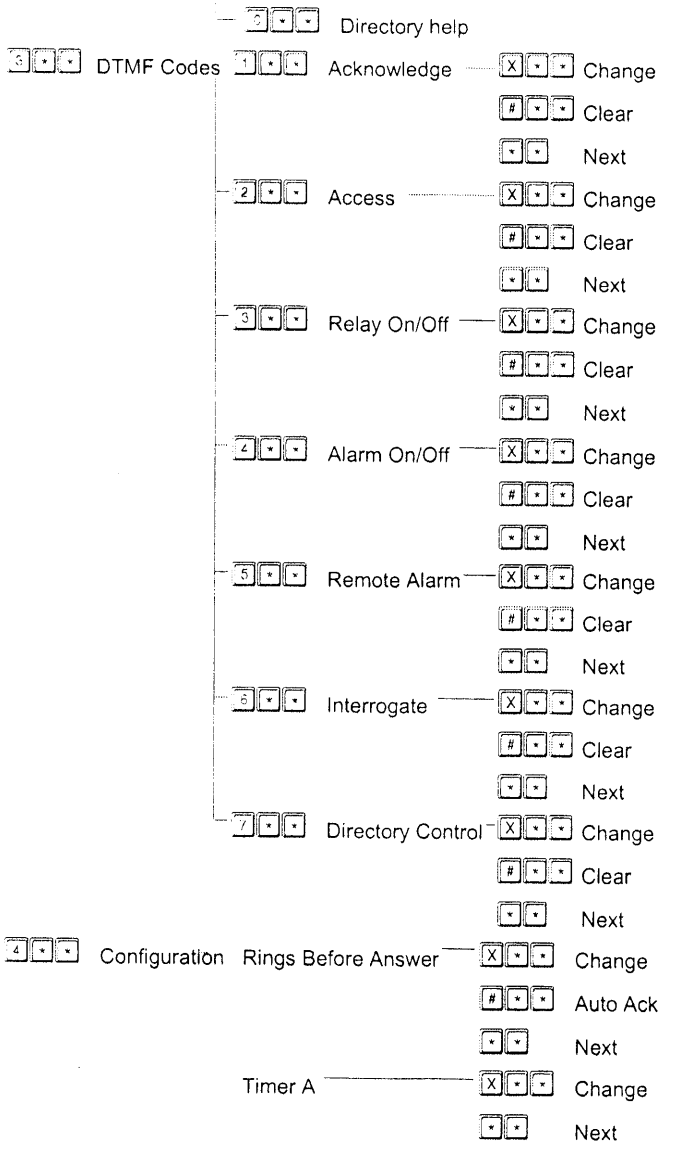

**Figure 8 Option 004 Connections**

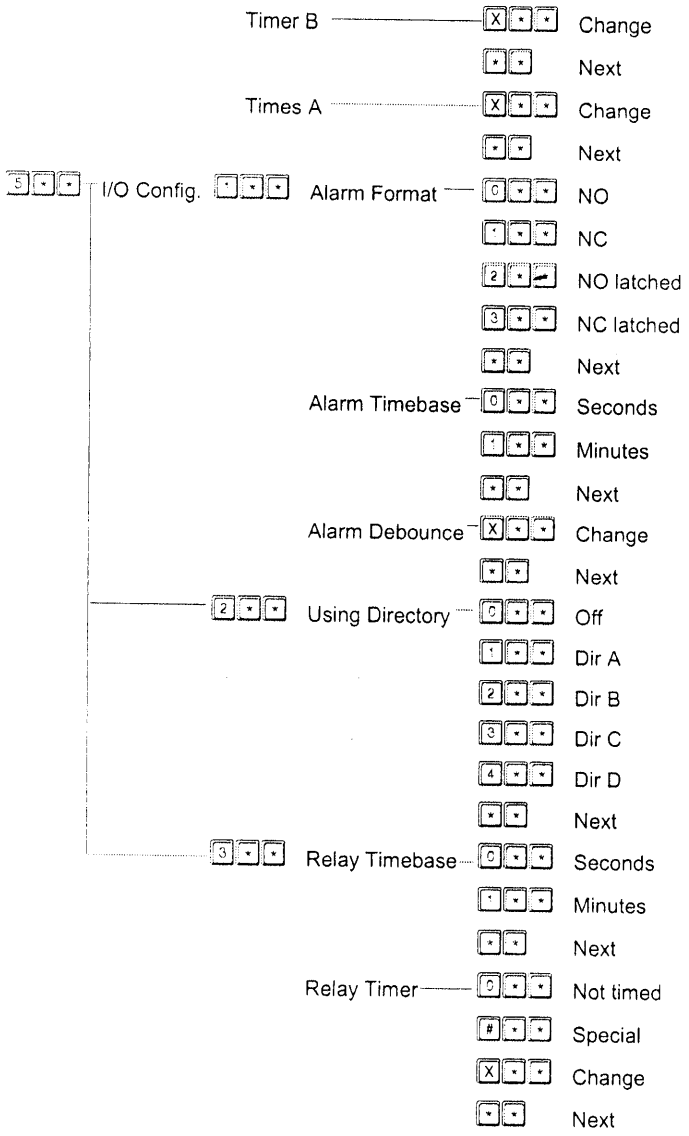
# Appendix C - Programming Tree

The parameters used to program the ProTalk Plus are given as a summary below. Where X appears, user data is entered

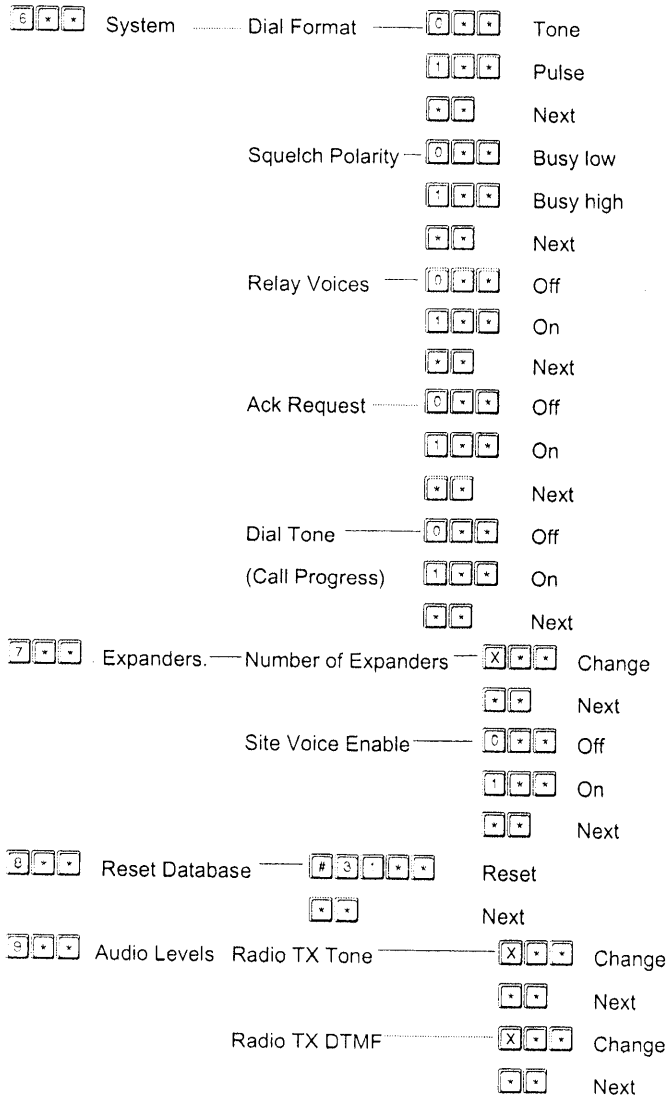


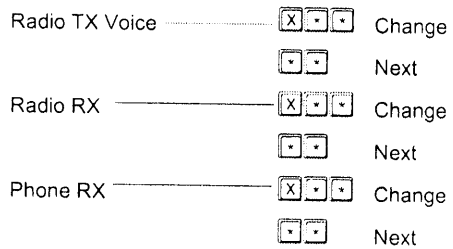



Timer B
Change
Next
Times A
Change
Next
5 I/O Config. 1
Alarm Format
NO
NC
NO latched
NC latched
Next
Alarm Timebase
Seconds
Minutes
Next
Alarm Debounce
Change
Next
2 Using Directory
Off
Dir A
Dir B
Dir C
Dir D
Next
3 Relay Timebase
Seconds
Minutes
Next
Relay Timer
Not timed
Special
Change
Next




6 System
Dial Format
Tone
Pulse
Next
Squelch Polarity
Busy low
Busy high
Next
Relay Voices
Off
On
Next
Ack Request
Off
On
Next
Dial Tone
(Call Progress)
Off
On
Next
7 Expanders.
Number of Expanders
Change
Next
Site Voice Enable
Off
On
Next
8 Reset Database
# 3 1
Reset
Next
9 Audio Levels
Radio TX Tone
Change
Next
Radio TX DTMF
Change
Next






# Appendix D - Mounting

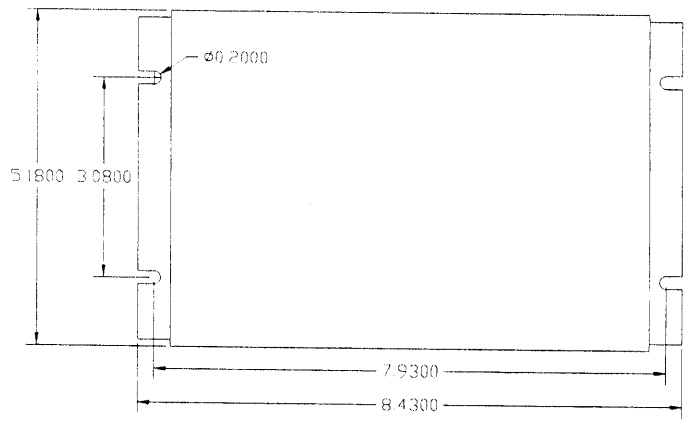



**Figure 9 Mounting Detail**

## Chapter 18 PLANT LEVEL TRANSMITTERS

**MANUFACTURER/DISTRIBUTOR:**
EVEREST AUTOMATION
277,BRUNWICK BLV.
POINTE-CLAIRE,QUE. H9R 4X5
PH:514-630-9290 FAX:6535

### 18.1 TIP SENSITIVE ULTRASONIC LEVEL CONTROL

Ultrasonic Tip Sensitive Magnetrol 910-A1A2-016 --- LSHH-103 (explosion proof type)

Ultrasonic Tip Sensitive Magnetrol 910-A1A2-010 --- LSHH-104 (explosion proof type)

**MANUFACTURER/DISTRIBUTOR:**
VISION-MILLTRONICS
358,RUE MCARTHUR
VILLE ST-LAURENT,QUE H4T 1X8
PH:514-733-1800 FAX:3830

### 18.2 MULTIRANGER "EJA530A-eas4n-02EE/CF1/D4/MV25VIS-4M"

### 18.3 XPS-10/15 F SERIES TRANSDUCER

**MANUFACTURER/DISTRIBUTOR:**
PROVAN
2315, HALPERN
ST-LAURENT,QUE. H4S 1S3
PH:514-332-3230 FAX:3552

### 18.4 ABSOLUTE PRESSURE TRANSMITTER EJA530A. "FEW TANK"

### 18.5 BLOCK AND BLEED MULTI PORT VALVE.

**END OF CHAPTER 18**

LSHH 103 → 10" Lonb
LSHH 104 → 16" Lonb

Magnetrol®

EVEREST

# ECHOTEL® 910

**Tip sensitive ultrasonic level control**

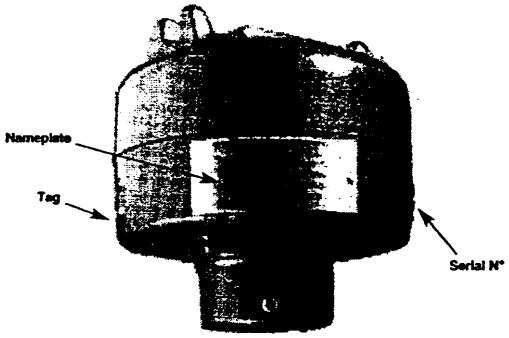
## INSTRUCTION MANUAL AND REPLACEMENT PARTS

**WARNING: NOT SUITABLE FOR USE IN AERATED/ADHESIVE PROCESSES**

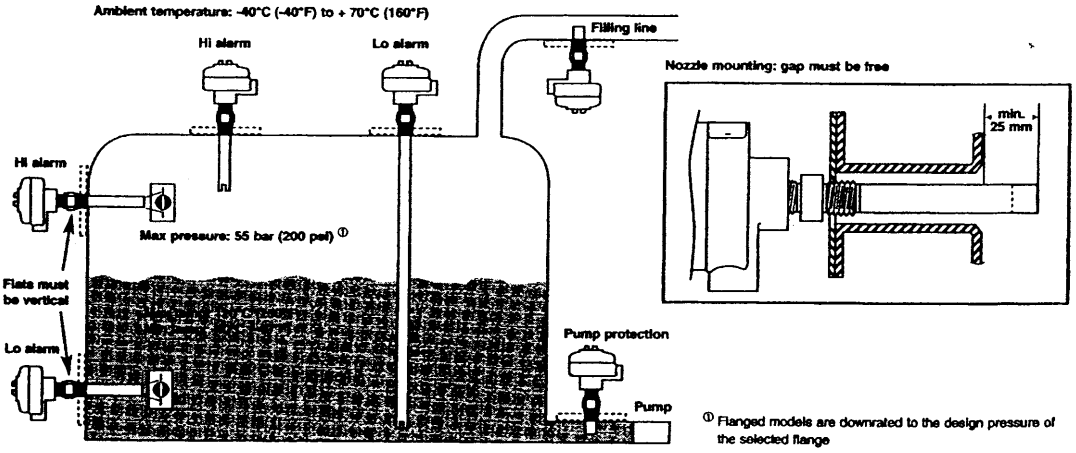
**Serial n°:** _____ **Tag n°:** _____

## UNPACKING

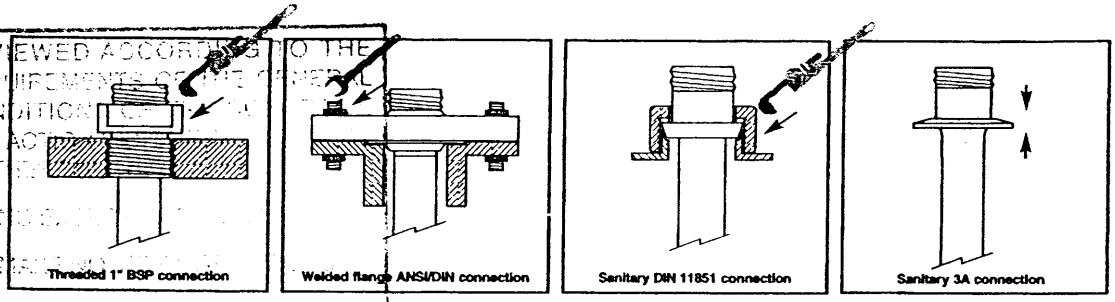
Unpack the instrument carefully. Make sure all components have been removed from the foam protection. Inspect all components for damage. Report any concealed damage to the carrier within 24 hours. Check the contents of the carton/crates against the packing slip and report any discrepancies to Magnetrol. Check the nameplate model number (Model number/approvals as per inserted separate sheet) to be sure it agrees with the packing slip and purchase order. Check and record the serial number for future reference when ordering parts.




## MOUNTING




① Flanged models are downrated to the design pressure of the selected flange




REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS ANY ACTION TO BE TAKEN

☑ [illegible]

☐ [illegible]

☐ [illegible]

☐ REJECTED

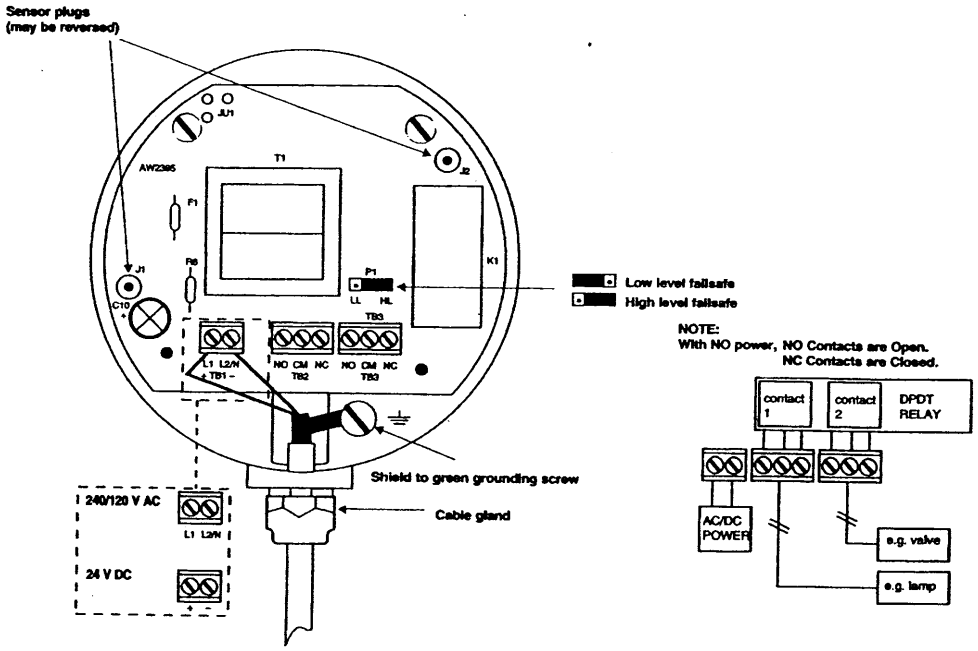
DATE 19 Aug 05 BY QC

EARTH TECH (CANADA) INC.

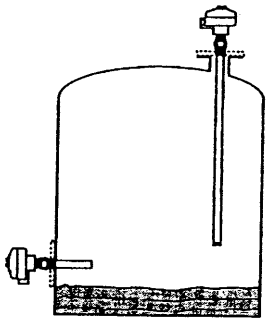
(1)

18.1

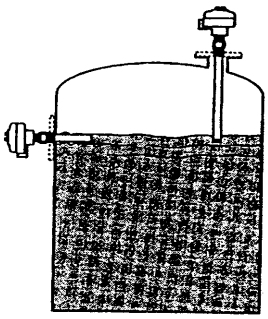
## WIRING




## FAILSAFE – ALARM STATUS



LOW LEVEL FAILSAFE



HIGH LEVEL FAILSAFE

## ELECTRICAL SPECIFICATIONS: 910

| *Description* | | *Specification* |
|---|---|---|
| Line Voltage (±10%) | | 240/120 V AC, 50-60 Hz or 24 V DC |
| Power Consumption | | 2.5 VA Nominal |
| Electronics Temperature | | -40°C to +70°C (-40°F to +160°F) |
| Process Pressure/Temperature | | 55 bar at -40°C to +120°C (800 PSIG at -40°F to +250°F) |
| Response Time | | 0.5 s. typical |
| Repeatability | | 2 mm. (0.078") |
| Output Relay | Goldflash relay | DPDT, 8.0 A resistive |
| | Hermetically sealed relay | DPDT, 5.0 A resistive |
| Housing | | IP 65, anti-corrosive painted, cast aluminium |
| Failsafe | | Field selectable high or low level alarm |
| ATEX (consult factory for FM/CSA approvals) | | ATEX II 1/2 G EEx d IIC T6 / EEx e II T6 |



(2)

18.1

## MODEL IDENTIFICATION

**A complete measuring system consists of:**

1. One code for ECHOTEL® series 910 electronics and transducer
2. Optional: Code for raised face mounting flanges, consult factory

### HOUSING MATERIALS OF CONSTRUCTION

| | | | |
|---|---|---|---|
| A | Standard – | 3/4" NPT | dual cable entry, anti corrosive coated aluminium, non-hazardous |
| V | ATEX – | 3/4" NPT | dual cable entry, anti-corrosive coated aluminium, explosion proof |
| W | ATEX – | M 20 x 1.5 | dual cable entry, anti corrosive coated aluminium, explosion proof |
| U | ATEX – | PG 13.5 | dual cable entry, anti corrosive coated aluminium, explosion proof |
| S | ATEX – | PG 16 | dual cable entry, anti corrosive coated aluminium, explosion proof |
| 5 | ATEX – | 3/4" NPT | single cable entry, stainless steel housing, explosion proof |

### PROCESS CONNECTION

| | |
|---|---|
| A | Threaded 3/4" NPT connection |
| 2 | Threaded 1" NPT connection |
| 9 | Threaded G1 (1" BSP) connection |
| 3 | Sanitary connection - 1 1/2" (compatible with Tri-Clover Tri-Clamp® fittings) |
| 4 | Sanitary connection - 2" (compatible with Tri-Clover Tri-Clamp® fittings) |
| 5 | Sanitary connection - Din 11851 DN 25 |
| 6 | Sanitary connection - Din 11851 DN 32 |
| 7 | Sanitary connection - Din 11851 DN 40 |
| 8 | Sanitary connection - Din 11851 DN 50 |
| 1 | Ansi flange raised flange - 1" 150 lbs |
| C | Ansi flange raised flange - 1 1/2" 150 lbs |
| D | Ansi flange raised flange - 2" 150 lbs |
| E | Ansi flange raised flange - 1" 300 lbs |
| F | Ansi flange raised flange - 1 1/2" 300 lbs |
| G | Ansi flange raised flange - 2" 300 lbs |
| H | Ansi flange raised flange - 1" 600 lbs |
| J | Ansi flange raised flange - 2" 600 lbs |
| K | Din flange Din 2527 Form B - DN 25/PN 16 |
| L | Din flange Din 2527 Form B - DN 40/PN 16 |
| M | Din flange Din 2527 Form B - DN 50/PN 16 |
| N | Din flange Din 2527 Form B - DN 25/PN 25 |
| P | Din flange Din 2527 Form B - DN 40/PN 25 |
| Q | Din flange Din 2527 Form B - DN 50/PN 25 |
| R | Din flange Din 2527 Form B - DN 25/PN 40 |
| S | Din flange Din 2527 Form B - DN 40/PN 40 |
| T | Din flange Din 2527 Form B - DN 50/PN 40 |
| U | Din flange Din 2527 Form E - DN 25/PN 64 |
| V | Din flange Din 2527 Form E - DN 40/PN 64 |
| W | Din flange Din 2527 Form E - DN 50/PN 64 |
| X | Din flange Din 2527 Form E - DN 25/PN 100 |
| Y | Din flange Din 2527 Form E - DN 40/PN 100 |
| Z | Din flange Din 2527 Form E - DN 50/PN 100 |

### INPUT POWER/RELAY

| | | | |
|---|---|---|---|
| 1 | 240 V AC/8 A DPDT goldflash relay | J | 240 V AC/5 A DPDT herm. sealed relay |
| 2 | 24 V DC/8 A DPDT goldflash relay | K | 24 V DC/5 A DPDT herm. sealed relay |
| 0 | 120 V AC/8 A DPDT goldflash relay | H | 120 V AC/5 A DPDT herm. sealed relay |

### TRANSDUCER SPECIFICATION PER CM (0.39") INCREMENTS

| | |
|---|---|
| 0 0 3 | 30 mm ( 1.2") - minimum insertion length |
| 0 0 5 | 50 mm ( 2.0") - min length for 1" BSP and flanged process connection |
| 2 5 4 | 2540 mm (100.0") - maximum length |

**Note:** Transducer lengths are measured in accordance with process connection style.
– Consult dimensional drawings on page 4.

9 1 0 – A M A 2 – 0 4 0 **complete code for Echotel 910 alarm switch**

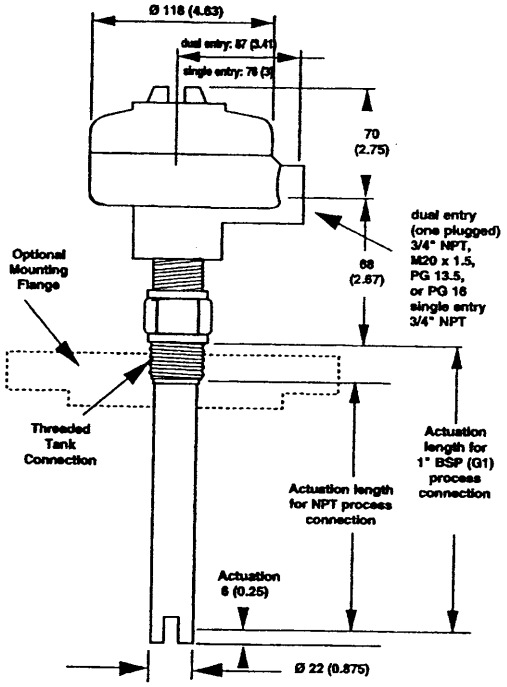
A1A2-016 (LENGTH IN INCH) AMERICAN PART #
A1A2-10 (LENGTH IN INCH)

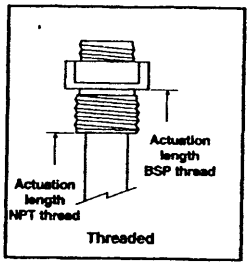


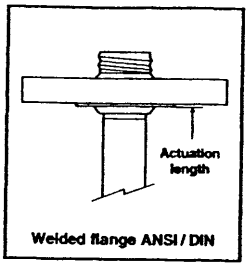
(3)

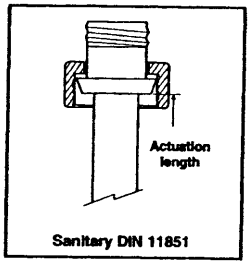
18.1

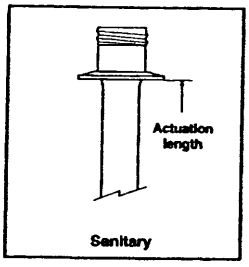
## DIMENSIONS



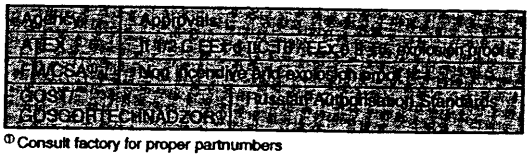



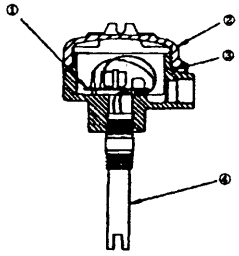




## AGENCY APPROVALS



① Consult factory for proper partnumbers

## REPLACEMENT PARTS




| No. | Description | | Part Number |
|---|---|---|---|
| 1 | PC board - goldflash relay | 240 V AC | 30-2043-004 |
| | | 120 V AC | 30-2043-003 |
| | | 24 V DC | 30-2043-002 |
| | PC board - hermetically sealed relay | 240 V AC | 30-2043-012 |
| | | 120 V AC | 30-2043-011 |
| | | 24 V DC | 30-2043-010 |
| 2 | Cover | | *Consult factory* |
| 3 | O-Ring | | 12-2101-345 |
| 4 | Transducer | | *Consult factory* |

UNDER RESERVE OF MODIFICATIONS

BULLETIN N°: BE 51-604.14
EFFECTIVE: SEPTEMBER 2003
SUPERSEDES: October 2001

Magnetrol®

WARRANTY 2 YEARS

ISO 9001

www.magnetrol.com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Tel. 02204 / 9536-0 • Fax. 02204 / 9536-53 • E-Mail: vertrieb@magnetrol.de

ITALIA Via Arese 12, I-20159 Milano
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INDIA E-22, Anand Niketan, New Delhi - 110 021
Tel. 91 (11) 6186211 • Fax 91 (11) 6186418 • E-Mail: magnetrolindia@vsnl.com


(4)

18.1

# Echotel®
# Model 910

**Installation and Operating Manual**

*Ultrasonic*

*Level*

*Switch*

Magnetrol®

STI

18.1

### Read this Manual Before Installing

This manual provides information on the Echotel Model 910 Ultrasonic Liquid Level Switches. It is important that all instructions are read carefully and followed in sequence. Detailed instructions are included in the Installation section of this manual.

### Conventions Used in this Manual

Certain conventions are used in this manual to convey specific types of information. General technical material, support data, and safety information are presented in narrative form. The following styles are used for notes, cautions, and warnings.

#### Notes

Notes contain information that augments or clarifies an operating step. Notes do not normally contain actions. They follow the procedural steps to which they refer.

#### Cautions

Cautions alert the technician to special conditions that could injure personnel, damage equipment, or reduce a component's mechanical integrity. Cautions are also used to alert the technician to unsafe practices or the need for special protective equipment or specific materials. In this manual, a caution box indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

#### Warnings

Warnings identify potentially dangerous situations or serious hazards. In this manual, a warning indicates an imminently hazardous situation which, if not avoided, could result in serious injury or death.

### Safety Messages

The Echotel Model 910 is designed for use in Category II, Pollution Degree 2 installations. Follow all standard industry procedures for servicing electrical and computer equipment when working with or around high voltage. Always shut off the power supply before touching any components. Although high voltage is not present in this system, it may be present in other systems.

Electrical components are sensitive to electrostatic discharge. To prevent equipment damage, observe safety procedures when working with electrostatic sensitive components.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

***WARNING!*** Explosion hazard. Do not connect or disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

### Low Voltage Directive

For use in Category II installations. If equipment is used in a manner not specified by manufacturer, protection provided by equipment may be impaired.

### Notice of Trademark, Copyright, and Limitations

Echotel is a registered tradename of Magnetrol International.

Copyright © 2005 Magnetrol International, Incorporated. All rights reserved.

Magnetrol/STI reserves the right to make changes to the product described in this manual at any time without notice. Magnetrol/STI makes no warranty with respect to the accuracy of the information in this manual.

### Warranty

All Magnetrol/STI Model 910 Level Switches are warranted free of defects in materials or workmanship for two full years from the date of original factory shipment.

If returned within the warranty period; and, upon factory inspection of the control, the cause of the claim is determined to be covered under the warranty; then, Magnetrol/STI will repair or replace the control at no cost to the purchaser (or owner) other than transportation.

Magnetrol/STI shall not be liable for misapplication, labor claims, direct or consequential damage or expense arising from the installation or use of equipment. There are no other warranties expressed or implied, except special written warranties covering some Magnetrol/STI products.

### Quality Assurance

The quality assurance system in place at Magnetrol/STI guarantees the highest level of quality throughout the company. Magnetrol/STI is committed to providing full customer satisfaction both in quality products and quality service.

Magnetrol's quality assurance system is registered to ISO 9001 affirming its commitment to known international quality standards providing the strongest assurance of product/service quality available.

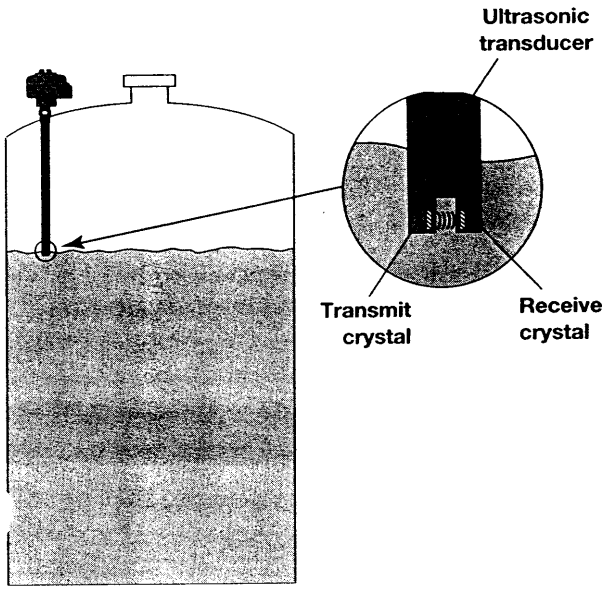
18.1

## 1.0 Introduction

Echotel Model 910 Level Switches utilize ultrasonic contact technology for measuring level in clean liquid applications.

## 1.1 Principle of Operation

The Model 910 Level Switch uses ultrasonic energy to detect the presence or absence of liquid in a transducer gap. The basic principle behind ultrasonic contact technology is that high-frequency sound waves are easily transmitted across a transducer gap in the presence of a liquid medium, but are severely attenuated when the gap is dry. The Model 910 uses an ultrasonic frequency of 3 MHz to perform this liquid level measurement in a wide variety of process media and application conditions.




Ultrasonic signal transmission across transducer gap

Figure 1

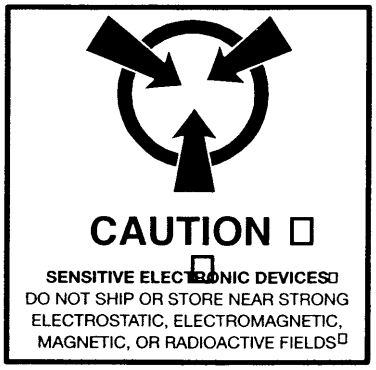
The transducer uses a pair of piezoelectric crystals that are encapsulated in epoxy at the tip of the 316 stainless steel transducer. The crystals are made of a ceramic material, that vibrates at a given frequency when subjected to an applied voltage. The transmit crystal converts an electrical signal from the Model 910 electronics into an ultrasonic signal. When liquid is present in the gap, the receive crystal is able to sense the ultrasonic signal from the transmit crystal and convert it back to an electrical signal. This signal is sent to the electronics to indicate the presence of liquid in the transducer gap. When there is no liquid present, the ultrasonic signal is attenuated, and is not detected by the receive crystal.

## 2.0 Installation

### 2.1 Unpacking

Unpack the instrument carefully. Inspect all units for damage. Report any concealed damage to carrier within 24 hours. Check the contents of the packing slip and purchase order. Check and record the serial number for future reference when ordering parts.

7
18.1




## 2.2 Electrostatic Discharge (ESD) Handling Procedure

Magnetrol/STI's electronic instruments are manufactured to the highest quality standards. These instruments use electronic components that may be damaged by static electricity present in most work environments.

The following steps are recommended to reduce the risk of component failure due to electrostatic discharge.

- Ship and store circuit boards in anti-static bags. If an anti-static bag is not available, wrap the board in aluminum foil. Do not place boards on foam packing materials.
- Use a grounding wrist strap when installing and removing circuit boards. A grounded workstation is recommended.
- Handle circuit boards only by the edges. Do not touch components or connector pins.
- Make sure that all electrical connections are completely made and none are partial or floating. Ground all equipment to a good, earth ground.

## 2.3 Preliminary Operational Check

After unpacking and before installation, perform the following operational check on the unit in a non-hazardous area:

1. Apply proper operating voltage to terminals L1 and L2/N. Power supply ground should be connected to the green ground screw in housing base.
2. Fill a suitable container with liquid.
3. Place transducer gap in the liquid. The relay output should actuate.
4. Remove transducer from the liquid. The relay output should de-actuate. In case of malfunction, consult *Section 3.1, Troubleshooting* on page 6.

**Caution:** This unit contains CMOS electronics which may become damaged by static electricity. Do not touch any semiconductor devices unless you are properly grounded.

## 2.4 Mounting

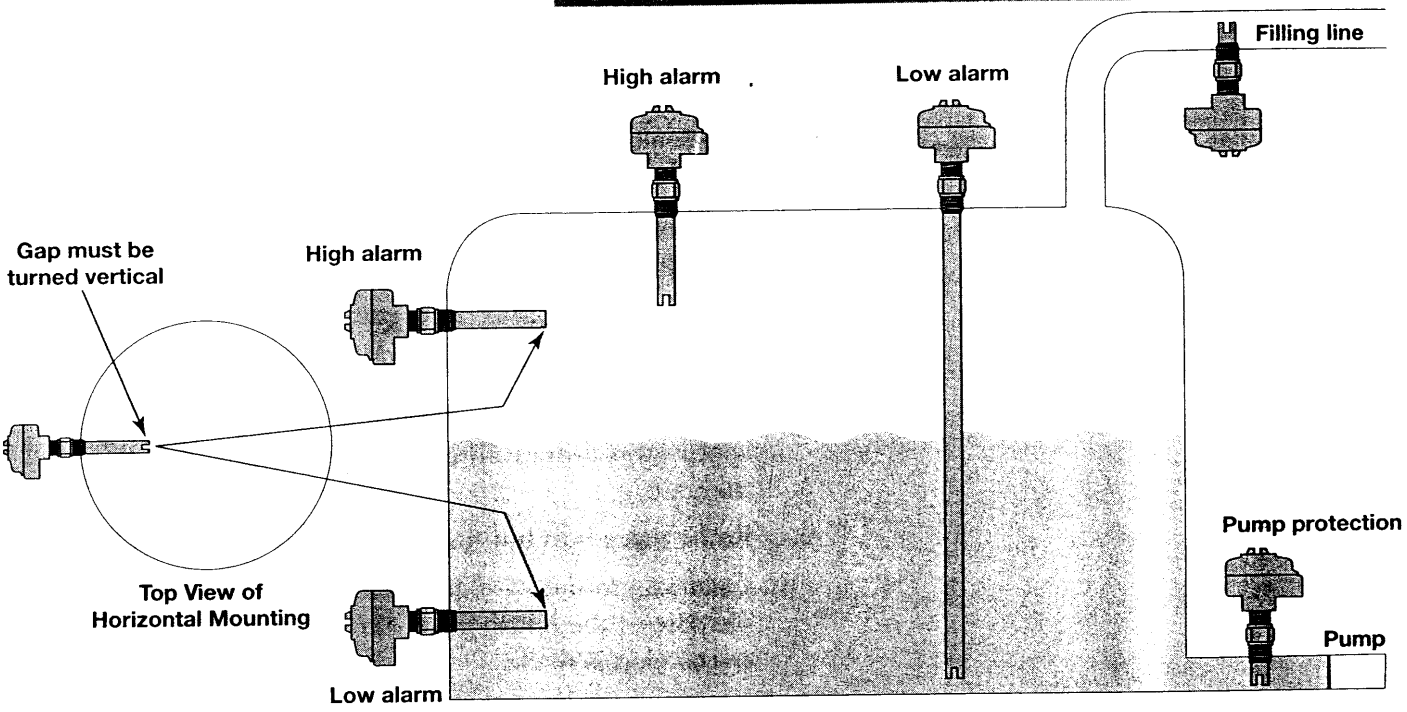



**Figure 2**
**Typical Mounting Orientations**

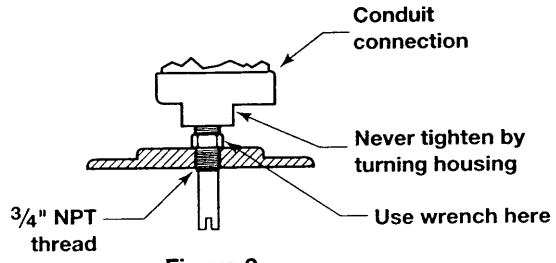



**Figure 3**
**Vertical Mounting**

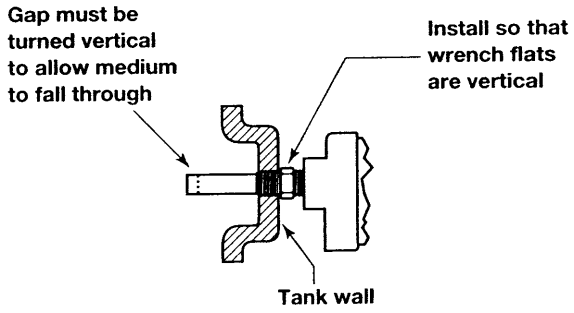



**Figure 4**
**Horizontal Mounting**

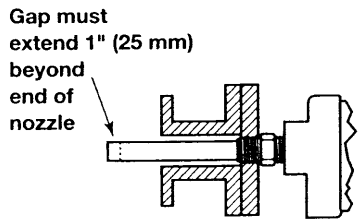



**Figure 5**
**Nozzle Mounting**

Model 910 level switches are shipped as integral units with the electronics assembled to the transducer. They may be mounted in a variety of positions as shown in Figures 2 through 5.

Proper orientation of the transducer gap will provide maximum performance in difficult applications. When the switch is mounted horizontally, the transducer gap must be turned vertical to allow proper drainage of the liquid media. See Figures 2 and 4.

Screw transducer into the opening using pipe compound or thread tape. If flanged, bolt unit to mating flange with proper gasket.

**Caution:** Never tighten unit on the tank connection by turning the housing. Use a wrench on the transducer mounting nut flats. Use thread tape or suitable pipe compound on the threads. Do not overtighten.

When installed in a nozzle or pipe, the transducer gap must extend into the tank at least one inch beyond the inside tank wall. Refer to Figure 5.

## 2.5 Wiring

### 2.5.1 Power

Power connèctions are made at the two-position terminal block labeled TB1 within the electronics enclosure. Use of 14–22 AWG twisted shielded pair wire is recommended.

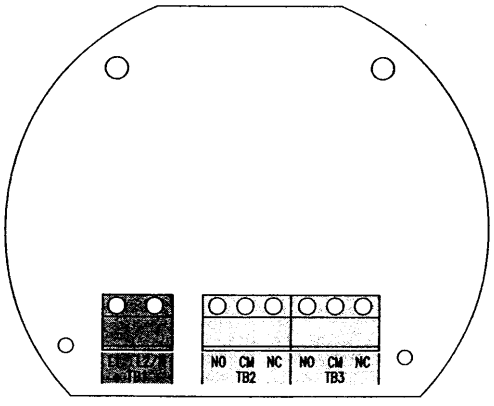
NOTE: Observe all applicable electrical codes and proper wiring procedures.

1. Make sure the power is turned off.
2. Unscrew and remove the housing cover.
3. Prevent moisture seepage into housing by installing an approved seal-drain fitting in the conduit run leading to the unit.
4. Route wires into housing.
5. Connect ground wire to green ground screw located in the base of the housing. DO NOT proceed until ground connection is made.
6. After grounding is complete, connect the power leads to proper terminals as follows:

| VAC Units | VDC Units |
|---|---|
| L1, L2/N | +, – |

**Caution:** In hazardous areas, do not power the unit until the conduit is sealed and the enclosure cover is screwed down securely.

7. Dress wiring to ensure no interference or contact with cover or circuit board components.

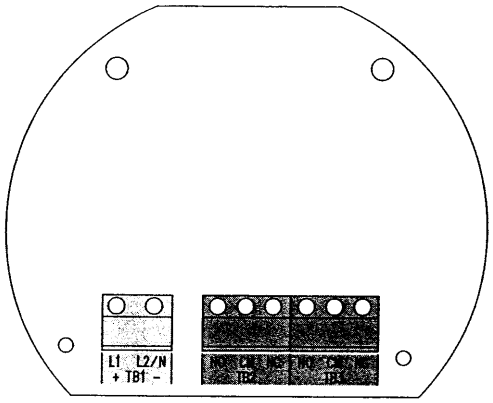



**TB1 Power Wiring**

## 2.5.2 Relay

Model 910 switches have a number of possible relay wiring options. The table below lists the relay contact positions for all possible combinations of power failure, condition of the transducer gap, and fail-safe jumper position. The user must decide which combinations constitute fail-safe and alarm conditions, and then select the appropriate relay wiring and fail-safe position.

1. Run relay output wiring to the terminal blocks labeled TB2 and TB3. Ensure that the load to be controlled is within the relay's rated capacity as shown in *Section 3.3.2, Electrical* on page 6.



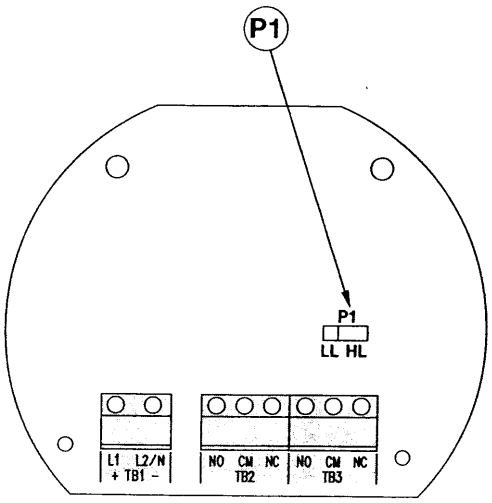

**Relay Output Wiring**

2. Select high or low fail-safe using the P1 jumper.

| P1 Fail-safe Jumper Position | Line Power | Transducer Gap | Relay Terminals | |
|---|---|---|---|---|
| | | | CM to NC | CM to NO |
| Low level | On | Dry | Closed | Open |
| | | Wet | Open | Closed |
| | Failure | Dry | Closed | Open |
| | | Wet | Closed | Open |
| High level | On | Dry | Open | Closed |
| | | Wet | Closed | Open |
| | Failure | Dry | Closed | Open |
| | | Wet | Closed | Open |

3. Replace housing cover. Installation is complete.

**Caution:** Never tighten unit to the tank connection by turning the housing. Use a wrench on the transducer mounting nut flats. Use thread tape or suitable pipe compound on threads. Do not over tighten.




**P1 Fail-safe Jumper**

# 3.0 Reference Information

## 3.1 Troubleshooting

**Caution:** In hazardous areas, do not remove housing cover until power is disconnected and atmosphere is determined to be safe.

### 3.1.1 No signal with level change

a. Verify power and control circuit wiring.
b. Make sure liquid is filling the transducer gap.
c. Check for dense foam on surface or dried product in the gap. Unit will not function properly if either condition exists.
d. Check transducer phone plugs for proper insertion in J1 and J2.
e. If control circuit does not actuate, consult factory.

### 3.1.2 Calibration

Model 910 switches do not require field calibration. The set point is not adjustable.

### 3.1.3 Switch chatter

a. Check voltage to make sure it is within tolerances shown in Section 3.3.2.
b. Check for turbulence. Relocate control or isolate from turbulence.
c. Check for excessive aeration.
d. Consult factory.

### 3.1.4 Control output will not de-actuate

a. Check transducer for plugged gap.
b. Check for dense foam or liquid in gap.
c. If control circuit does not de-actuate, consult factory.

## 3.2 Agency Approvals

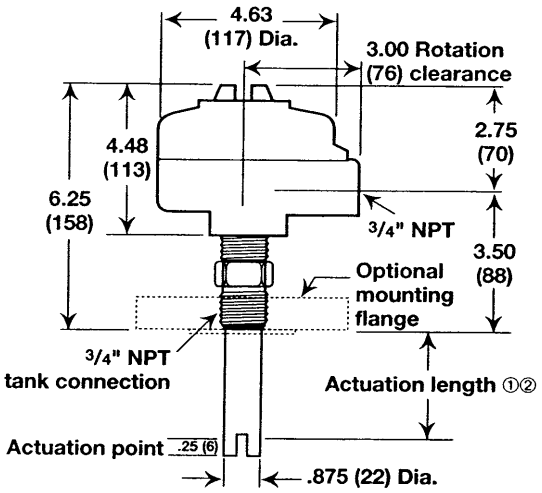
| AGENCY | APPROVED MODEL | PROTECTION METHOD | AREA CLASSIFICATION |
|---|---|---|---|
| **FM** FM APPROVED | 910-XXXX-XXX | Explosion Proof | Class I, Div. 1; Groups C & D<br>Class II, Div. 1; Groups E, F, & G<br>Class III, NEMA Type 4X |
| | 910-XXXX-XXX | Non-Incendive | Class I, Div. 2; Groups A, B, C, & D<br>Class II, Div. 2; Groups F & G<br>Class III, NEMA Type 4X |
| **CSA** | 910-XXXX-XXX | Explosion Proof | Class I, Div. 1; Groups C & D<br>Class II, Div. 1; Group E, F, & G<br>Class III, Type 4X |
| | 910-XXXX-XXX | Non-Incendive | Class I, Div. 2; Groups A, B, C, & D<br>Class II, Div. 2; Groups E, F, & G<br>Class III, Type 4X |
| **ATEX** | 910-5XXX-XXX<br>910-PXXX-XXX | | Ⓔx II 1/2 G EEx d II C T6/EEx e II T6 |

CE These units have been tested to EN 50081-2 and EN 50082-2 and are in compliance with the EMC Directive 89/336/EEC.

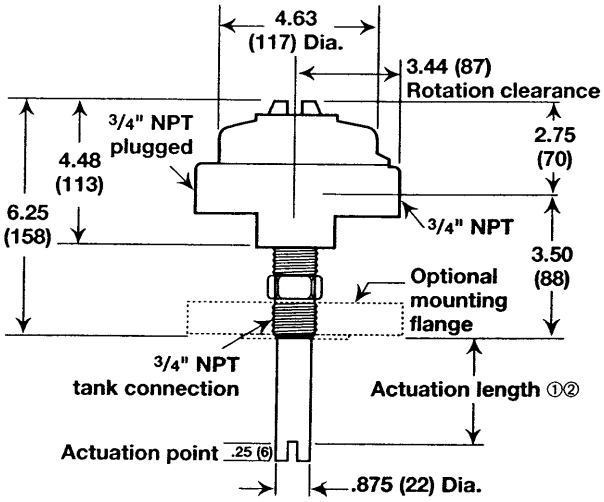
## 3.3 Specifications

### 3.3.1 Physical

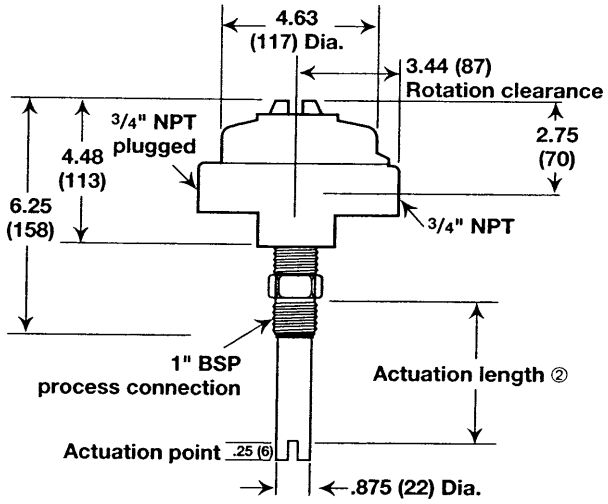
inches (mm)



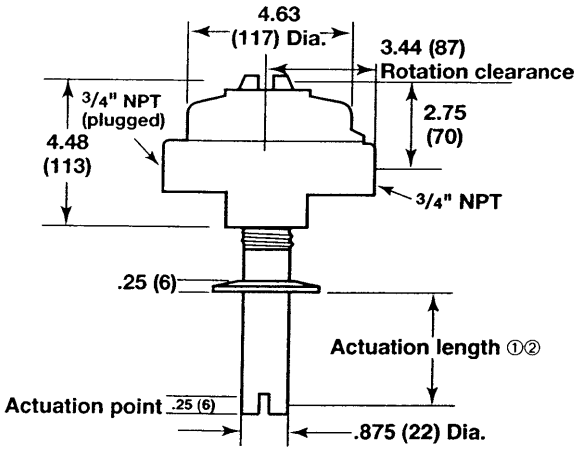

316 stainless steel housing
(Single 3/4" NPT conduit)




Aluminum sand cast housing
(Dual 3/4" NPT conduits)




Aluminum sand cast housing
(Dual 3/4" NPT conduit w/1" BSP process connection)




Aluminum sand cast housing
(Dual 3/4" NPT conduit with sanitary flange)

① 1" (Code 001) minimum with NPT threaded process connections.
2" (Code 002) minimum with sanitary or ANSI flanged process connections.

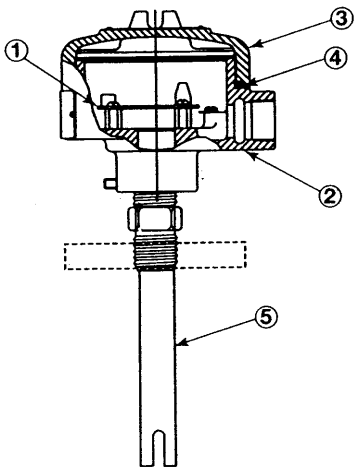
② 25 (Code 003) mm minimum with NPT threaded process connections.
50 (Code 005) mm minimum with 1" BSP, and sanitary or ANSI flanged process connections.

### 3.3.2 Electrical

| | |
|---|---|
| Power Supply: | 120 VAC (+10%/-15%), 50/60 Hz<br>240 VAC (+10%/-15%), 50/60 Hz<br>24 VDC (±10%) |
| Power Consumption: | 2.5 VA nominal |
| Relay Output: | Gold flash DPDT relay: 10 amps @ 120 VAC, 240 VAC, 24 VDC ①<br>Hermetically sealed DPDT relay: 5 amps @ 120 VAC, 24 VDC, and 3 amps @ 240 VAC |
| Repeatability: | 0.078" (2 mm) |
| Fail-safe Configuration: | Field selectable high or low |
| Calibration: | None required |
| Ambient Temperature: | Electronics: -40° to +160° F (-40° to +71° C) |
| Process Temperature: | Transducer: -40° to +250° F (-40° to +121° C) |
| Operating/Non-Operating Pressure: | 800/1500 psig (55/103 bar) |
| Shock | ANSI/ISA-S71.03 Class SA1 |
| Vibration | ANSI/ISA-S71.03 Class VC2 |

① Gold flash DPDT relay is rated at 8 amps when used with Housing codes 5 or P

## 3.4 Replacement Parts




| No. | | Description | Part Number |
|---|---|---|---|
| 1 | PC Board | 120 VAC w/10 amp relay | Z30-2043-003 |
| | | 240 VAC w/10 amp relay | Z30-2043-004 |
| | | 24 VDC w/10 amp relay | Z30-2043-002 |
| | | 120 VAC w/5 amp HS relay | Z30-2043-011 |
| | | 240 VAC w/3 amp HS relay | Z30-2043-012 |
| | | 24 VDC w/5 amp HS relay | Z30-2043-010 |
| 2 | Housing Base | Aluminum w/FM and CSA | 004-9182-002 |
| | | Aluminum w/all 3 approvals | 004-9182-008 |
| | | 316 SS w/FM and CSA | 004-9140-001 |
| | | 316 SS w/CENELEC | 004-9140-001 |
| 3 | Housing Cover | Aluminum w/FM and CSA | 004-9105-001 |
| | | Aluminum w/all 3 approvals | 004-9105-005 |
| | | 316 SS w/FM and CSA | 004-9142-001 |
| | | 316 SS w/CENELEC | 004-9142-001 |
| 4 | O-Ring | | 012-2101-345 |
| 5 | Transducer | | Consult factory |

***WARNING!*** Explosion hazard — Substitution of components may impair suitability for Class 1, Division 2 rating.

***WARNING!*** Explosion hazard — Do not disconnect equipment unless power has been switched off, or the area is known to be non-hazardous.

## 3.5 Model Numbers

### 3.5.1 Model 910

**HOUSING**

| | |
|---|---|
| A | Aluminum sand cast with ¾" NPT dual conduit, FM and CSA approvals |
| Y | 316 stainless steel with ¾" NPT single conduit, FM and CSA approvals |
| P | Aluminum sand cast with ¾" NPT dual conduit, FM, CSA and ATEX approvals |
| 5 | 316 stainless steel with ¾" NPT single conduit, ATEX approval |

**TRANSDUCER UNIT OF LENGTH**

| | |
|---|---|
| 1 | English (actuation length in inches) |
| M | Metric (actuation length in centimeters) |

**PROCESS CONNECTION**

| | |
|---|---|
| A | ¾" NPT |
| 2 | 1" NPT |
| 9 | 1" BSP |
| 3 | 1½" sanitary flange, 16 amp (Compatible with Tri-Clover Tri-Clamp® fittings) |
| 4 | 2" sanitary flange, 16 amp (Compatible with Tri-Clover Tri-Clamp® fittings) |
| 1 | 1" 150 lb. ANSI raised face flange |
| C | 1½" 150 lb. ANSI raised face flange |
| D | 2" 150 lb. ANSI raised face flange |
| E | 1" 300 lb. ANSI raised face flange |
| F | 1½" 300 lb. ANSI raised face flange |
| G | 2" 300 lb. ANSI raised face flange |

**INPUT POWER**

| | |
|---|---|
| 0 | 120 VAC with 10 amp DPDT gold flash relay |
| 1 | 240 VAC with 10 amp DPDT gold flash relay |
| 2 | 24 VDC with 10 amp DPDT gold flash relay |
| H | 120 VAC with 5 amp DPDT hermetically sealed relay |
| J | 240 VAC with 3 amp DPDT hermetically sealed relay |
| K | 24 VDC with 5 amp DPDT hermetically sealed relay |

**ACTUATION LENGTH**

| |
|---|
| 1" to 96" in 1" increments (with Transducer Unit of Length code 1) Example: 4 inches = 004 ① ③ |
| 3 cm to 244 cm in 1 cm increments (with Transducer Unit of Length code M) Examples: 6 centimeters = 006 ② ③ |

| 9 | 1 | 0 | — | | | . | | | — | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

① 1" (code 001) minimum with NPT process connections, 2" (code 002) minimum with sanitary or ANSI flanged process connections.

② 2.5 cm (code 003) minimum with NPT process connections, 5 cm (code 005) minimum with 1" BSP, or sanitary or ANSI flanged process connections.

③ Consult factory for longer lengths.

## Service Policy

Owners of Magnetrol/STI controls may request the return of a control or any part of a control for complete rebuilding or replacement. They will be rebuilt or replaced promptly. Controls returned under our service policy must be returned by Prepaid transportation. Magnetrol/STI will repair or replace the control at no cost to the purchaser (or owner) other than transportation if:

1. Returned within the warranty period; and
2. The factory inspection finds the cause of the claim to be covered under the warranty.

If the trouble is the result of conditions beyond our control; or, is NOT covered by the warranty, there will be charges for labor and the parts required to rebuild or replace the equipment.

In some cases it may be expedient to ship replacement parts; or, in extreme cases a complete new control, to replace the original equipment before it is returned. If this is desired, notify the factory of both the model and serial numbers of the control to be replaced. In such cases, credit for the materials returned will be determined on the basis of the applicability of our warranty.

No claims for misapplication, labor, direct or consequential damage will be allowed.

## Return Material Procedure

So that we may efficiently process any materials that are returned, it is essential that a "Return Material Authorization" (RMA) number be obtained from the factory, prior to the material's return. This is available through Magnetrol/STI's local representative or by contacting the factory. Please supply the following information:

1. Company Name
2. Description of Material
3. Serial Number
4. Reason for Return
5. Application

Any unit that was used in a process must be properly cleaned in accordance with OSHA standards, before it is returned to the factory.

A Material Safety Data Sheet (MSDS) must accompany material that was used in any media.

All shipments returned to the factory must be by prepaid transportation.

All replacements will be shipped F.O.B. factory.

NOTE: See Electrostatic Discharge Handling Procedure on page 2.

Magnetrol

5300 Belmont Road • Downers Grove, Illinois 60515-4499 • 630-969-4000 • Fax 630-969-9489 • www.magnetrol.com
145 Jardin Drive, Units 1 & 2 • Concord, Ontario Canada L4K 1X7 • 905-738-9600 • Fax 905-738-1306
Heikensstraat 6 • B 9240 Zele, Belgium • 052 45.11.11 • Fax 052 45.09.93
Regent Business Ctr., Jubilee Rd. • Burgess Hill, Sussex RH15 9TL U.K. • 01444-871313 • Fax 01444-871317

STI

5300 Belmont Road • Downers Grove, Illinois 60515-4499 • 630-969-4028 • Fax 630-969-9489 • www.sticontrols.com

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BULLETIN: 51-604.14
EFFECTIVE: January 2005
SUPERSEDES: July 2004

## Siemens Milltronics Process Instruments

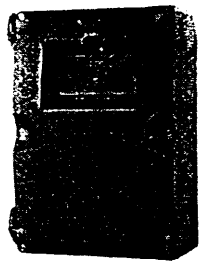
# *MultiRanger*

MultiRanger is a high-performance ultrasonic level controller that offers reliable and consistent performance. Using non-contacting ultrasonic technology, it provides continuous level measurement for virtually any short- to medium-range application up to 15 m (50 ft). MultiRanger can be used on a wide range of materials, including fuel oil, municipal waste, acids, woodchips, or on materials with high angles of repose.

MultiRanger offers true dual point monitoring, digital communications with built-in Modbus RTU via RS-485, as well as compatibility with Dolphin Plus, allowing PC configuration and set-up. MultiRanger features Sonic Intelligence® advanced echo-processing software for increased reading reliability.

MultiRanger 100 offers cost-effective level alarming, as well as on/off and alternating pump control. MultiRanger 200 will monitor open channel flow and features more advanced relay alarming and pump control functions as well as volume conversion.

It is compatible with chemical-resistant Echomax® transducers that can be used in hostile environments at temperatures as high as 145°C (293°F).



LE/LIT-101
LE/LIT-102

### Product Features

- Digital communications with built-in Modbus RTU via RS-485
- Compatible with SmartLinx system and Dolphin Plus configuration software
- Dual point level monitoring (optional)
- 3 relays standard, 6 relays optional
- Differential transducer input for improved signal-to-noise ratio
- MultiRanger 100: level measurement , simple pump control and level alarming
- MultiRanger 200: level, volume, open channel measurement, differential, advanced pump control and alarming

LEVEL MEASUREMENT
CONTINUOUS LEVEL

## *Technical Specifications*

**Power**
- ac version: 100-230 Vac ± 15%, 50 / 60 Hz, 36 VA (17W)
- dc version: 12-30 Vdc (20W)

**Environment**
- location: indoor/outdoor
- altitude: 2000 m max.
- ambient temperature: -20 to 50°C (-5 to 122°F)
- relative humidity: suitable for outdoor (Type 4X / NEMA 4X / IP65 enclosure)
- installation category: II
- pollution degree: 4

**Range**
- 0.3 to 15 m (1 to 50 ft) dependent on transducer

**Accuracy**
- 0.25% of maximum range or 6 mm (0.24"), whichever is greater

**Resolution**
- 0.1% of program range* or 2 mm (0.08"), whichever is greater

**Programming**
- primary: hand held programmer
- secondary: PC running Dolphin Plus software

**Display**
- 100 x 40 mm (4 x 1.5") multi-field back lit LCD

**Enclosure**
- Type 4X / NEMA 4X / IP65, polycarbonate

**Temperature Compensation**
- Range: -40 to 150°C (-58 to 302°F)
- Source: integral transducer sensor, TS-3 temperature sensor, ANY programmable fixed temperature

**Temperature Error**
- sensor: 0.09% of range
- fixed: 0.5% / °C deviation from programmed value

**Outputs**

**mA outputs (2)**
- 0-20 mA or 4-20 mA, max. loading 750 Ω, 0.1% resolution, isolated

**Transducer Drive**
- 315 V peak

**Relays**
- three, 2 Form 'A' / 1 Form 'C'
- six, 4 Form 'A' / 2 Form 'C'
- all relays rated 5A at 250 V ac, non-inductive

**Communication**
- RS-232 running Modbus RTU or ASCII via RJ-11 connector
- RS-485 running Modbus RTU or ASCII via terminal blocks
- optional: Smartlinx® cards or RS-485 modem kit

**Inputs**

**mA (analog) (1) (MultiRanger 200 only)**
- 0-20 or 4-20 mA, from alternate device, scaleable

**Discrete (2)**
- 10-50 Vdc switching level
- logical 0= <0.5 Vdc
- logical 1 = 10 to 50 Vdc
- 3 mA maximum draw

**Transducer**
- compatible models: Echomax® series and ST-H series (44 kHz)

**Cable**
- transducer and mA output signal to be 2-3 copper conductors, twisted, with shield** and drain wire, 300V 0.5-0.75mm$^2$ (22-18AWG)

**Weight**
- 1.37 kg (3.02 lbs)

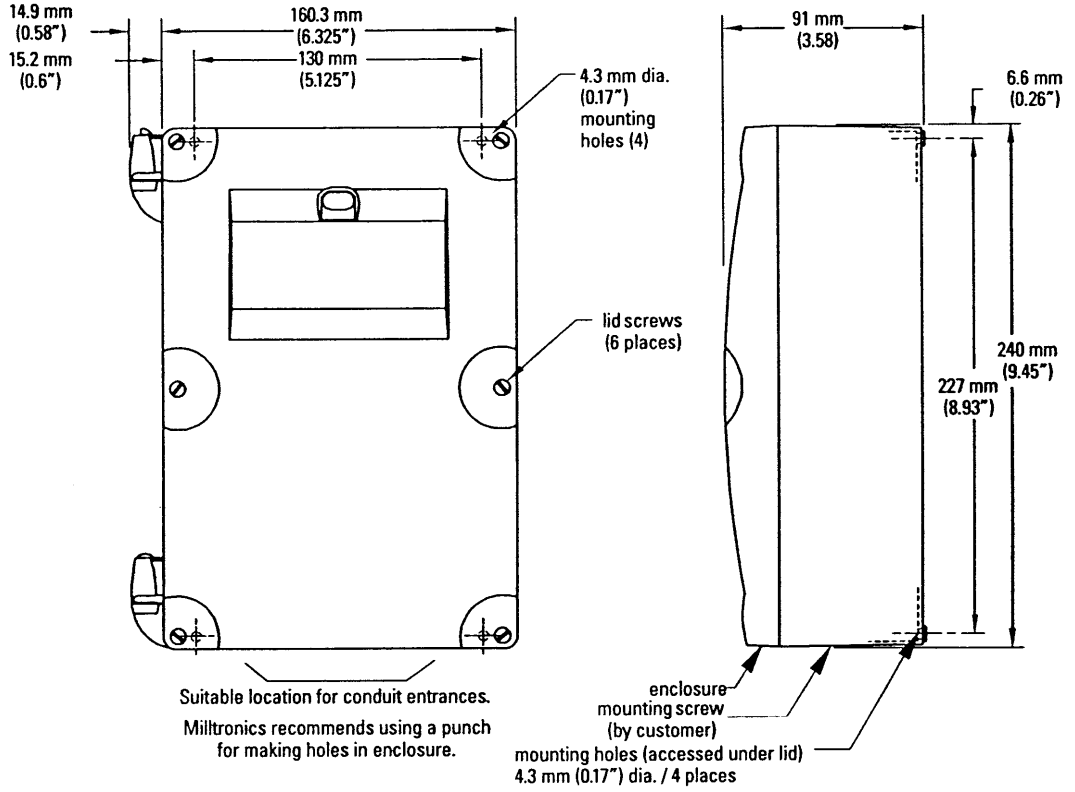
**Approvals**
- CE***, FM, CSA$_{US/C}$, UL Listed
- CSA Class I, Div. 2, Group A, B, C and D; Class II, Div. 2, Group F and G; Class III (pending)

* Program range is defined as the empty distance to the face of the transducer plus any range extension.
** Shielding preferred - braided screen
***EMC performance available upon request.
*Specifications are subject to change without notice.*

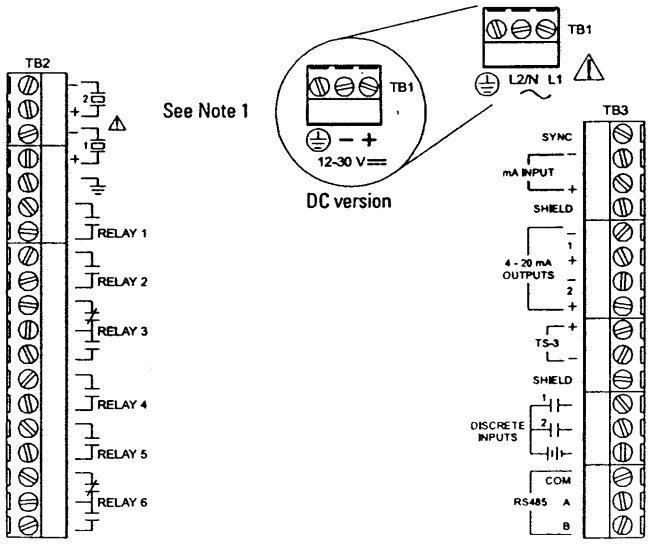
REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT. ANY PROGRAMMING INDICATED IS SUBJECT TO SPECIFIC REQUIREMENTS.
☑ NO EXCEPTIONS TAKEN
☐ MAKE NOTED CORRECTIONS
☐ REVISE & RESUBMIT
☐ REJECTED
DATE July 21/05 BY SDK
EARTH TECH (CANADA) INC.

# MultiRanger

## Dimensions




## Wiring




Relays shown in de-energized position.

### Notes

1) *Use 2-3 copper conductors, twisted with shield, for extensions up to 365 m (1200 ft). Run in grounded metal conduit, separate from other wiring.*

- Verify that all system components are installed in accordance with instructions.
- Connect all cable shields to the MultiRanger Shield Connections. Avoid differential ground potentials by not connecting cable shields to ground (earth) anywhere else.
- Keep exposed conductors on shielded cables as short as possible to reduce noise on the line caused by stray transmissions and noise pickup.

Flow Line Options
PO Box 1115
Medina, OH 44258
Phone/Fax: 330-722-2552
www.flo-corp.com
mailto:sales@flo-corp.com

JOB; WASTE WATER TREATMENT PLANT AT IQUALUIT, NUNAVUT
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK, PER; C.FAUTEUX, P.Eng
G.FAUTEUX, P.ENG.
P.A.PELLETIER,P.ENG. PAP.

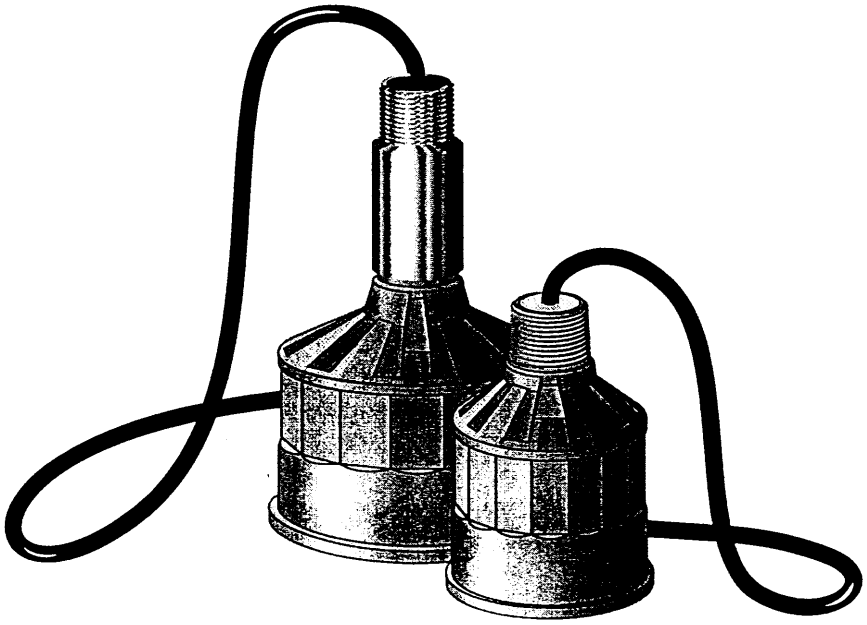
(2)

18.2

MILLTRONICS

# XPS-10/15 F SERIES TRANSDUCER

Instruction Manual PL-551 January 2001



JOB; WASTE WATER TREATMENT
PLANT AT IQUALUIT, NUNAVUT
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK, PER; C.FAUTEUX, T.P.f
G.FAUTEUX, P.ENG.cf
P.A.PELLETIER,P.ENG.PAP

33455510
Rev. 2.2

1/27 18.3

**Safety Guidelines**

Warning notices must be observed to ensure personal safety as well as that of others, and to protect the product and the connected equipment. These warning notices are accompanied by a clarification of the level of caution to be observed.

**Qualified Personnel**

This device/system may only be set up and operated in conjunction with this manual. Qualified personnel are only authorized to install and operate this equipment in accordance with established safety practices and standards.

**Warning:** This product can only function properly and safely if it is correctly transported, stored, installed, set up, operated, and maintained.

**Note:** Always use product in accordance with specifications.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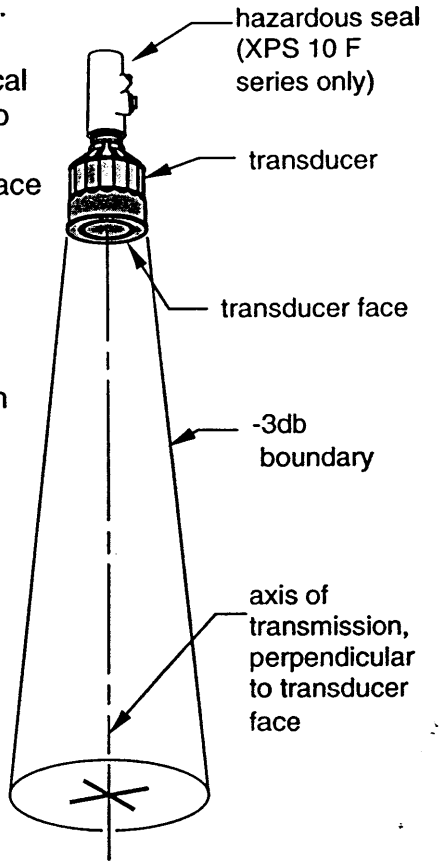
4

# About Milltronics' Transducers

The Echomax XPS F series of transducers operates in association with Milltronics ultrasonic level monitoring products.

The transducer operates by converting electrical pulses that are provided by the transceiver into *ultrasonic pulses*. When transmitted, these ultrasonic pulses reflect from the material surface and echo back to the transducer. The echo is converted back to an electrical signal, and is interpreted by the Milltronics tranceiver using our proven Sonic Intelligence™ algorithms.




The effective acoustical energy is emitted from the transducer face and radiated outward, decreasing in amplitude at a rate inversely proportional to the square of the distance.

Maximum power is radiated axially (perpendicular) from the transducer face in a line referred to as the axis of transmission. Where power is reduced by half (– 3 dB), a conical boundary defining the sound beam, centered about the axis of transmission, is established. The diametric measurement of the cone in degrees defines the beam angle. Impedance matching techniques are used to optimize the transfer of power from the transducer into air and vice versa.

The XPS F series transducers incorporate an integral temperature sensor that reports the air temperature at the transducer to the transceiver. The connection is transparent, in that both the ultrasonic and temperature components of the transducer use the same leads.

## Hazardous Area Applications

The Echomax XPS F series of transducers can be used in hazardous areas.

For the XPS 10 F series transducer, a hazardous seal must be used to suit hazardous area classification. This seal is **not** supplied by Milltronics.

The XPS 15 F comes equipped with a stainless steel coupling suitable for use in hazardous locations.



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# Specifications

## XPS 10 F Series Transducers

### Measurement Range:

- 0.3 – 10m (1 – 33ft)

### Frequency:

- 43kHz

### Beam Angle:

- 12°

### Environmental

- location: indoor/outdoor
- altitude: 2000m maximum
- ambient temperature: -20 to 95°C (-4 to 203°F)
- pollution degree: 4

### Construction

- exposure: Kynar®[1]
- colour: slate gray
- mounting: 1" NPT conduit connection
- options:
  - factory flange to suit ANSI standard
  - submergence shield, where flooding can occur
  - split flange for field mounting to suit ANSI
- cable: 2-wire shielded / twisted, 0.5 $mm^2$ (20 AWG) PVC jacket

### Supply Source

- Transducer shall only be supplied by a Milltronics certified controller.

### Weight[2]

- 0.8kg (1.8lb)

### Separation

- 365m (1200ft) from transducer

### Approvals

- FM Class 1 Div 1, Group A, B, C and D
- FM Class 2 Div 1, Group E, F, and G
- see nameplate or consult Milltronics for other current approvals

---

[1] Kynar® is registered trade mark of ELF Atochem.
[2] approximate shipping weight of transducer with standard cable length





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# XPS 15 F Series Transducers

Specifications

## Measurement Range:

- 0.45 – 15m (1.5 – 50ft)

## Frequency:

- 43kHz

## Beam Angle:

- 6°

## Environmental

- location: indoor/outdoor
- altitude: 2000m maximum
- ambient temperature: -20 to 95°C (-4 to 203°F)
- pollution degree: 4

## Construction

- exposure: Kynar®[3]
- colour: slate gray
- mounting: 1" NPT conduit connection
- options:
  - factory flange to suit ANSI standard
  - submergence shield, where flooding can occur
  - split flange for field mounting to suit ANSI
- cable: 2-wire shielded / twisted, 0.5 $mm^2$ (20 AWG) PVC jacket

## Supply Source

- Transducer shall only be supplied by a Milltronics certified controller.

## Weight[4]

- 2.0 kg (4.4lb)

## Separation

- 365m (1200ft) from transducer

## Approvals

- FM Class 1 Div 1, Group A, B, C and D
- FM Class 2 Div 1, Group E, F, and G
- see nameplate or consult Milltronics for other current approvals

---

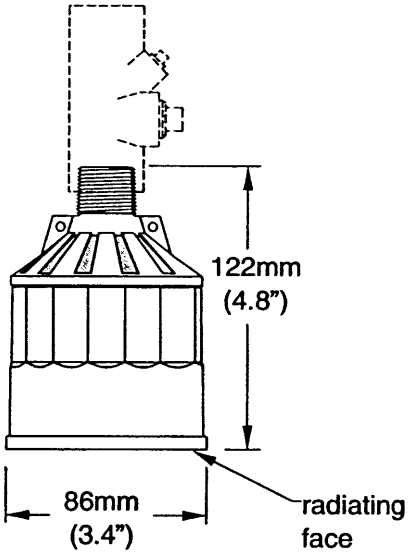
[3] Kynar® is registered trade mark of ELF Atochem

[4] approximate shipping weight of transducer with standard cable length

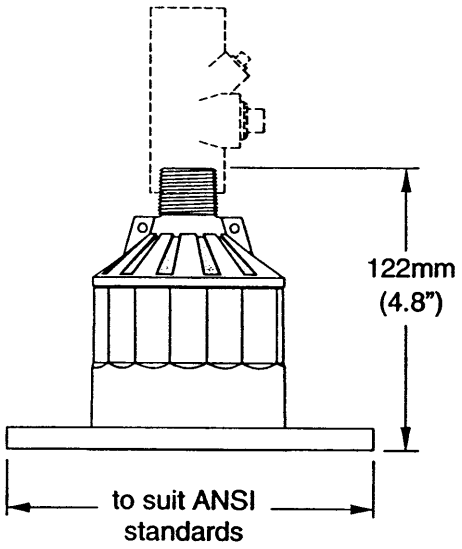
# Outline and Dimensions

## XPS 10 F Series Transducers

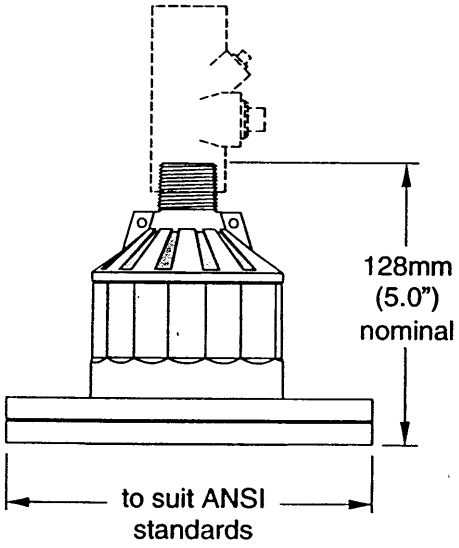
**Standard**



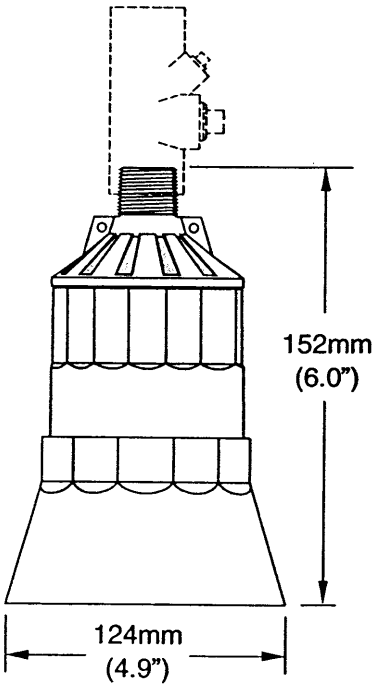

**Flange (optional)**




**Split Flange (optional)**




**Submergence Shield (optional)**




Refer to submergence shield instructions
(Milltronics' manual number PL-530)

**Note:**
For the XPS 10 F series transducer, a hazardous seal must be used to suit hazardous area classification. This seal is **not** supplied by Milltronics. For more information, refer to page 26.





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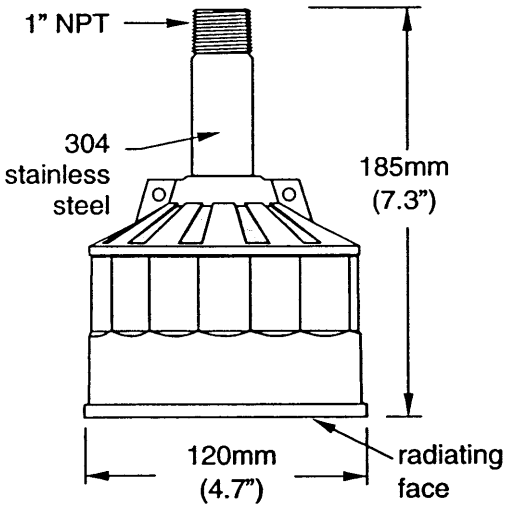
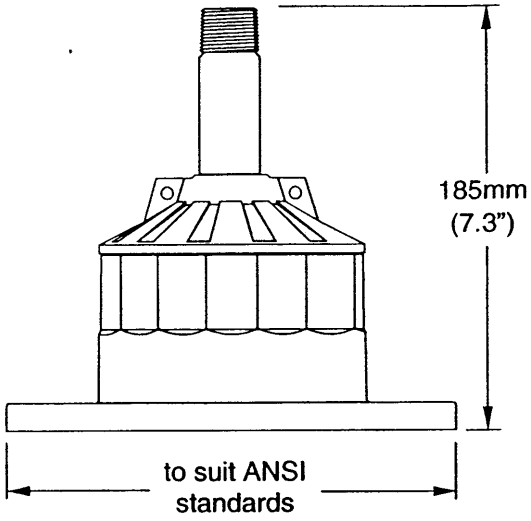
# XPS-15 F Series Transducers



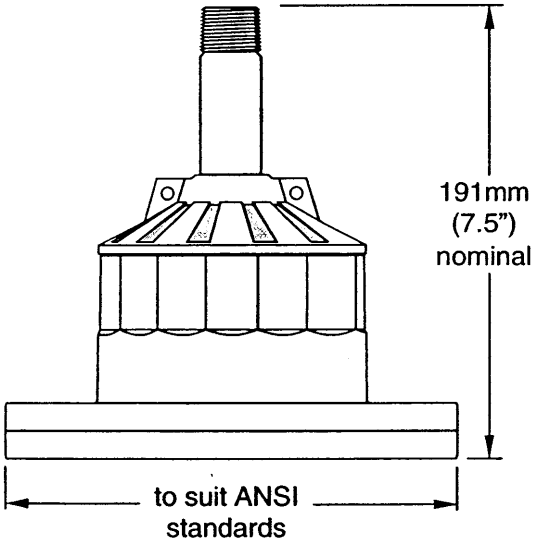
**Standard**



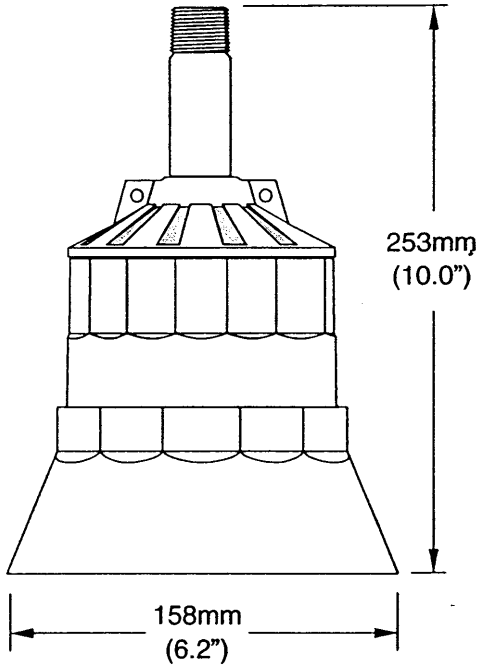

**Flange (optional)**




**Split Flange (optional)**




**Submergence Shield (optional)**




Refer to submergence shield instructions
(Milltronics' manual number PL-530)

**Note:**
The XPS 15 F comes equipped with a stainless steel coupling suitable for use in hazardous locations.



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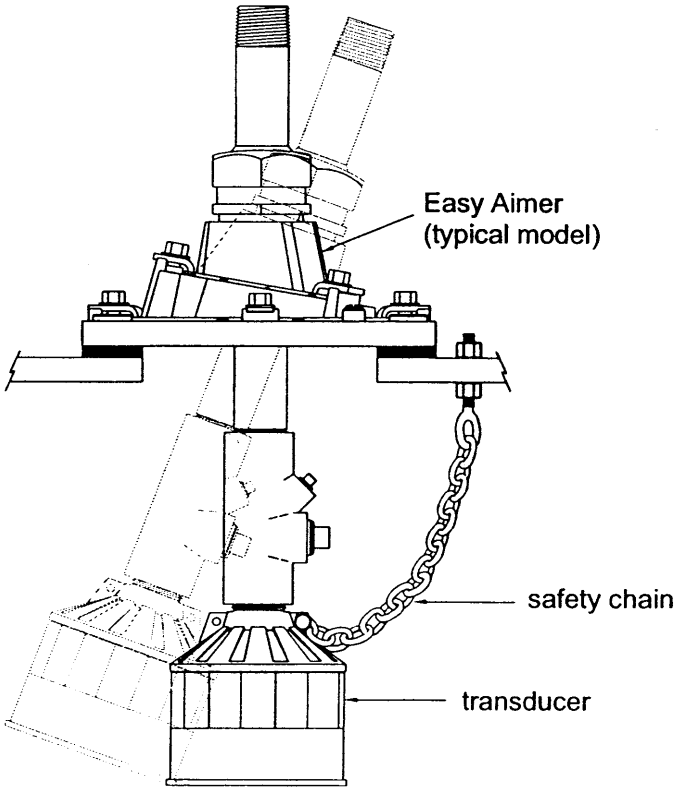
# Mounting

## Recommendations

- Special handling precautions must be taken to protect the face of the transducer from any damage.
- Mount the transducer so that it is *above the maximum material level by at least the blanking value (0.3m for XPS 10 F and 0.45m for XPS 15 F).* Refer to the associated transceiver manual for instructions on setting the blanking value.
- On liquid applications, the transducer must be mounted so that the axis of transmission is perpendicular to the liquid surface.
- On solids applications, a Milltronics Easy Aimer should be used to facilitate aiming of the transducer.
- *Do not over-tighten mounting.* Hand tightening of the mounting hardware is sufficient.
- Secure installation by connecting a safety chain from the transducer to a structural member.
- Consider the optional *temperature sensor* when mounting the transducer.

## Solids Applications (XPS 10 F shown)



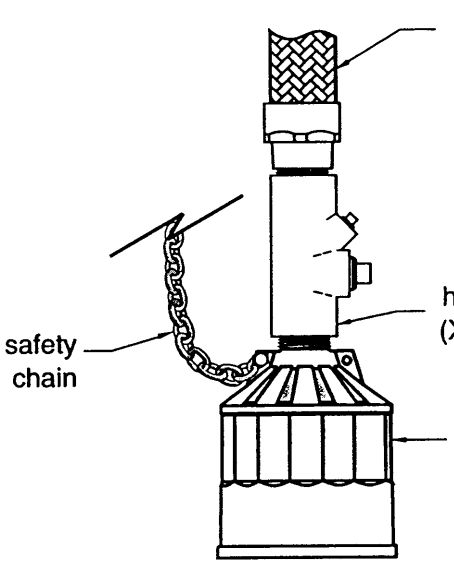

**Note:**
**For the XPS 10 F series transducer, a hazardous seal must be used to suit hazardous area classification. This seal is not supplied by Milltronics. For more information, refer to page 26.**

# Liquid Applications

**Notes:**

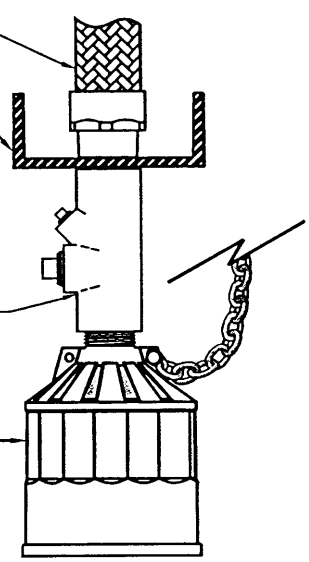
- In, the examples that follow, an XPS 10 F Series transducer is shown using a hazardous seal. This seal is **not** supplied by Milltronics.
- An XPS 15 F transducer can also be used in these applications, but, because it comes equipped with a stainless steel coupling, no hazardous seal is required.

**Flexible Conduit** (XPS 10 F shown)

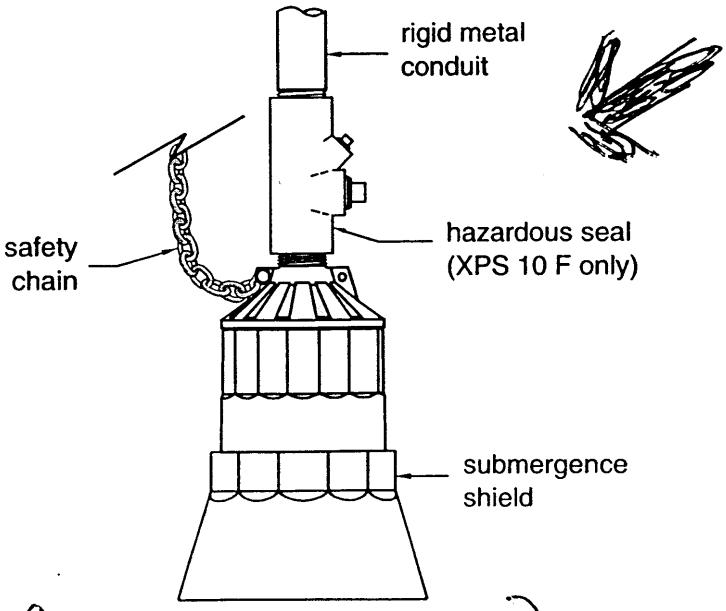



Flexible conduit transducer should not be subjected to wind, vibration or jarring.

**Bracket** (XPS 10 F shown)




**Submersible** (XPS 10 F shown)




Submersible transducer, used in applications where flooding is possible.

Mounting



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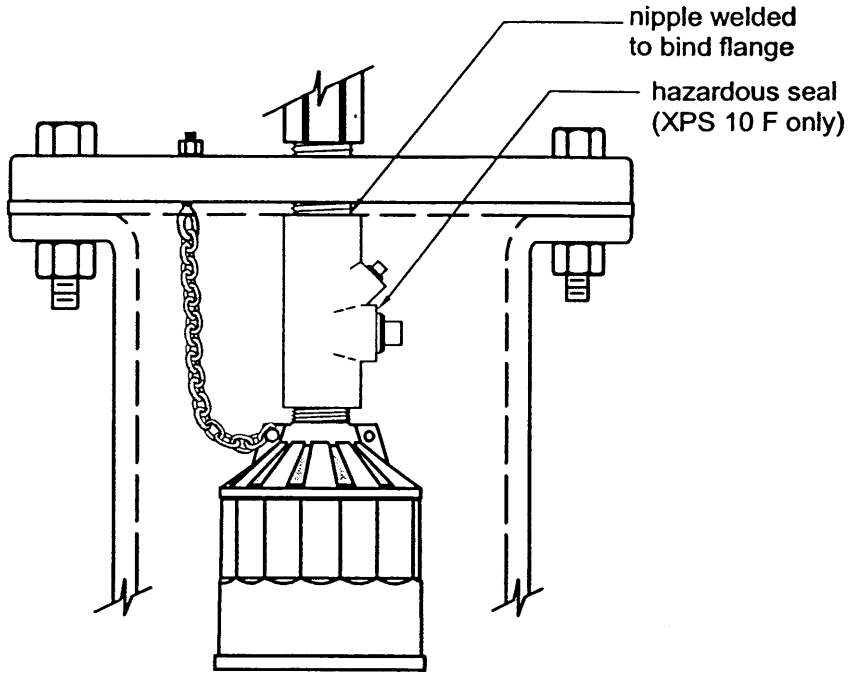
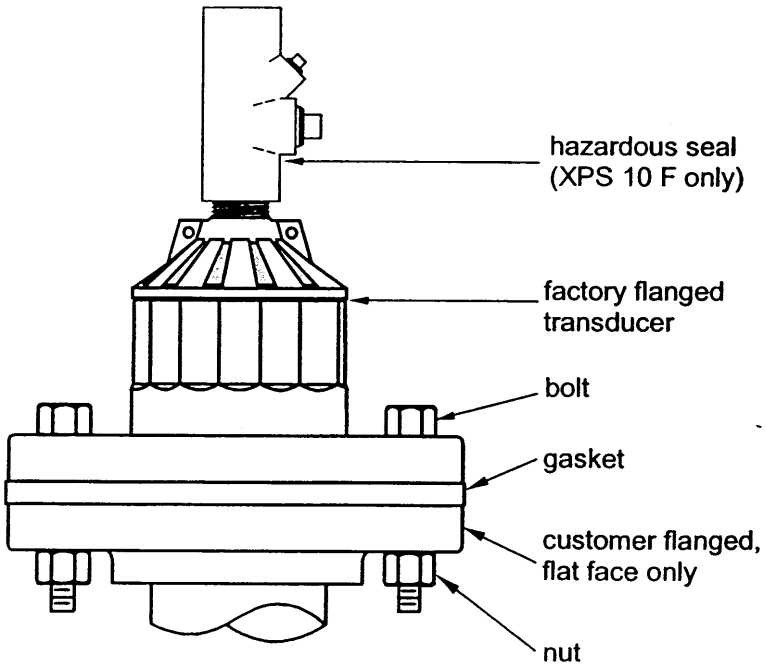
**Blind Flange** (XPS 10 F shown)




Flange, gasket, hazardous seal and hardware supplied by customer.
Refer to page 19

**Flanged** (XPS 10 F shown)




Flange, gasket, and hardware supplied by customer.
Refer to page 19

Note: Tighten the flange bolts evenly in order to ensure a good seal between the mating flanges.
**Caution: Over-tightening can cause performance degradation.**





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# Interconnection

**Note:**
Installation should only be performed by qualified personnel and in accordance with local governing regulations.

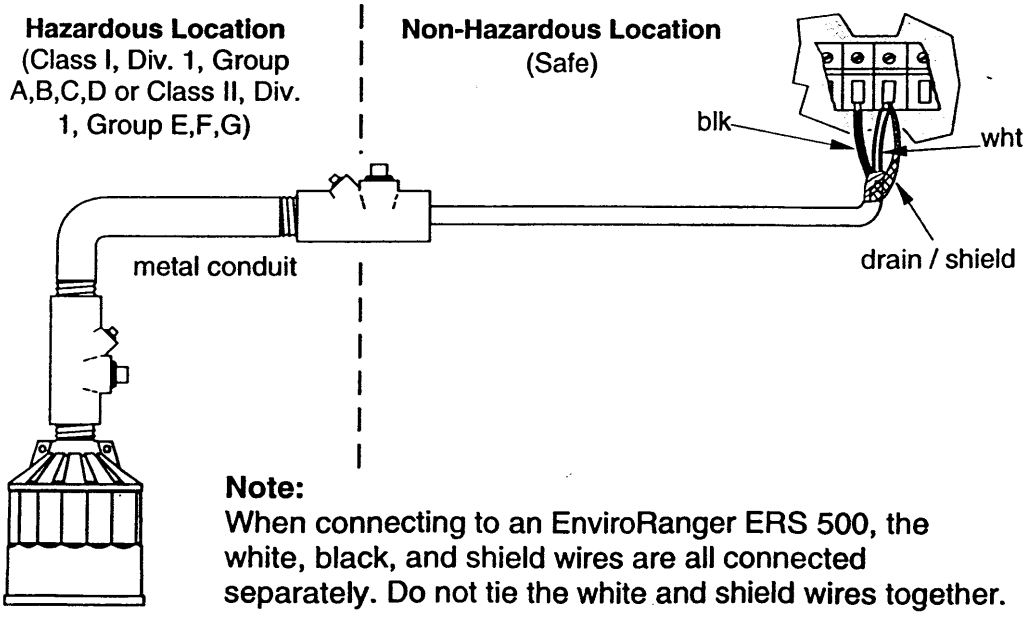
## Recommendations

- When using an XPS 15 F transducer, configure the electronic transceiver for an XCT-12. These two transducers use the same settings.
- Do not route cable openly.
- For optimum isolation against electrical noise, run cable separately in a grounded metal conduit.
- Seal all thread connections to prevent ingress of moisture.
- Do not run cable near high voltage or current runs, contactors and SCR control drives.

**Note:**
In the interconnection examples that follow:

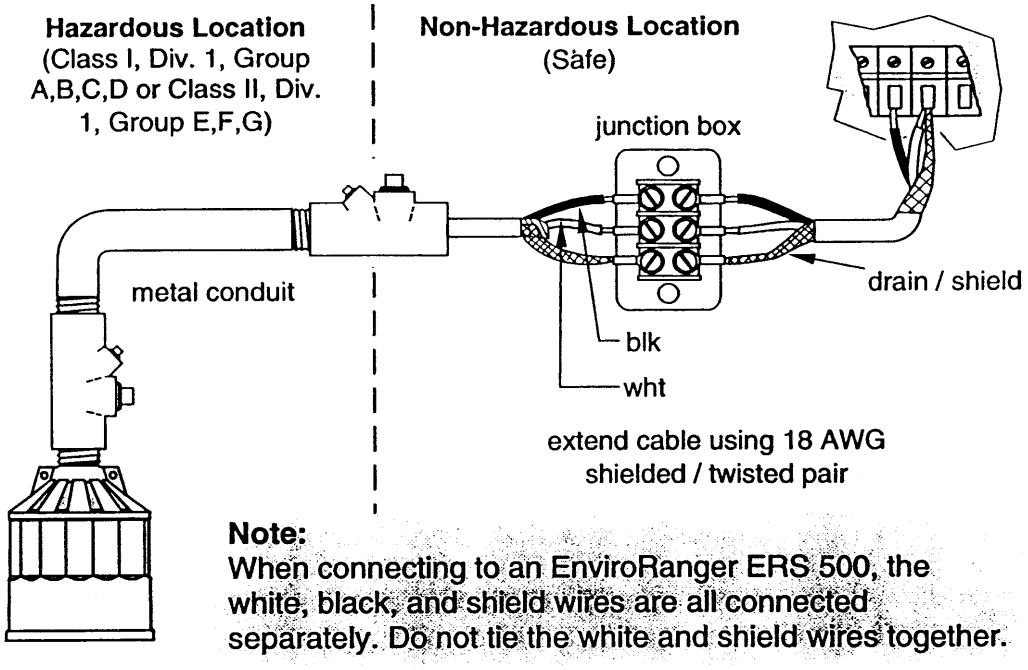
- an XPS 10 F Series transducer is shown. An XPS 15 F transducer can also be used, but no hazardous seal is required.
- assume that the transducer is located in a Hazardous location (Class I, Div. 1, Group A,B,C,D or Class II, Div. 1, Group E,F,G.) and the transceiver in a Non-Hazardous (Safe) Location.

## Direct Connection (XPS 10 F shown)



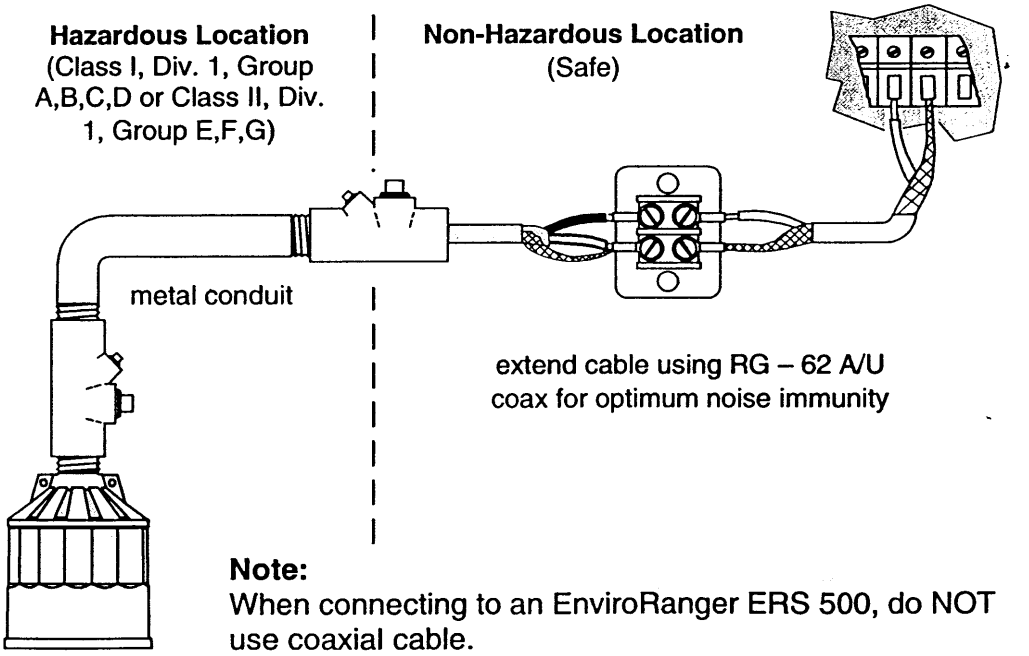

**Note:**
When connecting to an EnviroRanger ERS 500, the white, black, and shield wires are all connected separately. Do not tie the white and shield wires together.

## 2-Wire Extension (XPS 10 F shown)




**Note:**
When connecting to an EnviroRanger ERS 500, the white, black, and shield wires are all connected separately. Do not tie the white and shield wires together.

## Coaxial Cable (XPS 10 F shown)




**Note:**
When connecting to an EnviroRanger ERS 500, do NOT use coaxial cable.





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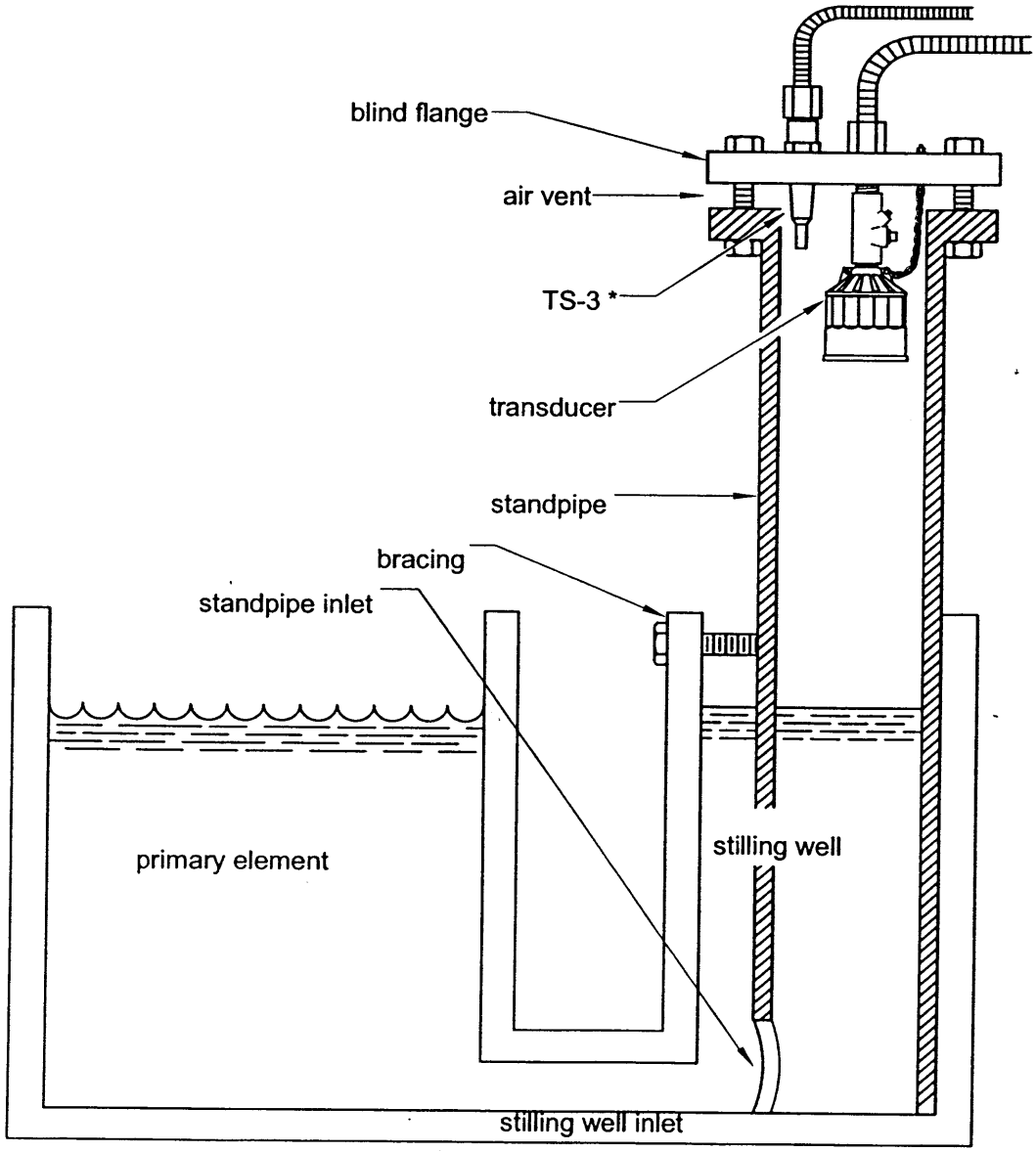
# Applications

**Notes:**

- The transducer is to be used only in the manner outlined in this instruction manual.
- Normally, the transducer requires no cleaning or maintenance. However, if performance changes are observed, immediately shut down the level measurement system and perform a thorough inspection, especially on the transducer.
- An XPS 10 F Series transducer is shown in these examples. An XPS 15 F transducer can also be used, but no hazardous seal is required.

## Liquid Applications

### Stilling Well / OCM




Refer to page 19.

* the use of a TS-3 temperature sensor provides better temperature tracking in applications where the temperature can change quickly.



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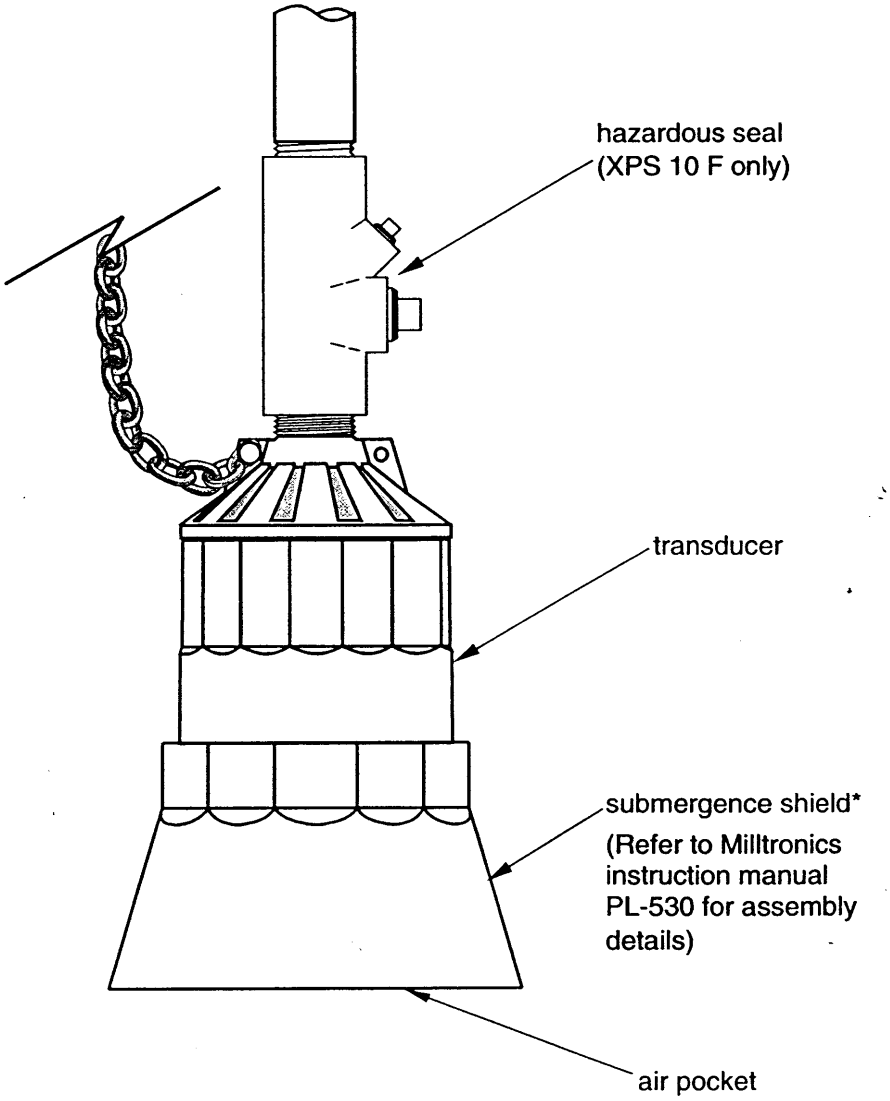
## Submergence

In applications where flooding is possible, the transducer can be fitted with a submergence shield*. The shield acts as a bell to create an air pocket in front of the transducer face. The associated transceiver* interprets this as a flooding condition, and reacts accordingly.

**Note:**
Refer to transceiver manual for programming requirements.




* on applicable models



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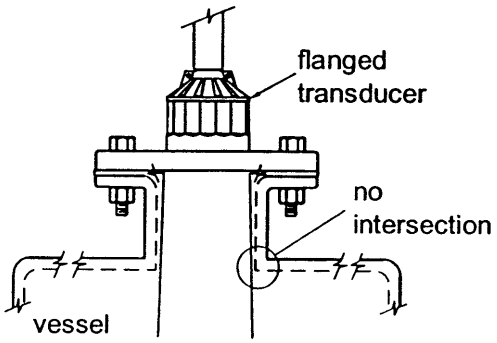
## Standpipes

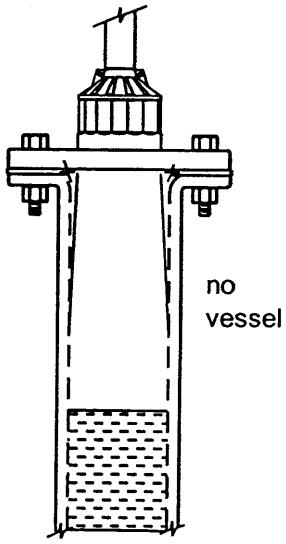
In many applications, access must be made via a standpipe. In such cases, Milltronics can provide factory bonded flanged transducers or a split flange kit that will readily mate to the flanged standpipe. Another option is to hang the transducer from a blind flange.

The standpipe length should be as short and the diameter as large as possible. As a rule of thumb, the -3 dB cone of the sound beam should not intersect the standpipe wall in applications opening into a vessel or larger area. Otherwise, additional blanking will be required to compensate for the interference zone created by the opening.

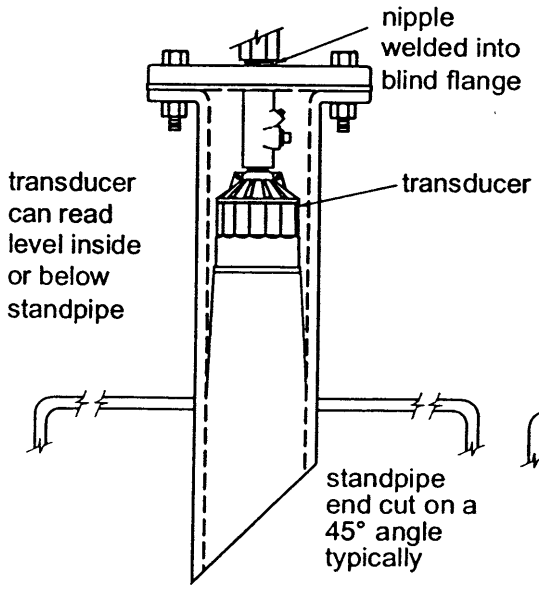
**Note:** When using a stilling well, make sure there is no build-up, welds, couplings, or other debris on the inside of the well wall. This can affect reliability of measurement.



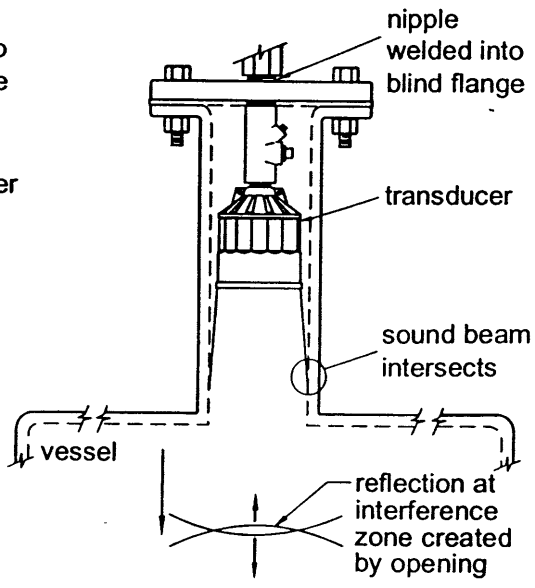

no additional blanking required




no additional blanking required




no additional blanking required




near blanking extension of 150 mm (6")



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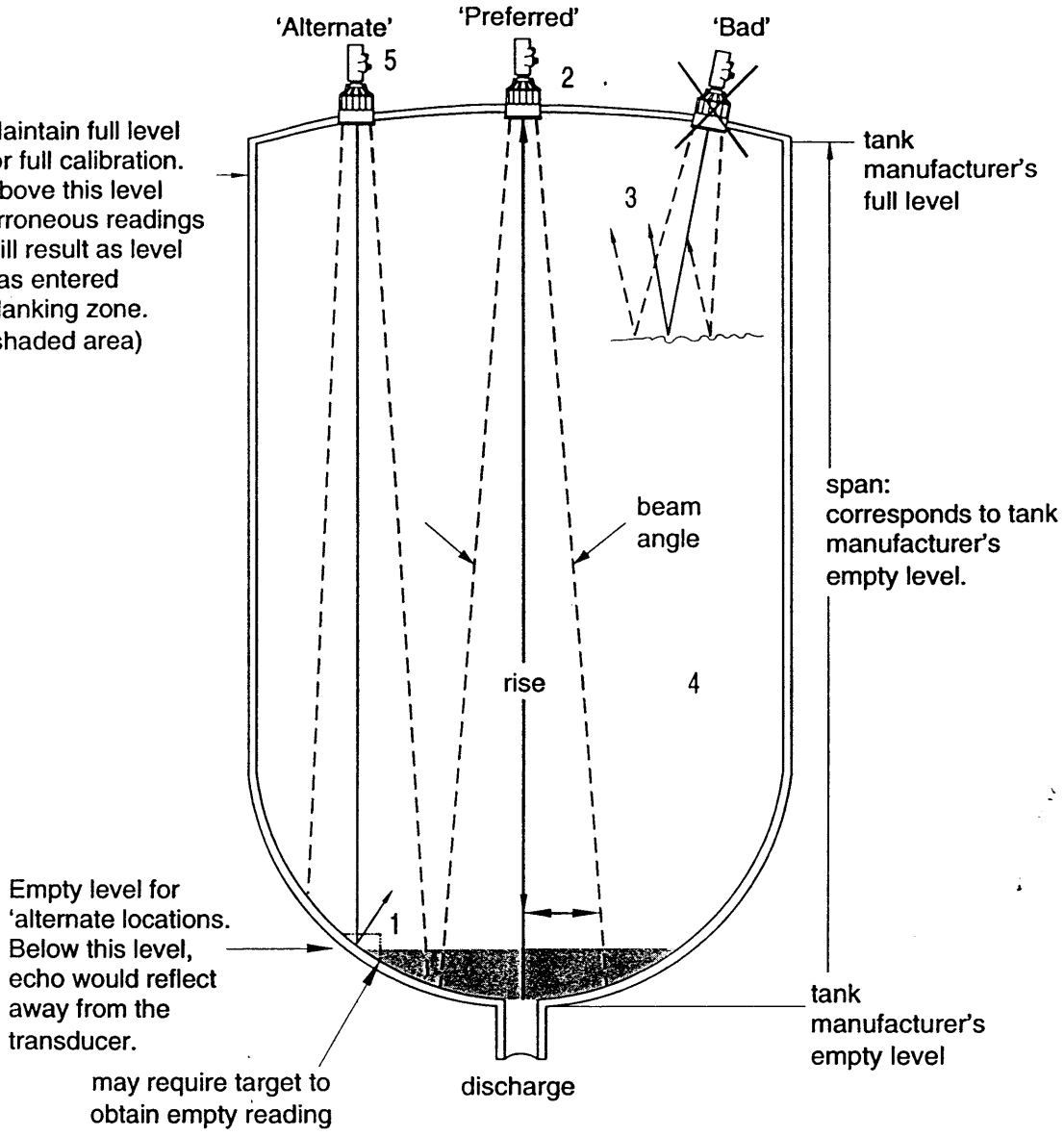
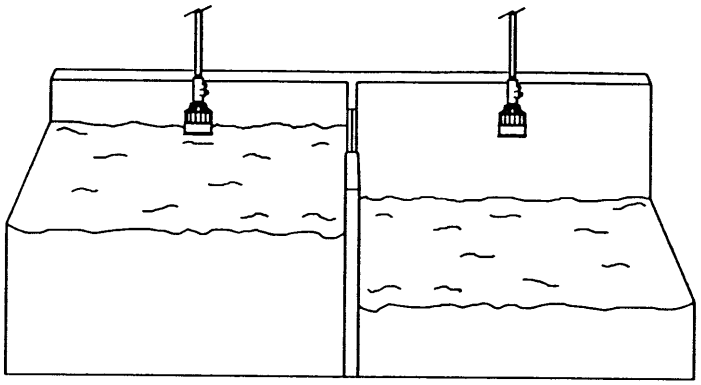
# Volume



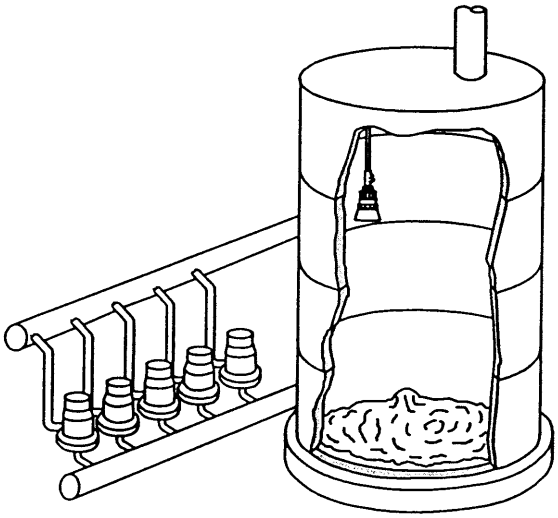

1. Beam should not detect bin bottom. If this occurs, use range extension parameters (on transceivers where available) to omit false echoes. A 6° beam angle (XPS 15 F) represents a rise:run of about 20:1 (10:1 for the 12° beam angle of the XPS 10 F). In most tanks, the transducer should be centered as much as possible (without interference from inlet) for optimum reading range.
2. Sound beam must be perpendicular to liquid surface. If standpipe is used, refer to page 19.
3. Echo has missed improperly levelled transducer.
4. When performing an empty or full calibration, the tank must contain its normal vapour and be at its normal temperature.
5. When used in hazardous areas, the XPS 10 F series transducer (shown) must use a hazardous seal. This seal is **not** supplied by Milltronics. The XPS 15 F Series transducer comes equipped with a stainless steel coupling suitable for use in hazardous locations.

# Water / Wastewater

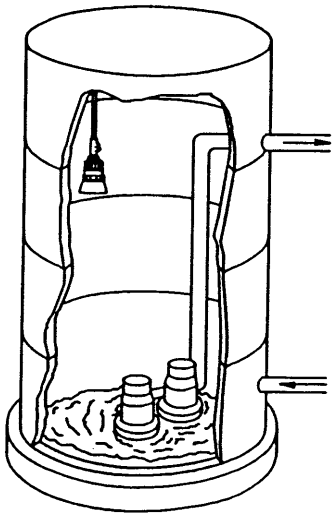
## Differential Level



## Pump Control



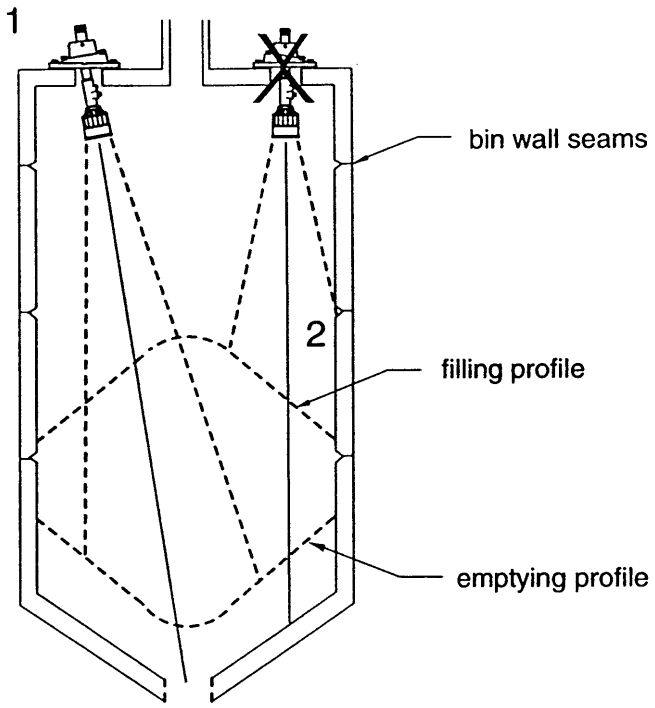
## Sewage Lift



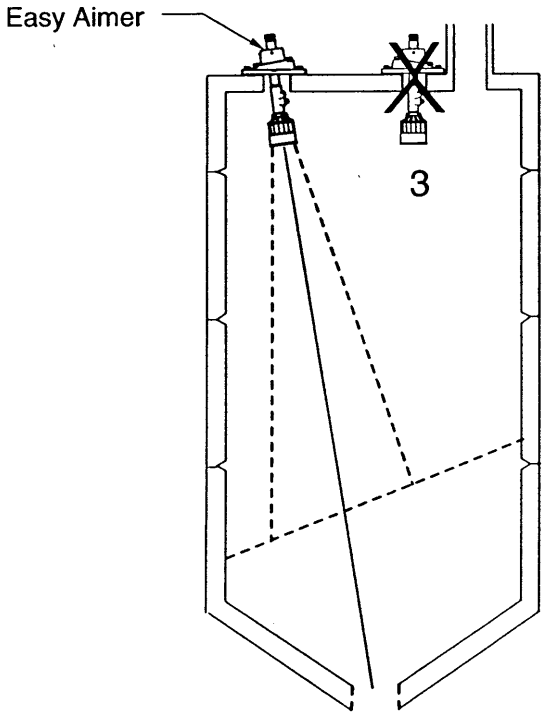
# Solids Applications

## Typical

1. Transducer angled to avoid seams in bin wall and aimed at discharge in order to read bin when empty.
2. Avoid intersecting bin wall seams, structural members and wall irregularities.




3. Transducer too close to material inlet. Falling material will intersect sound beam and cause erroneous readings or loss of echo.



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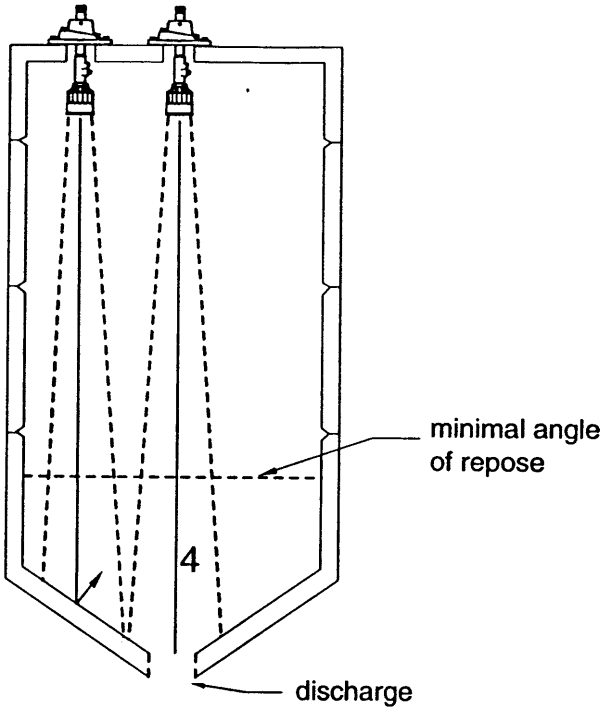
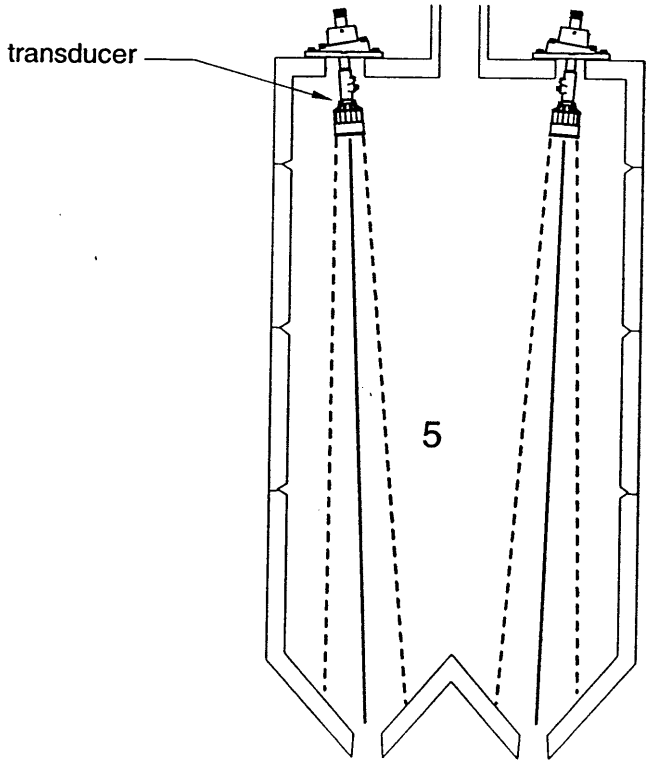
4. On fluid like solids, aim transducer perpendicular to material surface.




5. On dual discharge bins, aim each transducer at the discharge point.



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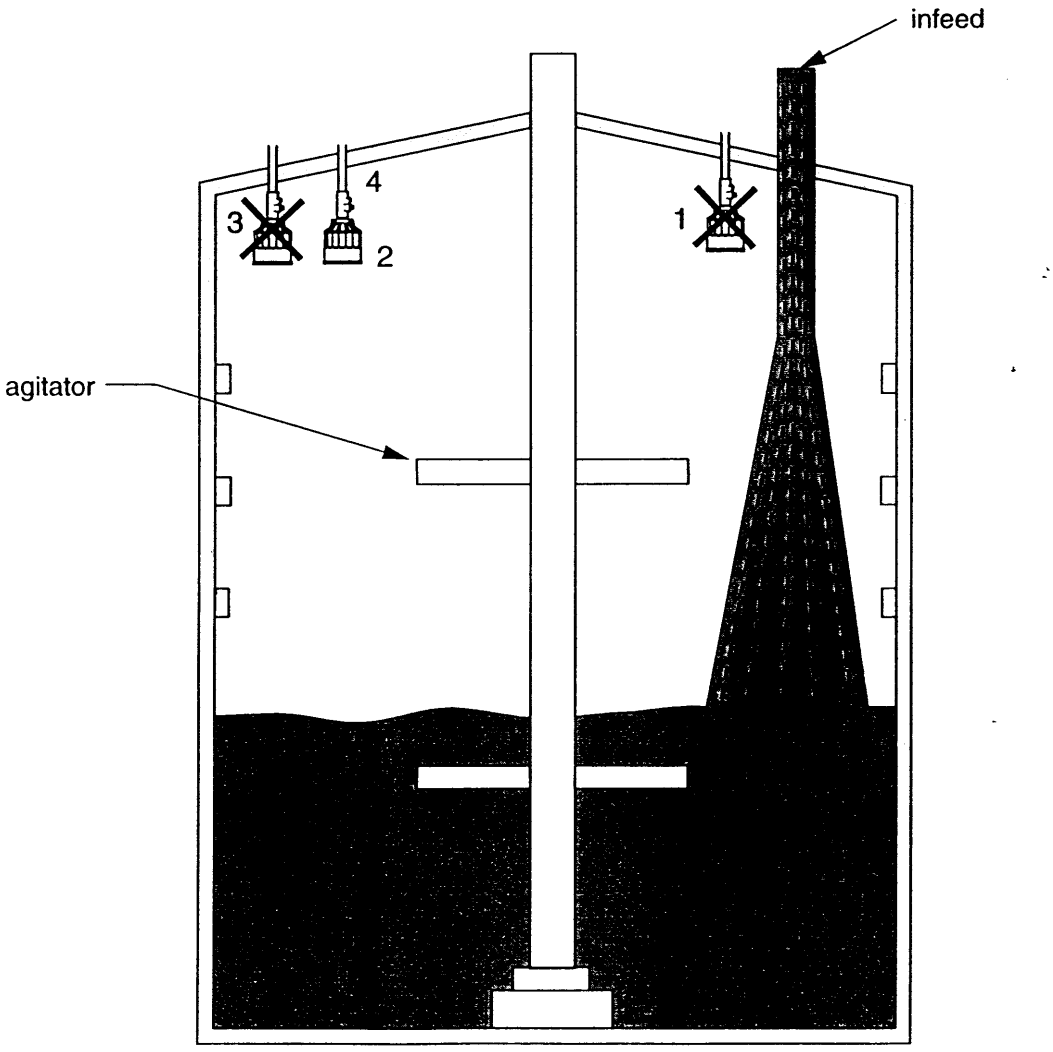
# Special

## Storage Bin with Agitator

1. Transducer should be kept away from infeed.
2. Where agitators are in use, use the Agitator Discrimination parameter on transceivers where available.
3. Transducer should be aimed away from wall projections.
4. When used in hazardous areas, the XPS 10 F series transducer (shown) must use a hazardous seal. This seal is **not** supplied by Milltronics. The XPS 15 F Series transducer comes equipped with a stainless steel coupling suitable for use in hazardous locations.



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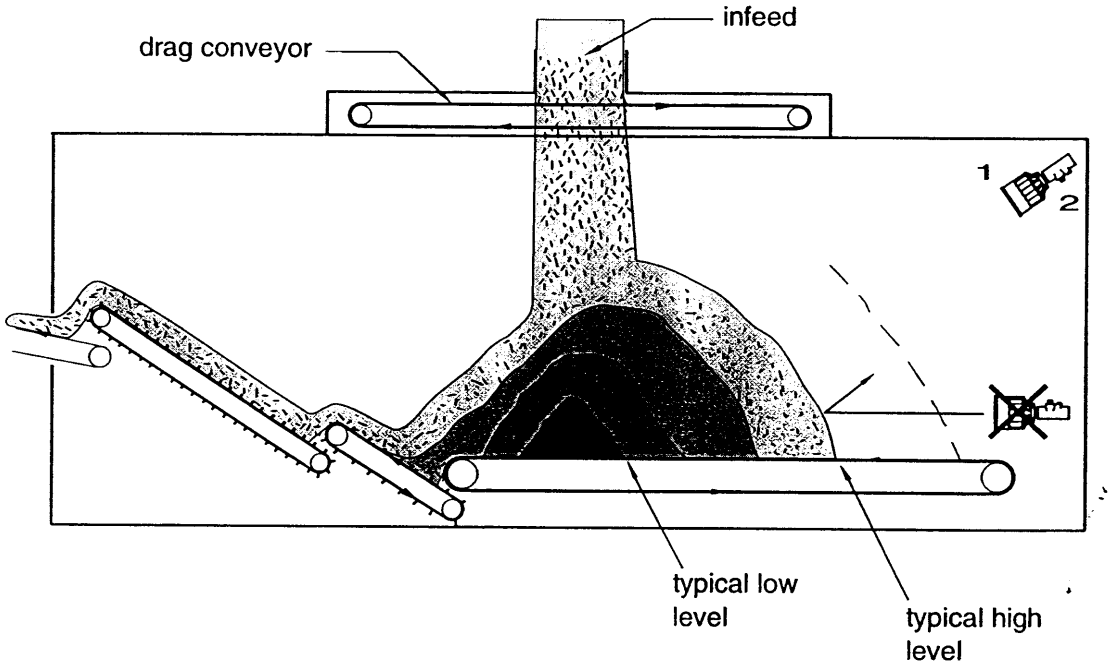
## Dryer - Wood Chips

1. Transducer should be mounted perpendicular to slope of wood chips.
2. When used in hazardous areas, the XPS 10 F series transducer (shown) must use a hazardous seal. This seal is **not** supplied by Milltronics. The XPS 15 F Series transducer comes equipped with a stainless steel coupling suitable for use in hazardous locations.



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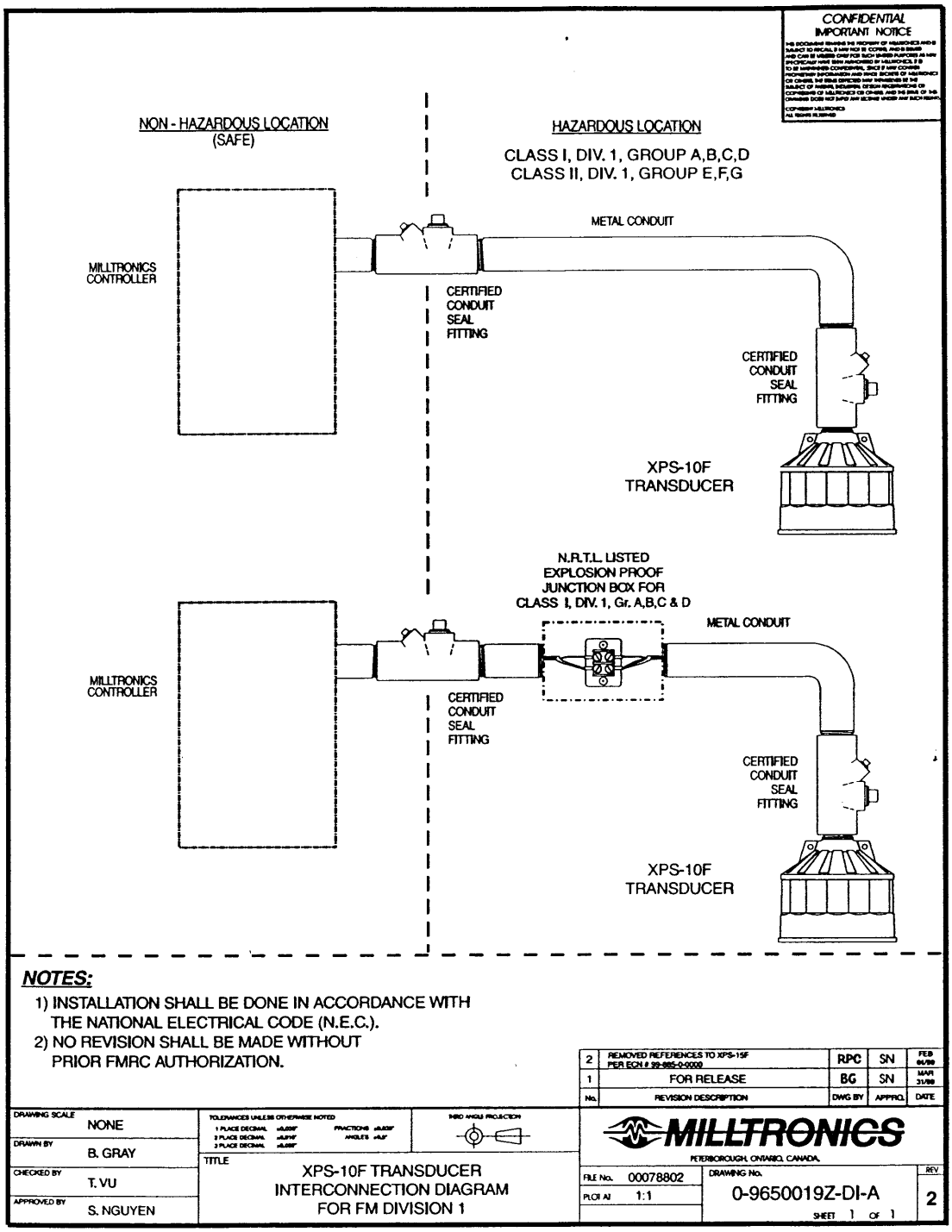
# Installation Diagram for the XPS 10 F



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Subject to change without prior notice

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**MILLTRONICS**

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Printed in Canada

27/27

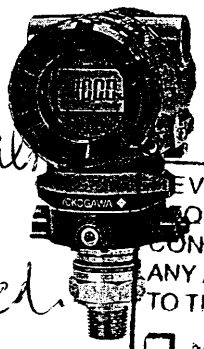
# General Specifications

Model EJA510A and EJA530A Absolute and Gauge Pressure Transmitter

GS 01C21F01-00E

[Style: S2]

The absolute and gauge pressure transmitter model EJA510A and EJA530A can be used to measure liquid, gas, or steam pressure. Both output a 4 to 20 mA DC signal corresponding to the measured pressure, and also feature remote setup and monitoring through communications with the BRAIN™ terminal and CENTUM CS™ or μXL™ or HART® 275 host.



## ■ STANDARD SPECIFICATIONS

### □ PERFORMANCE SPECIFICATIONS

Zero-based calibrated span, linear output, wetted parts material code 'S' and silicone oil.

**Reference Accuracy of Calibrated Span**
(including the effects of zero-based linearity, hysteresis, and repeatability, values are in absolute for EJA510A)

±0.2 % of Span

±0.075 % of Span, when/ HAC is specified (EJA530A: A, B and C capsule)

±0.12 % of Span, when/ HAC is specified (EJA530A: D capsule)

For spans below *X*,

$\pm[0.05+0.15\frac{X}{\text{Span}}]$ % of Span

$\pm[0.025+0.05\frac{X}{\text{Span}}]$ % of span, when/ HAC is specified (EJA530A: A, B and C capsule)

$\pm[0.03+0.09\frac{X}{\text{Span}}]$ % of span, when/ HAC is specified (EJA530A: D capsule)

Where *X* equals:

| Capsule | *X* MPa {psi} |
|---|---|
| A | 20 kPa {2.9} |
| A with/ HAC | 40 kPa {5.8} |
| B | 0.2 {29} |
| C | 1 {145} |
| D | 8 {1160} |

**Ambient Temperature Effects**
**Total Effects per 28 °C (50 °F) Change**
±[0.15% Span + 0.15% URL]

**Stability**
±0.1% of URL per 12 months

**Vibration Effects**
±0.1 % of URL
(5 to 15Hz; 4mm peak-to-peak constant displacement, 15 to 150Hz; 2g, 150 to 2000Hz; 1g)

**Power Supply Effects**
±0.005 % per Volt (from 21.6 to 32 V DC, 350 Ω)

### □ FUNCTIONAL SPECIFICATIONS

**Span & Range Limits**
**(Values are in absolute for EJA510A)**

| Measurement Span and Range | | MPa | psi (/D1) | bar (/D3), kgf/cm² (/D4) | |
|---|---|---|---|---|---|
| A | Span | 10 to 200 kPa | 1.45 to 29 | 0.1 to 2 | 0.1 to 2 |
| | Range | 0 to 200 kPa | 0 to 29 | 0 to 2 | 0 to 2 |
| B | Span | 0.1 to 2 | 14.5 to 290 | 1 to 20 | 1 to 20 |
| | Range | 0 to 2 | 0 to 290 | 0 to 20 | 0 to 20 |
| C | Span | 0.5 to 10 | 72.5 to 1450 | 5 to 100 | 5 to 100 |
| | Range | 0 to 10 | 0 to 1450 | 0 to 100 | 0 to 100 |
| D | Span | 5 to 50 | 720 to 7200 | 50 to 500 | 50 to 500 |
| | Range | 0 to 50 | 0 to 7200 | 0 to 500 | 0 to 500 |

T01E.EPS

URL is defined as the Upper Range Limit from the table above.

**Zero Adjustment Limits**
Zero can be fully elevated or suppressed, within the Lower and Upper Range Limits of the capsule.

**External Zero Adjustment**
External zero is continuously adjustable with 0.01 % incremental resolution of span. Span may be adjusted locally using the digital indicator with range switch.

**Mounting Position Effect**
Rotation in diaphragm plane has no effect. Tilting up to 90° will cause zero shift up to 0.27 kPa {1.1 in$H_2O$} which can be corrected by the zero adjustment.

**Output**
Two wire 4 to 20 mA DC output with digital communications. BRAIN or HART FSK protocol are superimposed on the 4 to 20 mA signal.

REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT
ANY ACTION INDICATED IS SUBJECT TO THESE REQUIREMENTS
☐ NO EXCEPTIONS TAKEN
☑ MAKE NOTED CORRECTIONS
☐ REVISE & RESUBMIT
☐ REJECTED
DATE May 21/05 BY DC
EARTH TECH (CANADA) INC.

JOB: WASTE WATER TREATMENT PLANT IQUALUIT, CONTRACTOR PRE-APPROVAL; SIFEC-KUDLIK per: C.FAUTEUX, T,P. G.FAUTEUX, P,ENG.

YOKOGAWA ◆
Yokogawa Electric Corporation
2-9-32, Nakacho, Musashino-shi, Tokyo, 180-8750 Japan
Phone: 81-422-52-5690 Fax.: 81-422-52-2018

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# General Specifications

Model EJA510A and EJA530A Absolute and Gauge Pressure Transmitter

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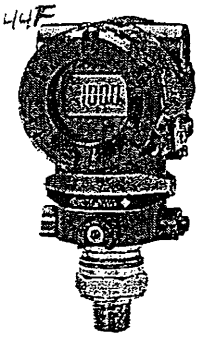
EJA530A - EA54N-D2EE - CF1/D1/
M25/N1S - 44F



REVIEWED ACCORDING TO TH REQUIREMENTS OF THE GENERA CONDITIONS OF THE CONTRAC ANY ACTION INDICATED IS SUBJEC TO THESE REQUIREMENTS.

☑ NO EXCEPTIONS TAKEN
☐ MAKE NOTED CORRECTIONS
☐ REVISE & RESUBMIT
☐ REJECTED

DATE 11 Aug 05 BY D.C
EARTH TECH (CANADA) INC

The absolute and gauge pressure transmitter model EJA510A and EJA530A can be used to measure liquid, gas, or steam pressure. Both output a 4 to 20 mA DC signal corresponding to the measured pressure, and also feature remote setup and monitoring through communications with the BRAIN™ terminal and CENTUM CS™ or μXL™ or HART® 275 host.

## ■ STANDARD SPECIFICATIONS

### ☐ PERFORMANCE SPECIFICATIONS

Zero-based calibrated span, linear output, wetted parts material code 'S' and silicone oil.

**Reference Accuracy of Calibrated Span**
(including the effects of zero-based linearity, hysteresis, and repeatability, values are in absolute for EJA510A)

±0.2 % of Span

±0.075 % of Span, when/ HAC is specified (EJA530A: A, B and C capsule)

±0.12 % of Span, when/ HAC is specified (EJA530A: D capsule)

For spans below *X*,

$\pm[0.05+0.15\frac{X}{\text{Span}}]$ % of Span

$\pm[0.025+0.05\frac{X}{\text{Span}}]$ % of span, when/ HAC is specified (EJA530A: A, B and C capsule)

$\pm[0.03+0.09\frac{X}{\text{Span}}]$ % of span, when/ HAC is specified (EJA530A: D capsule)

Where *X* equals:

| Capsule | *X* MPa {psi} |
|---|---|
| A | 20 kPa {2.9} |
| A with/ HAC | 40 kPa {5.8} |
| B | 0.2 {29} |
| C | 1 {145} |
| D | 8 {1160} |

**Ambient Temperature Effects**
**Total Effects per 28 °C (50 °F) Change**
±[0.15% Span + 0.15% URL]

**Stability**
±0.1% of URL per 12 months

**Vibration Effects**
±0.1 % of URL
(5 to 15Hz; 4mm peak-to-peak constant displacement, 15 to 150Hz; 2g, 150 to 2000Hz; 1g)

**Power Supply Effects**
±0.005 % per Volt (from 21.6 to 32 V DC, 350 Ω)

### ☐ FUNCTIONAL SPECIFICATIONS

**Span & Range Limits**

**(Values are in absolute for EJA510A)**

| Measurement Span and Range | | MPa | psi (/D1) | bar (/D3) | kgf/cm²(/D4) |
|---|---|---|---|---|---|
| A | Span | 10 to 200 kPa | 1.45 to 29 | 0.1 to 2 | 0.1 to 2 |
| | Range | 0 to 200 kPa | 0 to 29 | 0 to 2 | 0 to 2 |
| B | Span | 0.1 to 2 | 14.5 to 290 | 1 to 20 | 1 to 20 |
| | Range | 0 to 2 | 0 to 290 | 0 to 20 | 0 to 20 |
| C | Span | 0.5 to 10 | 72.5 to 1450 | 5 to 100 | 5 to 100 |
| | Range | 0 to 10 | 0 to 1450 | 0 to 100 | 0 to 100 |
| D | Span | 5 to 50 | 720 to 7200 | 50 to 500 | 50 to 500 |
| | Range | 0 to 50 | 0 to 7200 | 0 to 500 | 0 to 500 |

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URL is defined as the Upper Range Limit from the table above.

**Zero Adjustment Limits**
Zero can be fully elevated or suppressed, within the Lower and Upper Range Limits of the capsule.

**External Zero Adjustment**
External zero is continuously adjustable with 0.01 % incremental resolution of span. Span may be adjusted locally using the digital indicator with range switch.

**Mounting Position Effect**
Rotation in diaphragm plane has no effect. Tilting up to 90° will cause zero shift up to 0.27 kPa {1.1 in$H_2O$} which can be corrected by the zero adjustment.

**Output**
Two wire 4 to 20 mA DC output with digital communications. BRAIN or HART FSK protocol are superimposed on the 4 to 20 mA signal.

YOKOGAWA ◆

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Phone: 81-422-52-5690 Fax.: 81-422-52-2018

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**Failure Alarm**

Output status at CPU failure and hardware error;
Up-scale: 110%, 21.6 mA DC or more (standard)
Down-scale: -5%, 3.2 mA DC or less

**Damping Time Constant (1st order)**

The sum of the amplifier and capsule damping time constant must be used for the overall time constant. Amp damping time constant is adjustable from 0.2 to 64 seconds.

| Capsule (Silicone Oil) | A, B, C, and D |
|---|---|
| Time Constant (approx. sec) | 0.2 |

**Ambient Temperature Limits**
**(approval codes may affect limits)**

-40 to 85 °C (-40 to 185 °F)
-30 to 80 °C (-22 to 176 °F) with LCD Display

**Process Temperature Limits**
**(approval codes may affect limits)**

-40 to 120 °C (-40 to 248 °F)

**Ambient Humidity Limits**

5 to 100 % RH @ 40 °C (104 °F)

**Maximum Overpressure**

| | Capsule | |
|---|---|---|
| Capsule | EJA510A | EJA530A |
| A | 4 MPa abs{580 psia} | 4 MPa {580 psig} |
| B | 4 MPa abs{580 psia} | 4 MPa {580 psig} |
| C | 20 MPa abs{2900 psia} | 20 MPa {2900 psig} |
| D | 60 MPa abs{8500 psia} | 60 MPa {8500 psig} |

**Working Pressure Limits (Silicone Oil)**
**Maximum Pressure Limit**

| | Capsule | |
|---|---|---|
| Capsule | EJA510A | EJA530A |
| A | 200 kPa abs{29 psia} | 200 kPa {29 psig} |
| B | 2 MPa abs{290 psia} | 2 MPa {290 psig} |
| C | 10 MPa abs{1450 psia} | 10 MPa {1450 psig} |
| D | 50 MPa abs{7200 psia} | 50 MPa {7200 psig} |

**Minimum Pressure Limit**
**See graph below.**

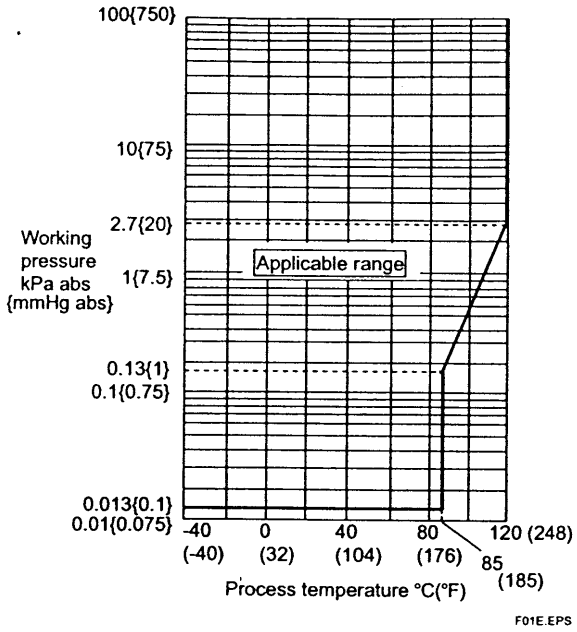


**Figure 1. Working Pressure and Process Temperature [For model EJA510A]**

**Supply & Load Requirements**

(Safety approvals can affect electrical requirements, see graph below)
With 24 V DC supply, up to a 570 Ω load can be used.

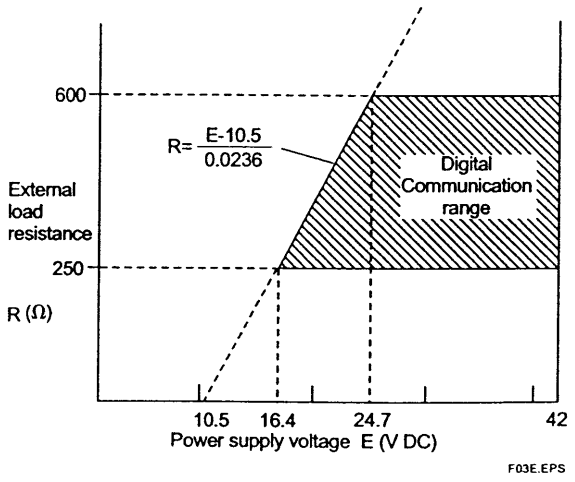


**Figure 2. Relationship Between Power Supply Voltage and External Load Resistance**

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**Supply Voltage**
10.5 to 42 V DC for operation
16.4 to 42 V DC for digital communications
(16.4 to 30 V DC for Intrinsically safe type)

**Load**
0 to 1335 Ω for operation
250 to 600 Ω for digital communication

**EMC Conformity Standards:** CE , C N200
EN61326, AS/NZS 2064

**Communication Requirements**

**BRAIN**

**Communication Distance**
Up to 2 km (1.25 miles) when using CEV polyethylene-insulated PVC-sheathed cables. Communication distance varies depending on type of cable used.

**Load Capacitance**
0.22 μF or less (see note)

**Load Inductance**
3.3 mH or less (see note)

**Input Impedance of communicating device**
10 kΩ or more at 2.4 kHz.

Note : For general-use and Flameproof type.
For Intrinsically safe type, please refer to 'OPTIONAL SPECIFICATIONS.'

**HART**

**Communication Distance**
Up to 1.5 km (1 mile) when using multiple twisted pair cables. Communication distance varies depending on type of cable used.

Use the following formula to determine cable length for specific applications:

$$L = \frac{65 \times 10^6}{(R \times C)} - \frac{(C_f + 10{,}000)}{C}$$

Where:
L = length in meters or feet
R = resistance in Ω (including barrier resistance)
C = cable capacitance in pF/m or pF/ft
$C_f$ = maximum shunt capacitance of receiving devices in pF/m or pF/ft

## ☐ PHYSICAL SPECIFICATIONS

**Wetted Parts Materials:**

**Diaphragm and Process connector**
Refer to 'MODEL AND SUFFIX CODE.'

**Non-wetted Parts Materials:**

**Housing**
Low copper cast-aluminum alloy with polyurethane paint (Munsell 0.6GY3.1/2.0)

**Degrees of Protection**
IP67, NEMA4X, JIS C0920 immersion proof

**Cover O-rings**
Buna-N

**Data plate and tag**
SUS304

**Fill Fluid**
Silicone, Fluorinated oil (option)

**Weight**
1.6 kg (3.5 lb) without integral indicator, mounting bracket.

**Connections**
Refer to the model code to specify the electrical connection type.

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# ■ MODEL AND SUFFIX CODES

## ● Model EJA510A and EJA530A

| Model | Suffix Codes | | Description |
|---|---|---|---|
| **EJA510A** | ····· | | Absolute pressure transmitter |
| **EJA530A** | ····· | | Gauge pressure transmitter |
| Output Signal | -D ····· | | 4 to 20 mA DC with digital communication (BRAIN protocol) |
| | -E ····· | | 4 to 20 mA DC with digital communication (HART protocol, refer to GS 01C22T01-00E) |
| Measurement span (capsule) | A ····· | | 10 to 200 kPa{0.1 to 2 kgf/cm²} |
| | B ····· | | 0.1 to 2 MPa{1 to 20 kgf/cm²} |
| | C ····· | | 0.5 to 10 MPa{5 to 100 kgf/cm²} |
| | D ····· | | 5 to 50 MPa{50 to 500 kgf/cm²} |
| Wetted parts material | | | [Process Connection] [Diaphragm] |
| | S ····· | | SUS316L Hastelloy C-276 |
| | H ····· | | Hastelloy C-276 Hastelloy C-276 |
| Process connection | 4 ····· | | 1/2 NPT female |
| | 7 ····· | | 1/2 NPT male |
| | 8 ····· | | G 1/2 DIN 16 288 male |
| | 9 ····· | | M20×1.5 DIN 16 288 male |
| — | N ····· | | Always N |
| — | -0 ····· | | Always 0 |
| Electrical connection | | 0 ····· | G1/2 female, one electrical connection |
| | | 2 ····· | 1/2 NPT female, two electrical connections without blind plug |
| | | 3 ····· | Pg 13.5 female, two electrical connections without blind plug |
| | | 4 ····· | M20 female, two electrical connections without blind plug |
| | | 5 ····· | G1/2 female, two electrical connections and a blind plug |
| | | 7 ····· | 1/2 NPT female, two electrical connections and a blind plug |
| | | 8 ····· | Pg 13.5 female, two electrical connections and a blind plug |
| | | 9 ····· | M20 female, two electrical connections and a blind plug |
| Integral indicator | | D ··· | Digital indicator |
| | | E ··· | Digital indicator with the range setting switch |
| | | ☆ N ··· | (None) |
| Mounting bracket | | E ·· | SECC Carbon steel 2-inch pipe mounting |
| | | F ·· | SUS304 2-inch pipe mounting |
| | | ☆ N ·· | (None) |
| Optional codes | | | /□ Optional specification |

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The '☆' marks indicate the most typical selection for each specification. Example: EJA530A-DAS4N-02NN/□

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## ■ OPTIONAL SPECIFICATIONS (For Explosion Protected types)

| Item | Description | Code |
|---|---|---|
| Factory Mutual (FM) | FM Explosionproof Approval<br>Explosionproof for Class I, Division 1, Groups B, C and D<br>Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G<br>Hazardous(classified) locations, indoors and outdoors(NEMA 4X)<br>Temperature class: T6<br>Amb. Temp.: –40 to 60°C(–40 to 140°F)<br>Electrical connection: 1/2 NPT female *1 | FF1 |
| | FM Intrinsically safe Approval *3<br>Intrinsically Safe for Class I, Division 1, Groups A, B, C & D, Class II, Division 1, Groups E, F & G and Class III, Division 1 Hazardous Locations.<br>Nonincendive for Class I, Division 2, Groups A, B, C & D, Class II, Division. 2, Groups E, F & G, and Class III, Division 1 Hazardous Locations.<br>Enclosure: "NEMA 4X," Temp. Class: T4, Amb. Temp.: –40 to 60°C(–40 to 140°F)<br>Intrinsically Safe Apparatus Parameters<br>[Groups A, B, C, D, E, F and G]<br>Vmax=30 V, Imax=165 mA, Pmax=0.9 W, Ci=22.5 nF, Li=730 μH<br>[Groups C, D, E, F and G]<br>Vmax=30 V, Imax=225 mA, Pmax=0.9 W, Ci=22.5 nF, Li=730 μH<br>Electrical connection: 1/2 NPT female *1 | FS1 |
| | Combined FF1 and FS1 *3<br>Electrical connection: 1/2 NPT female *1 | FU1 |
| CENELEC ATEX | CENELEC ATEX (KEMA) Flameproof Approval [PENDING]<br>EExd IIC T4, T5, T6, Amb. Temp.: T4 and T6; –40 to 75°C(–40 to 167°F), T5; –40 to 80 °C(–40 to 176 °F)<br>Max. process Temp.: T4; 120°C(248°F), T5; 100°C(212°F), T6; 85°C(185°F)<br>Electrical connection: 1/2 NPT female and M20 female *2 | |
| | CENELEC ATEX (KEMA) Intrinsically safe Approval *3<br>EEx ia IIC T4, Amb. Temp.: –40 to 60 °C(–40 to 140 °F)<br>Ui=30 V, Ii=165 mA, Pi=0.9 W, Ci=22.5 nF, Li=730 μH<br>Electrical connection: 1/2 NPT female and M20 female *2 | KS2 |
| | CENELEC ATEX Type of protection "n" *3<br>Ex nL IIC T4, Amb. Temp.: –40 to 60°C(–40 to 140°F)<br>U=30 V, I=165 mA<br>Electrical connection: 1/2 NPT female and M20 female *2 | KN2 |
| CENELEC (KEMA) | CENELEC (KEMA) Flameproof, Intrinsically safe, and Type n Approval<br>Ex nA IIC T4, Amb. Temp.: –40 to 60°C(–40 to 140°F) U=30 V, I=165 mA<br>Electrical connection: 1/2 NPT female, Pg 13.5 female and M20 female *4 | KU1 |
| Canadian Standards Association (CSA) | CSA Explosionproof Approval<br>Explosionproof for Class I, Division 1, Groups B, C and D<br>Dustignitionproof for Class II/III, Division 1, Groups E, F and G<br>Division2 'SEALS NOT REQUIRED,' Temp. Class: T4, T5, T6 Encl Type 4x<br>Max. Process Temp.: T4; 120°C(248°F), T5; 100°C(212°F), T6; 85°C(185°F)<br>Amb. Temp.: –40 to 80°C(–40 to 176°F)<br>Electrical connection: 1/2 NPT female *1 | CF1 |
| | CSA Intrinsically safe Approval *3<br>Class I, Groups A, B, C and D Class II and III, Groups E, F and G<br>Encl Type 4x, Temp. Class: T4, Amb. Temp.: –40 to 60°C(–40 to 140°F)<br>Vmax=30 V, Imax=165 mA, Pmax=0.9 W, Ci=22.5 nF, Li=730 μH<br>Electrical connection: 1/2 NPT female *1 | CS1 |
| | Combined CF1 and CS1 *3<br>Electrical connection: 1/2 NPT female *1 | CU1 |
| Standards Association of Australia (SAA) | SAA Flameproof, Intrinsically safe and Non-sparking Approval *3<br>Ex d IIC T4/T5/T6, IP67 class I, Zone 1, Amb. Temp. : –40 to 80°C(–40 to 176°F)<br>Max. Process Temp.: T4; 120°C(248°F), T5; 100°C(212°F), T6; 85°C 185°F)<br>Ex ia IIC T4, IP67 class I, Zone 0<br>Ex n IIC T4, IP67 class I, Zone 2<br>Ui=30 V DC, Ii=165 mA DC, Wi=0.9 W, Amb. Temp.: –40 to 60°C(–40 to 140°F)<br>Electrical connection: 1/2 NPT female, Pg 13.5 female and M20 female *2 | SU1 |

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*1: Applicable for Electrical connection code 2 and 7.
*2: Applicable for Electrical connection code 2, 4, and 7.
*3: Use the safety barrier certified by the testing laboratories(BARD-400 is not applicable).
*4: Applicable for Electrical connection code 2, 3, 4 and 7.

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## ■ OPTIONAL SPECIFICATIONS

| Item | | Description | | Code |
|---|---|---|---|---|
| High accuracy type *11 | | High accuracy | | HAC |
| Painting | Color change | Amplifier cover only | | P□ |
| | Coating change | Epoxy resin-baked coating | | X1 |
| Lightning protector | | Transmitter power supply voltage: 10.5 to 32 V DC (10.5 to 30 V DC for intrinsically safe type.)<br>Allowable current: Max. 6000 A (1×40 μs), Repeating 1000 A (1×40 μs) 100 times | | A |
| Oil-prohibited use | | Degrease cleansing treatment | | K1 |
| | | Degrease cleansing treatment and with fluorinated oil filled capsule.<br>Operating temperature −20 to 80°C | | K2 |
| Calibration units *1 | | P calibration (psi unit) | (See Table for Span and Range Limits.) | D1 |
| | | bar calibration (bar unit) | | D3 |
| | | M calibration (kgf/cm² unit ) | | D4 |
| Fast response *9 | | Update time: 0.125 sec or less<br>Amplifier damping time constant: 0.1 to 64 sec in 9 increments<br>Response time (with min. damping time constant): max. 0.3 sec | | F1 |
| Failure alarm down-scale *2 | | Output status at CPU failure and hardware error is −5%, 3.2 mA or less. | | C1 |
| NAMUR NE43 compliant *2 *10 | | Output signal limits: 3.8 mA to 20.5 mA | Failure alarm down-scale: output status at CPU failure and hardware error is −5%, 3.2 mA or less. | C2 |
| | | | Failure alarm up-scale: output status at CPU failure and hardware error is 110%, 21.6 mA or more. | C3 |
| Stainless steel amplifier housing *3 | | Amplifier housing material; SCS14A stainless steel (equivalent to SUS316 cast stainless steel or ASTM CF-8M) | | E1 |
| Stainless steel tag plate | | SUS304 stainless steel tag plate wired onto transmitter | | N4 |
| Mill Certificate | | Process connector | | M15 |
| Pressure test/Leak test Certificate | | Test Pressure: 200 kPa (2 kgf/cm²) *4 | Nitrogen ($N_2$) Gas *8<br>Retention time: 10 minutes | T05 |
| | | Test Pressure: 2 MPa (20 kgf/cm²) *5 | | T06 |
| | | Test Pressure: 10 MPa (100 kgf/cm²) *6 | | T07 |
| | | Test Pressure: 50 MPa (500 kgf/cm²) *7 | | T08 |

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*1: The unit of MWP (Max. working pressure) on the name plate of a housing is the same unit as specified by Optional code D1, D3 and D4.
*2: The hardware error indicates faulty amplifier or capsule.
When combining with Optional code F1, output status for down-scale is −2.5%, 3.6 mA DC or less.
*3: Applicable for Electrical connection code 2, 3, 4, and 7. Not applicable for Optional code P□ and X1.
*4: Applicable for Capsule code A.
*5: Applicable for Capsule code B.
*6: Applicable for Capsule code C.
*7: Applicable for Capsule code D.
*8: Pure nitrogen gas is used for oil-prohibited use (Optional code K1 and K2)
*9: Consult Yokogawa when combining with Optional code for explosion protected type.
*10: Not applicable for Optional code C1.
*11: Applicable for EJA530A.

### < Settings When Shipped >

| | |
|---|---|
| Tag Number | As specified in order *1 |
| Output Mode | 'Linear' |
| Display Mode | 'Linear' |
| Operation Mode | 'Normal' unless otherwise specified in order |
| Damping Time Constant | '2 sec.' |

| | |
|---|---|
| Calibration Range Lower Range Value | As specified in order |
| Calibration Range Higher Range Value | As specified in order |
| Calibration Range Units | Selected from $mmH_2O$, mmAq, mmWG, mmHg, Torr, Pa, hPa, kPa, MPa, mbar, bar, gf/cm², kgf/cm², $inH_2O$, inHg, $ftH_2O$, psi, or atm.(Only one unit can be specified) |

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*1: Up to 16 alphanumeric characters (including - and · ) for Output Signal code D or up to 8 alphanumeric characters for Output Signal code E will be entered in the amplifier memory.

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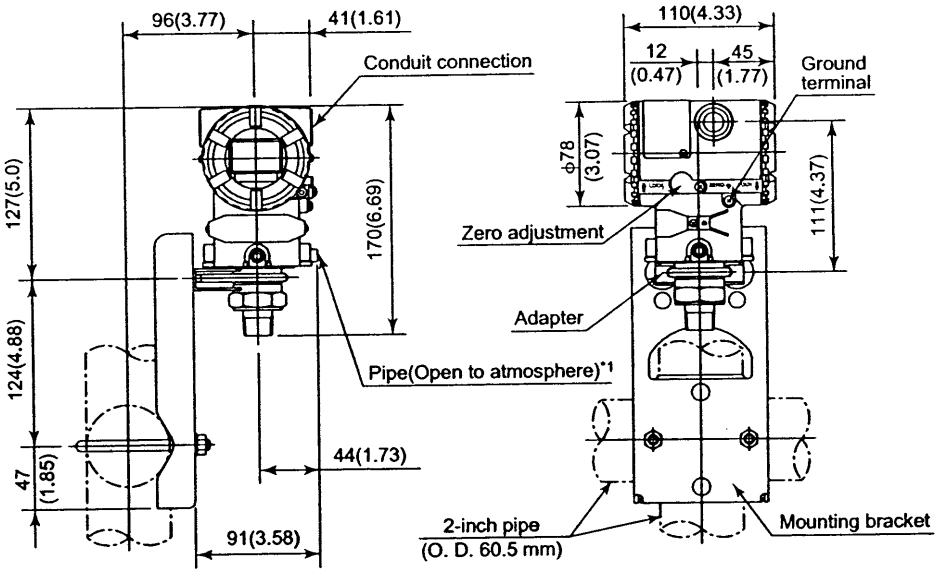
# ■ DIMENSIONS

## ● Model EJA510A and EJA530A

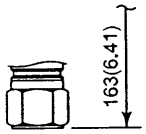
◆ With Process Connection code 7

Unit: mm(Approx. inch)

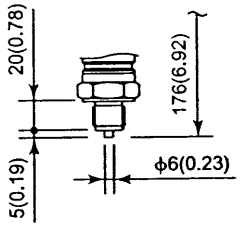



*1: Applied to Model EJA530A with Measurement span code A, B, and C.

◆ For Process Connection code 4




◆ For Process Connection code 8 and 9

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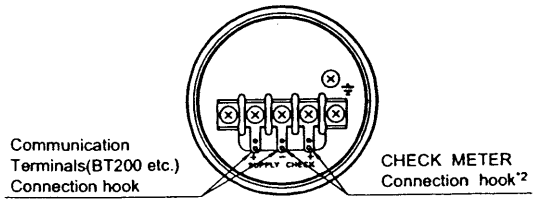
## ● Terminal Configuration




## ● Terminal Wiring

| | |
|---|---|
| SUPPLY + − | Power supply and output terminal |
| CHECK + − | External indicator(ammeter) terminal*2 |
| ⏚ | Ground terminal |

*2: When using an external indicator or a check meter, the internal resistance must be 10 Ω or less.

F04E.EPS

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YOKOGAWA
2 Dart Road
Newnan, GA 30265
Fax: (770) 254-0928
Tel: (770) 254-0400

# DPharp Factory Calibration Test Report

| | |
|---|---|
| Model Number | EJA530A-EAS4N-02EE/CF1/D1 |
| Serial Number | 27E620228U |
| Capsule Serial | 1S5F041J |
| Date | 8/2/05 |
| Ambient Temperature | 23.70 Deg. C |
| Operator | 2426 |
| Order Number | KDG0241 |
| Line Number | 02 |
| Component Number | 01 |
| PO Number | 155402 |
| Tag Number | |

## Calibrated Range

| | |
|---|---|
| Low Range Value | 0.00 |
| High Range Value | 29.00 |
| Unit of Measure | psi |
| Pressure Std Serial # | 49069 |

| Test Point | Pressure | Output Voltage | Error % |
|---|---|---|---|
| 1. Voltage Output 0% | 0.00 psi | 1.0001 V | 0.003 % |
| 2. Voltage Output 25% | 7.25 psi | 1.9996 V | -0.010 % |
| 3. Voltage Output 50% | 14.50 psi | 2.9993 V | -0.017 % |
| 4. Voltage Output 75% | 21.75 psi | 3.9990 V | -0.025 % |
| 5. Voltage Output 100% | 29.00 psi | 4.9988 V | -0.030 % |
| 6. Voltage Output 75% | 21.75 psi | 3.9992 V | -0.020 % |
| 7. Voltage Output 50% | 14.50 psi | 2.9994 V | -0.015 % |
| 8. Voltage Output 25% | 7.25 psi | 1.9995 V | -0.012 % |
| 9. Voltage Output 0% | 0.00 psi | 0.9997 V | -0.007 % |
| | | **Average Error:** | 0.016 % |





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# User's Manual

DPharp

# Model EJA510A and EJA530A Absolute Pressure and Gauge Pressure Transmitters

**[Style: S2]**

IM 01C21F01-01E

CITY OF IQUALUIT
C/O WASTE WATER TREAT.PLANT
C/O POTABLE WATER PLANT
P.O.BOX 460, IQUALUIT,
NUNAVUT, XOA OHO
18.4

YOKOGAWA
Yokogawa Electric Corporation

IM 01C21F01-01E
5th Edition

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Model EJA510A and EJA530A Absolute and Gauge
Pressure Transmitter ..... CMPL 01C21F01-01E

## REVISION RECORD




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# 1. INTRODUCTION

Thank you for purchasing the DPharp electronic pressure transmitter.

The DPharp Pressure Transmitters are precisely calibrated at the factory before shipment. To ensure correct and efficient use of the instrument, please read this manual thoroughly and fully understand how to operate the instrument before operating it.

## ■ Regarding This Manual

- This manual should be passed on to the end user.
- The contents of this manual are subject to change without prior notice.
- All rights reserved. No part of this manual may be reproduced in any form without Yokogawa's written permission.
- Yokogawa makes no warranty of any kind with regard to this manual, including, but not limited to, implied warranty of merchantability and fitness for a particular purpose.
- If any question arises or errors are found, or if any information is missing from this manual, please inform the nearest Yokogawa sales office.
- The specifications covered by this manual are limited to those for the standard type under the specified model number break-down and do not cover custom-made instruments.
- Please note that changes in the specifications, construction, or component parts of the instrument may not immediately be reflected in this manual at the time of change, provided that postponement of revisions will not cause difficulty to the user from a functional or performance standpoint.

**NOTE**

For FOUNDATION Fieldbus and HART protocol versions, please refer to IM 01C22T02-01E IM 01C22T01-01E respectively, in addition to this manual.

- The following safety symbol marks are used in this manual:

**WARNING**

Indicates a potentially hazardous situation which, if not avoided, *could* result in death or serious injury.

**CAUTION**

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against *unsafe practices.*

**IMPORTANT**

Indicates that operating the hardware or software in this manner may damage it or lead to system failure.

**NOTE**

Draws attention to information essential for understanding the operation and features.



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## 1.1 For Safe Use of Product

For the protection and safety of the operator and the instrument or the system including the instrument, please be sure to follow the instructions on safety described in this manual when handling this instrument. In case the instrument is handled in contradiction to these instructions, Yokogawa does not guarantee safety. Please give your attention to the followings.

### (a) Installation

- The instrument must be installed by an expert engineer or a skilled personnel. The procedures described about INSTALLATION are not permitted for operators.
- In case of high process temperature, care should be taken not to burn yourself because the surface of body and case reaches a high temperature.
- The instrument installed in the process is under pressure. Never loosen the process connector bolts to avoid the dangerous spouting of process fluid.
- During draining condensate from the pressure-detector section, take appropriate care to avoid contact with the skin, eyes or body, or inhalation of vapors, if the accumulated process fluid may be toxic or otherwise harmful.
- When removing the instrument from hazardous processes, avoid contact with the fluid and the interior of the meter.
- All installation shall comply with local installation requirement and local electrical code.

### (b) Wiring

- The instrument must be installed by an expert engineer or a skilled personnel. The procedures described about WIRING are not permitted for operators.
- Please confirm that voltages between the power supply and the instrument before connecting the power cables and that the cables are not powered before connecting.

### (c) Operation

- Wait 10 min. after power is turned off, before opening the covers.

### (d) Maintenance

- Please do not carry out except being written to a maintenance descriptions. When these procedures are needed, please contact nearest YOKOGAWA office.
- Care should be taken to prevent the build up of drift, dust or other material on the display glass and name plate. In case of its maintenance, soft and dry cloth is used.

## 1.2 Warranty

- The warranty shall cover the period noted on the quotation presented to the purchaser at the time of purchase. Problems occurred during the warranty period shall basically be repaired free of charge.
- In case of problems, the customer should contact the Yokogawa representative from which the instrument wark+0-ŒXased, or the nearest Yokogawa office.
- If a problem arises with this instrument, please inform us of the nature of the problem and the circumstances under which it developed, including the model specification and serial number. Any diagrams, data and other information you can include in your communication will also be helpful.
- Responsible party for repair cost for the problems shall be determined by Yokogawa based on our investigation.
- The Purchaser shall bear the responsibility for repair costs, even during the warranty period, if the malfunction is due to:
  - Improper and/or inadequate maintenance by the purchaser.
  - Failure or damage due to improper handling, use or storage which is out of design conditions.
  - Use of the product in question in a location not conforming to the standards specified by Yokogawa, or due to improper maintenance of the installation location.
  - Failure or damage due to modification or repair by any party except Yokogawa or an approved representative of Yokogawa.
  - Malfunction or damage from improper relocation of the product in question after delivery.
  - Reason of force majeure such as fires, earthquakes, storms/floods, thunder/lightening, or other natural disasters, or disturbances, riots, warfare, or radioactive contamination.

# 2. HANDLING CAUTIONS

This chapter describes important cautions regarding how to handle the transmitter. Read carefully before using the transmitter.

The EJA-A Series pressure transmitters are thoroughly tested at the factory before shipment. When the transmitter is delivered, visually check them to make sure that no damage occurred during shipment.

Also check that all transmitter mounting hardware shown in Figure 2.1.1 is included. If the transmitter was ordered without the mounting bracket, the transmitter mounting hardware is not included. After checking the transmitter, repack it in the way it was delivered until installation.

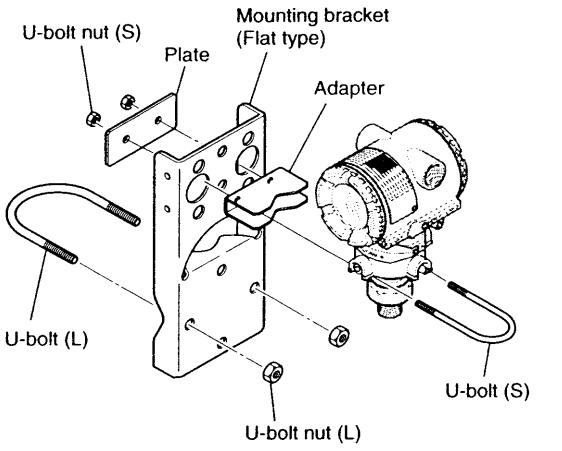


**Figure 2.1.1 Transmitter Mounting Hardware**

## 2.1 Model and Specifications Check

The model name and specifications are indicated on the name plate attached to the case. If the *reverse* operating mode was ordered (reverse signal), 'REVERSE' will be inscribed in field *1.

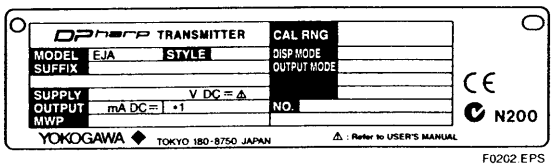


**Figure 2.1.2 Name Plate**

## 2.2 Unpacking

When moving the transmitter to the installation site, keep it in its original packaging. Then, unpack the transmitter there to avoid damage on the way.

## 2.3 Storage

The following precautions must be observed when storing the instrument, especially for a long period.

(a) Select a storage area which meets the following conditions:
- It is not exposed to rain or water.
- It suffers minimum vibration and shock.
- It has an ambient temperature and relative humidity within the following ranges.

Ambient temperature:
–40 to 85°C without integral indicator
–30 to 80°C with integral indicator
Relative humidity:
5% to 100% R.H. (at 40°C)
Preferred temperature and humidity:
approx. 25°C and 65% R.H.

(b) When storing the transmitter, repack it as nearly as possible to the way it was packed when delivered from the factory.

(c) If storing a transmitter that has been used, thoroughly clean the chambers inside the body, so that no measured fluid remains in it. Also make sure before storing that the transmitter assemblies are securely mounted.

## 2.4 Selecting the Installation Location

The transmitter is designed to withstand severe environmental conditions. However, to ensure stable and accurate operation for years, observe the following precautions when selecting an installation location.

(a) Ambient Temperature
Avoid locations subject to wide temperature variations or a significant temperature gradient. If the location is exposed to radiant heat from plant equipments, provide adequate thermal insulation and/or ventilation.

(b) Ambient Atmosphere
Avoid installing the transmitter in a corrosive atmosphere. If the transmitter must be installed in a corrosive atmosphere, there must be adequate ventilation as well as measures to prevent intrusion or stagnation of rain water in conduits.



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(c) Shock and Vibration
Select an installation site suffering minimum shock and vibration (although the transmitter is designed to be relatively resistant to shock and vibration).

(d) Installation of Explosion-protected Transmitters
Explosion-protected transmitters can be installed in hazardous areas according to the types of gases for which they are certified. See Subsection 2.9 "Installation of Explosion Protected Type Transmitters."

## 2.5 Pressure Connection

**WARNING**

- Instrument installed in the process is under pressure. Never loosen the process connection part to avoid the dangerous spouting of process fluid.
- During draining condensate from the capsule assembly, take appropriate care to avoid contact with the skin, eyes or body, or inhalation of vapors, if the accumulated process fluid may be toxic or otherwise harmful.

The following precautions must be observed in order to safely operate the transmitter under pressure.

(a) Make sure that the process connection part is tightened firmly.
(b) Make sure that there are no leaks in the impulse piping.
(c) Never apply a pressure higher than the specified maximum working pressure.

## 2.6 Waterproofing of Cable Conduit Connections

Apply a non-hardening sealant to the threads to waterproof the transmitter cable conduit connections. (See Figure 6.4.2a, 6.4.2b and 6.4.2c.)

## 2.7 Restrictions on Use of Radio Transceiver

**IMPORTANT**

Although the transmitter has been designed to resist high frequency electrical noise, if a radio transceiver is used near the transmitter or its external wiring, the transmitter may be affected by high frequency noise pickup. To test for such effects, bring the transceiver in use slowly from a distance of several meters from the transmitter, and observe the measurement loop for noise effects. Thereafter, always use the transceiver outside the area affected by noise.

## 2.8 Insulation Resistance and Dielectric Strength Test

Since the transmitter has undergone insulation resistance and dielectric strength tests at the factory before shipment, normally these tests are not required. However, if required, observe the following precautions in the test procedures.

(a) Do not perform such tests more frequently than is absolutely necessary. Even test voltages that do not cause visible damage to the insulation may degrade the insulation and reduce safety margins.

(b) Never apply a voltage exceeding 500 V DC (100 V DC with an internal lightning protector) for the insulation resistance test, nor a voltage exceeding 500 V AC (100 V AC with an internal lightning protector) for the dielectric strength test.

(c) Before conducting these tests, disconnect all signal lines from the transmitter terminals. Perform the tests in the following procedure:

**• Insulation Resistance Test**

1) Short-circuit the + and – SUPPLY terminals in the terminal box.
2) Turn OFF the insulation tester. Then connect the insulation tester plus (+) lead wire to the shorted SUPPLY terminals and the minus (–) leadwire to the grounding terminal.
3) Turn ON the insulation tester power and measure the insulation resistance. The voltage should be applied short as possible to verify that the insulation resistance is at least 20 MΩ.
4) After completing the test and being very careful not to touch exposed conductors disconnect the insulation tester and connect a 100 kΩ resistor between the grounding terminal and the short-circuiting SUPPLY terminals. Leave this resistor connected at least one second to discharge any static potential. Do not touch the terminals while it is discharging.

**• Dielectric Strength Test**

1) Short-circuit the + and – SUPPLY terminals in the terminal box.

2) Turn OFF the dielectric strength tester. Then connect the tester between the shorted SUPPLY terminals and the grounding terminal. Be sure to connect the grounding lead of the dielectric strength tester to the ground terminal.

3) Set the current limit on the dielectric strength tester to 10 mA, then turn ON the power and gradually increase the test voltage from '0' to the specified voltage.

4) When the specified voltage is reached, hold it for one minute.

5) After completing this test, slowly decrease the voltage to avoid any voltage surges.

## 2.9 Installation of Explosion Protected Type

In this section, further requirements and differences and for explosionproof type instrument are described. For explosionproof type instrument, the description in this chapter is prior to other description in this users manual.

For the intrinsically safe equipment and explosionproof equipment, in case the instrument is not restored to its original condition after any repair or modification undertaken by the customer, intrinsically safe construction or explosionproof construction is damaged and may cause dangerous condition. Please contact Yokogawa for any repair or modification required to the instrument.

**⚠ CAUTION**

This instrument is tested and certified as intrinsically safe type or explosionproof type. Please note that the construction of the instrument, installation, external wiring, maintenance or repair is strictly restricted, and non-observance or negligence of this restriction would result in dangerous condition.

**⚠ WARNING**

To preserve the safety of explosionproof equipment requires great care during mounting, wiring, and piping. Safety requirements also place restrictions on maintenance and repair activities. Please read the following sections very carefully.

### 2.9.1 FM Approval

#### a. FM Intrinsically Safe Type

Caution for FM intrinsically safe type. (Following contents refer "DOC. No. IFM012-A12 P.1 and 2.")

Note 1. Model EJA Series pressure transmitters with optional code /FS1 are applicable for use in hazardous locations.

- Intrinsically Safe for Class I, Division 1, Groups A, B, C & D. Class II, Division 1, Groups E, F & G and Class III, Division 1 Hazardous Locations.
- Nonincendive for Class I, Division 2, Groups A, B, C & D. Class II, Division 2, Groups E, F & G and Class III, Division 1 Hazardous Locations.
- Outdoor hazardous locations, NEMA 4X.
- Temperature Class: T4
- Ambient temperature: –40 to 60°C

Note 2. Entity Parameters

- Intrinsically Safe Apparatus Parameters
  [Groups A, B, C, D, E, F and G]
  Vmax = 30 V  Ci = 22.5 nF
  Imax = 165 mA  Li = 730 µH
  Pmax = 0.9 W
- * Associated Apparatus Parameters
  (FM approved barriers)
  Voc ≤ 30 V  Ca > 22.5 nF
  Isc ≤ 165 mA  La > 730 µH
  Pmax ≤ 0.9W
- Intrinsically Safe Apparatus Parameters
  [Groups C, D, E, F and G]
  Vmax = 30 V  Ci = 22.5 nF
  Imax = 225 mA  Li = 730 µH
  Pmax = 0.9 W
- * Associated Apparatus Parameters
  (FM approved barriers)
  Voc ≤ 30 V  Ca > 22.5 nF
  Isc ≤ 225 mA  La > 730 µH
  Pmax ≤ 0.9 W
- Entity Installation Requirements
  Vmax ≥ Voc or Vt, Imax ≥ Isc or It,
  Pmax (IS Apparatus) ≥ Pmax (Barrier)
  Ca ≥ Ci + Ccable, La ≥ Li + Lcable

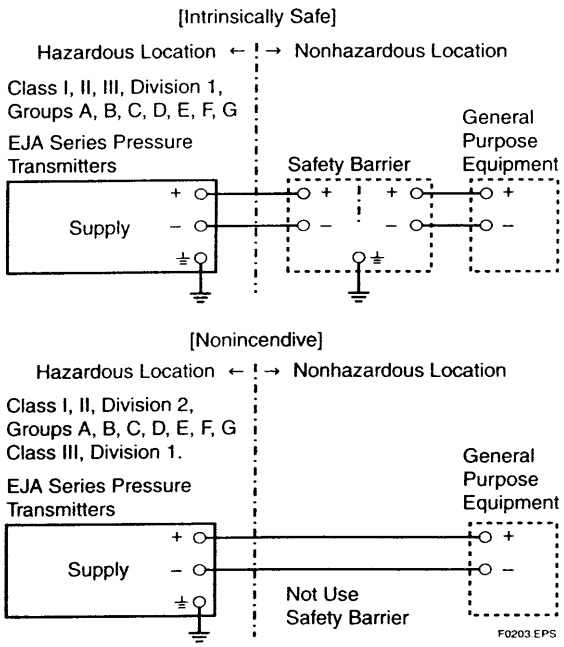
Note 3. Installation

- Barrier must be installed in an enclosure that meets the requirements of ANSI/ISA S82.01.
- Control equipment connected to barrier must not use or generate more than 250 V rms or V dc.
- Installation should be in accordance with ANSI/ISA RP12.6 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electric Code (ANSI/NFPA 70).

- The configuration of associated apparatus must be FMRC Approved.
- Dust-tight conduit seal must be used when installed in a Class II, III, Group E, F and G environments.
- Associated apparatus manufacturer's installation drawing must be followed when installing this apparatus.
- The maximum power delivered from the barrier must not exceed 0.9 W.
- Note a warning label worded "SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY," and "INSTALL IN ACCORDANCE WITH DOC. No. IFM012-A12 P.1 and 2."

Note 4. Maintenance and Repair

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void Factory Mutual Intrinsically safe and Nonincendive Approval.




### b. FM Explosionproof Type

Caution for FM explosionproof type.

Note 1. Model EJA Series differential, gauge, and absolute pressure transmitters with optional code /FF1 are applicable for use in hazardous locations.

- Explosionproof for Class I, Division 1, Groups B, C and D.
- Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G.
- Outdoor hazardous locations, NEMA 4X.
- Temperature Class: T6
- Ambient Temperature: –40 to 60°C
- Supply Voltage: 42 V dc max.
- Output signal: 4 to 20 mA

Note 2. Wiring

- All wiring shall comply with National Electrical Code ANSI/NEPA70 and Local Electrical Codes.
- When installed in Division 1, "FACTORY SEALED, CONDUIT SEAL NOT REQUIRED."

Note 3. Operation

- Keep the "CAUTION" nameplate attached to the transmitter.
  CAUTION: OPEN CIRCUIT BEFORE REMOVING COVER. SEAL ALL CONDUITS WITHIN 18 INCHES. WHEN INSTALLED IN DIV.1, "FACTORY SEALED, CONDUIT SEAL NOT REQUIRED." INSTALL IN ACCORDANCE WITH THE INSTRUCTION MANUAL IM 1C22.
- Take care not to generate mechanical sparking when accessing to the instrument and peripheral devices in a hazardous location.

Note 4. Maintenance and Repair

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void Factory Mutual Explosionproof Approval.

### c. FM Intrinsically Safe Type/FM Explosionproof Type

Model EJA Series pressure transmitters with optional code /FU1 can be selected the type of protection (FM Intrinsically Safe or FM Explosionproof) for use in hazardous locations.

Note 1. For the installation of this transmitter, once a particular type of protection is selected, any other type of protection cannot be used. The installation must be in accordance with the description about the type of protection in this instruction manual.

Note 2. In order to avoid confusion, unnecessary marking is crossed out on the label other than the selected type of protection when the transmitter is installed.

### 2.9.2 CSA Certification

#### a. CSA Intrinsically Safe Type

Caution for CSA Intrinsically safe type. (Following contents refer to "DOC No. ICS003-A12 P.1-1 and P.1-2.")

Note 1. Model EJA Series differential, gauge, and absolute pressure transmitters with optional code /CS1 are applicable for use in hazardous locations

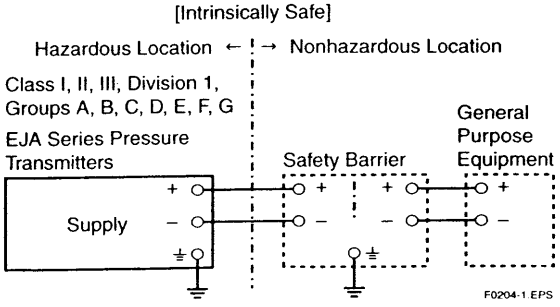
- Intrinsically Safe for Class I, Division 1, Groups A, B, C & D. Class II, Division 1, Groups E, F & G and Class III, Division 1 Hazardous Locations.
- Nonincendive for Class I, Division 2, Groups A, B, C & D, Class II, Division 2, Groups F & G, and Class III, Hazardous Locations. (not use Safety Barrier)
- Encl. "Type 4X"
- Temperature Class: T4
- Ambient temperature: –40 to 60°C
- Process Temperature: 120°C max.

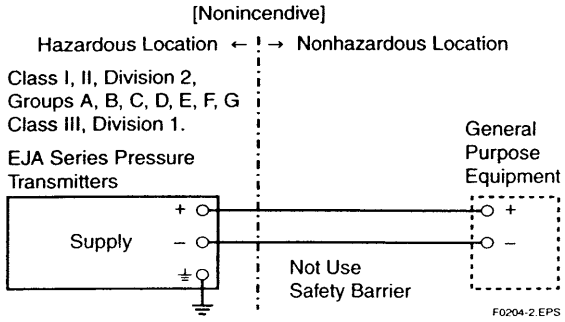
Note 2. Entity Parameters

- Intrinsically safe ratings are as follows:
  Maximum Input Voltage (Vmax) = 30 V
  Maximum Input Current (Imax) = 165 mA
  Maximum Input Power (Pmax) = 0.9 W
  Maximum Internal Capacitance (Ci) = 22.5 nF
  Maximum Internal Inductance (Li) = 730 μH
- * Associated apparatus (CSA certified barriers)
  Maximum output voltage (Voc) ≤ 30 V
  Maximum output current (Isc) ≤ 165 mA
  Maximum output power (Pmax) ≤ 0.9 W

Note 3. Installation

- All wiring shall comply with Canadian Electrical Code Part I and Local Electrical Codes.
- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation and Yokogawa Corporation of America is prohibited and will void Canadian Standards Intrinsically safe and nonincendive Certification.




#### b. CSA Explosionproof Type

Caution for CSA explosionproof type.

Note 1. Model EJA Series differential, gauge, and absolute pressure transmitters with optional code /CF1 are applicable for use in hazardous locations:

- Explosionproof for Class I, Division 1, Groups B, C and D.
- Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G.
- Encl "Type 4X"
- Temperature Class: T6, T5, and T4
- Process Temperature: 85°C (T6), 100°C (T5), and 120°C (T4)
- Ambient Temperature: –40 to 80°C
- Supply Voltage: 42 V dc max.
- Output Signal: 4 to 20 mA

Note 2. Wiring

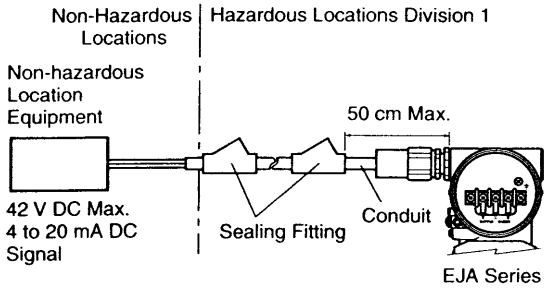
- All wiring shall comply with Canadian Electrical Code Part I and Local Electrical Codes.
- In hazardous location, wiring shall be in conduit as shown in the figure.
  CAUTION: SEAL ALL CONDUITS WITHIN 50 cm OF THE ENCLOSURE.
  UN SCELLEMENT DOIT ÊTRE INSTALLÉ À MOINS DE 50 cm DU BÎTIER.
- When installed in Division 2, "SEALS NOT REQUIRED."

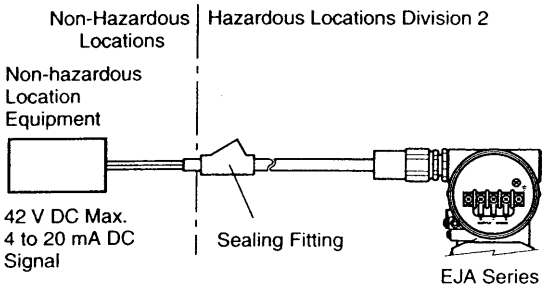
Note 3. Operation

- Keep the "CAUTION" label attached to the transmitter.
  CAUTION: OPEN CIRCUIT BEFORE REMOVING COVER.
  OUVRIR LE CIRCUIT AVANT D'NLEVER LE COUVERCLE.
- Take care not to generate mechanical sparking when accessing to the instrument and peripheral devices in a hazardous location.

Note 4. Maintenance and Repair

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation and Yokogawa Corporation of America is prohibited and will void Canadian Standards Explosionproof Certification.

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### c. CSA Intrinsically Safe Type/CSA Explosionproof Type

Model EJA Series pressure transmitters with optional code /CU1 can be selected the type of protection (CSA Intrinsically Safe or CSA Explosionproof) for use in hazardous locations.

Note 1. For the installation of this transmitter, once a particular type of protection is selected, any other type of protection cannot be used. The installation must be in accordance with the description about the type of protection in this instruction manual.

Note 2. In order to avoid confusion, unnecessary marking is crossed out on the label other than the selected type of protection when the transmitter is installed.

## 2.9.3 SAA Certification

### a. SAA Intrinsically Safe Type

Caution for SAA Intrinsically safe type and Type n.

Note 1. Model EJA Series differential, gauge, and absolute pressure transmitters with optional code /SU1 are applicable for use in hazardous locations.

- Type of Protection and Marking Code: Ex ia IIC T4 (Tamb = 60°C) IP67 Class I Zone 0
- Type of Protection and Marking Code: Ex n IIC T4 (Tamb = 60°C) IP67 Class I Zone 2
- Ambient Temperature: –40 to 60°C

Note 2. Entity Parameters

- Intrinsically safe rating of the transmitters are as follows.

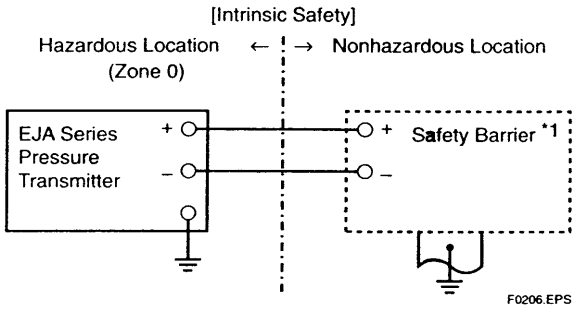
  Maximum Input Voltage (Ui) = 30 V
  Maximum Input Current (Ii) = 165 mA
  Maximum Input Power (Pi) = 0.9 W
  Maximum Internal Capacitance (Ci) = 0.02 μF
  Maximum Internal Inductance (Li) = 0.73 mH

Note 3. Wiring

- All Wiring shall comply with the Australian Standard.

Note 4. Maintenance and Repair

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void Standards Association of Australia Intrinsically safe and Type n Certification.

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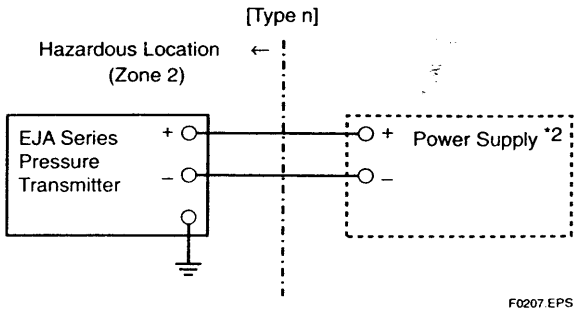
*1: Any safety barriers used for the output current must be limited by a resistor "R" such that Imaxout-Uz/R.

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*2: The voltage of the power supply is not exceed 30V dc.

### b. SAA Flameproof Type

Caution for SAA flameproof type.

Note 1. Model EJA Series differential, gauge, and absolute pressure transmitters with optional code /SU1 are applicable for use in hazardous locations:

- Type of Protection and marking Code: Ex d II C T* IP67 Class I Zone 1 (T* see schedule)
- Temperature Class: T6, T5, and T4
- Process Temperature: 85°C (T6), 100°C (T5), and 120°C (T4)
- Supply voltage: 42 V dc max.
- Output Signal: 4 to 20 mA
- Ambient Temperature: –40 to 80°C

Note 2. Wiring

- All wiring shall comply with the Australian Standard.

Note 3. Operation

- Keep the "CAUTION" label attached to the transmitter.

  CAUTION: AMBIENT TEMPERATURE ABOVE 75 DEG C SELECT SUITABLE CABLE.
  DISCONNECT POWER AND WAIT 1 MINUTE BEFORE REMAKING COVER

- Take care not to generate mechanical sparking when accessing to the instrument and peripheral devices in a hazardous location.

Note 4. Maintenance and Repair

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void Standards Association of Australia Flameproof Certification.

## 2.9.4 CENELEC ATEX (KEMA) Certification

### (1) Technical Data

### a. CENELEC ATEX (KEMA) Intrinsically Safe Type

Caution for CENELEC ATEX (KEMA) Intrinsically safe type.

Note 1. Model EJA Series differential, gauge, and absolute pressure transmitters with optional code /KS2 for potentially explosive atmospheres:

- No. KEMA 02ATEX1030 X
- Type of Protection and Marking code: EEx ia IIC T4
- Temperature Class: T4
- Enclosure: IP67
- Process Temperature: 120°C max.
- Ambient Temperature: –40 to 60°C

Note 2. Electrical Data

- In type of explosion protection intrinsic safety EEx ia IIC only for connection to a certified intrinsically safe circuit with following maximum values:
  Ui = 30 V
  Ii = 165 mA
  Pi = 0.9 W
  Effective internal capacitance; Ci = 22.5 nF
  Effective internal inductance; Li = 730 µH

Note 3. Installation

- All wiring shall comply with local installation requirements. (Refer to the installation diagram)

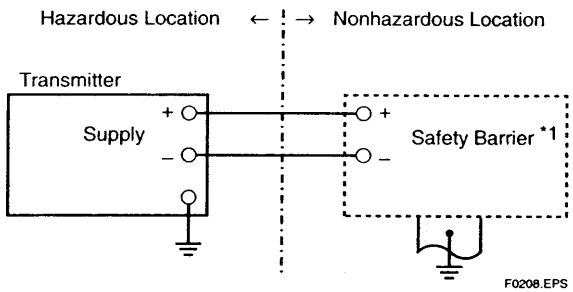
Note 4. Maintenance and Repair

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void KEMA Intrinsically safe Certification.

Note 5. Special Conditions for Safe Use

- In the case where the enclosure of the Pressure Transmitter is made of aluminium, if it is mounted in an area where the use of category 1 G apparatus is required, it must be installed such, that, even in the event of rare incidents, ignition sources due to impact and friction sparks are excluded.

[Installation Diagram]




*1: In any safety barriers used the output current must be limited by a resistor "R" such that Imaxout-Uz/R.

### b. CENELEC ATEX (KEMA) Flameproof Type

Caution for CENELEC ATEX (KEMA) flameproof type.

Note 1. Model EJA Series differential, gauge, and absolute pressure transmitters with optional code /KF2 for potentially explosive atmospheres:

- No. KEMA 02ATEX2148
- Type of Protection and Marking Code: EEx d IIC T6···T4
- Temperature Class: T6, T5, and T4
- Enclosure: IP67

- Maximum Process Temperature: 85°C (T6), 100°C (T5), and 120°C (T4)
- Ambient Temperature: T4 and T6; –40 to 75°C, T5; –40 to 80°C

Note 2. Electrical Data
- Supply voltage: 42 V dc max.
- Output signal: 4 to 20 mA

Note 3. Installation
- All wiring shall comply with local installation requirement.
- The cable entry devices shall be of a certified flameproof type, suitable for the conditions of use.

Note 4. Operation
- Keep the "CAUTION" label to the transmitter.
  CAUTION: AFTER DE-ENERGIZING, DELAY 10 MINUTES BEFORE OPENING. WHEN THE AMBIENT TEMP.≧70°C, USE HEAT-RESISTING CABLES≧90°C.
- Take care not to generate mechanical sparking when accessing to the instrument and peripheral devices in a hazardous location.

Note 5. Maintenance and Repair
- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void KEMA Flameproof Certification.

### c. CENELEC ATEX (KEMA) Intrinsically Safe Type/CENELEC ATEX (KEMA) Flameproof Type/ CENELEC ATEX Type n

Model EJA-A Series pressure transmitters with optional code /KU2 can be selected the type of protection CENELEC ATEX (KEMA) Intrinsically Safe, Flameproof or CENELEC ATEX Type n for use in hazardous locations.

Note 1. For the installation of this transmitter, once a particular type of protection is selected, any other type of protection cannot be used. The installation must be in accordance with the description about the type of protection in this user's manual.

Note 2. In order to avoid confusion, unnecessary marking is crossed out on the label other than the selected type of protection when the transmitter is installed.

#### ● CENELEC ATEX Type of Protection "n"

**⚠ WARNING**

When using a power supply not having a non-incendive circuit, please pay attention not to ignite in the surrounding flammable atmosphere. In such a case, we recommend using wiring metal conduit in order to prevent the ignition.

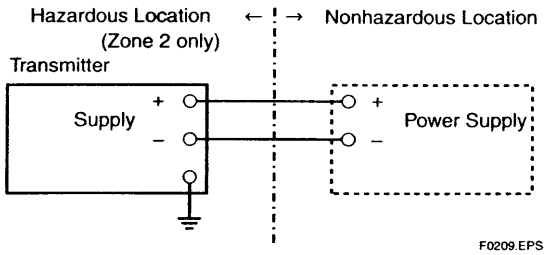
- Type of Protection and Marking Code: EEx nC IIL T4
- Temperature Class: T4
- Enclosure: IP67
- Process Temperature: 120°C max.
- Ambient Temperature: –40 to 60°C

Note 1. Electrical Data
  Ui = 30 V
  Effective internal capacitance; Ci = 22.5 nF
  Effective internal inductance; Li = 730 μH

Note 2. Installation
- All wiring shall comply with local installation requirements. (refer to the installation diagram)

Note 3. Maintenance and Repair
- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void Type of Protection "n".

[Installation Diagram]




Ratings of the Power Supply as follows;
  Maximum Voltage: 30 V

#### ● CENELEC ATEX Type of Protection "Dust"

- Type of Protection and Marking Code: II 1D
- Maximum Surface Temperature: T65°C (Tamb.: 40°C), T85°C (Tamb.: 60°C), and T105°C (Tamb.: 80°C)

### (2) Electrical Connection

The type of electrical connection is stamped near the electrical connection port according to the following marking.

| Screw Size | Marking |
|---|---|
| ISO M20×1.5 female | ⚠ M |
| ANSI 1/2 NPT female | ⚠ A |

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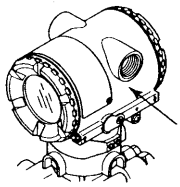


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### (3) Installation

⚠ **WARNING**

- All wiring shall comply with local installation requirement and local electrical code.
- There is no need of the conduit seal for both of Division 1 and Division 2 hazardous locations because this product is sealed at factory.

### (4) Operation

⚠ **WARNING**

- OPEN CIRCUIT BEFORE REMOVING COVER. INSTALL IN ACCORDANCE WITH THIS USER'S MANUAL
- Take care not to generate mechanical sparking when access to the instrument and peripheral devices in hazardous locations.

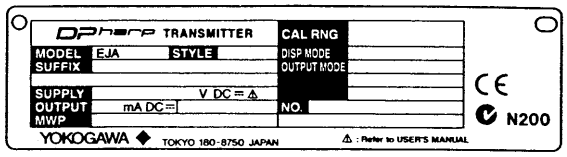
### (5) Maintenance and Repair

⚠ **WARNING**

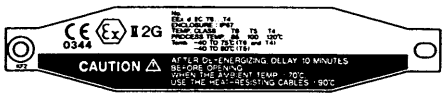
The instrument modification or parts replacement by other than authorized Representative of Yokogawa Electric Corporation is prohibited and will void the certification.

### (6) Name Plate

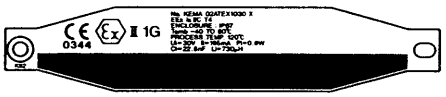
● Name plate



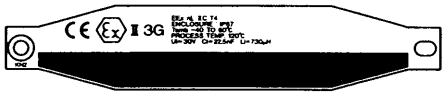

● Tag plate for flameproof type



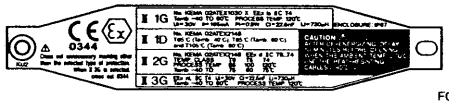

● Tag plate for intrinsically safe type




● Tag plate for type n protection




● Tag plate for flameproof, intrinsically safe type, type n protection, and Dust

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MODEL: Specified model code.
STYLE: Style code.
SUFFIX: Specified suffix code.
SUPPLY: Supply voltage.
OUTPUT: Output signal.
MWP: Maximum working pressure.
CAL RNG: Specified calibration range.
DISP MODE: Specified display mode.
OUTPUT MODE: Specified output mode.
NO.: Serial number and year of production*1.
YOKOGAWA ◆ TOKYO 180-8750 JAPAN: The manufacturer name and the address*2.

*1: The third figure from the last shows the last one figure of the year of production. For example, the production year of the product engraved in "NO." column on the name plate as follows is 2001.

12A819857 132
The year 2001

*2: "180-8750" is a zip code which represents the following address.

2-9-32 Nakacho, Musashino-shi, Tokyo Japan



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## 2.10 EMC Conformity Standards

EN61326, AS/NZS 2064

**NOTE**

YOKOGAWA recommends customer to apply the Metal Conduit Wiring or to use the twisted pair Shield Cable for signal wiring to conform the requirement of EMC Regulation, when customer installs the EJA Series Transmitters to the plant.

## 2.11 PED (Pressure Equipment Directive)

### (1) General

- EJA series of pressure transmitters are categorized as pressure accessories under the piping section of this directive 97/23/EC, which corresponds with Article 3, Paragraph 3 of PED, denoted as Sound Engineering Practice (SEP).
- EJA130A, EJA440A, EJA510A, and EJA530A can be used above 200 bar and therefore considered as a part of a pressure retaining vessel where category lll, Module H applies. These models can be specified by using the optional code /PE3.

### (2) Technical Data

Module: H
Type of Equipment: Pressure Accessory - Vessel
Type of Fluid: Liquid and Gas
Group of Fluid: 1 and 2

| Model | PS(bar)*1 | V(L) | PS·V(bar·L) | Category*2 |
|---|---|---|---|---|
| EJA110A | 160 | 0.01 | 1.6 | Article 3, Paragraph 3 |
| EJA120A | 0.5 | 0.01 | 0.005 | Article 3, Paragraph 3 |
| EJA130A | 420 | 0.01 | 4.2 | III |
| EJA310A | 140 | 0.01 | 1.4 | Article 3, Paragraph 3 |
| EJA430A | 140 | 0.01 | 1.4 | Article 3, Paragraph 3 |
| EJA440A | 500 | 0.01 | 5 | III |
| EJA510A | 500 | 0.1 | 50 | III |
| EJA530A | 500 | 0.1 | 50 | III |

*1: PS is maximum allowable pressure for vessel itself.
*2: Referred to Table 1 covered by ANNEX II of EC Directive on Pressure Equipment Directive 97/23/EC

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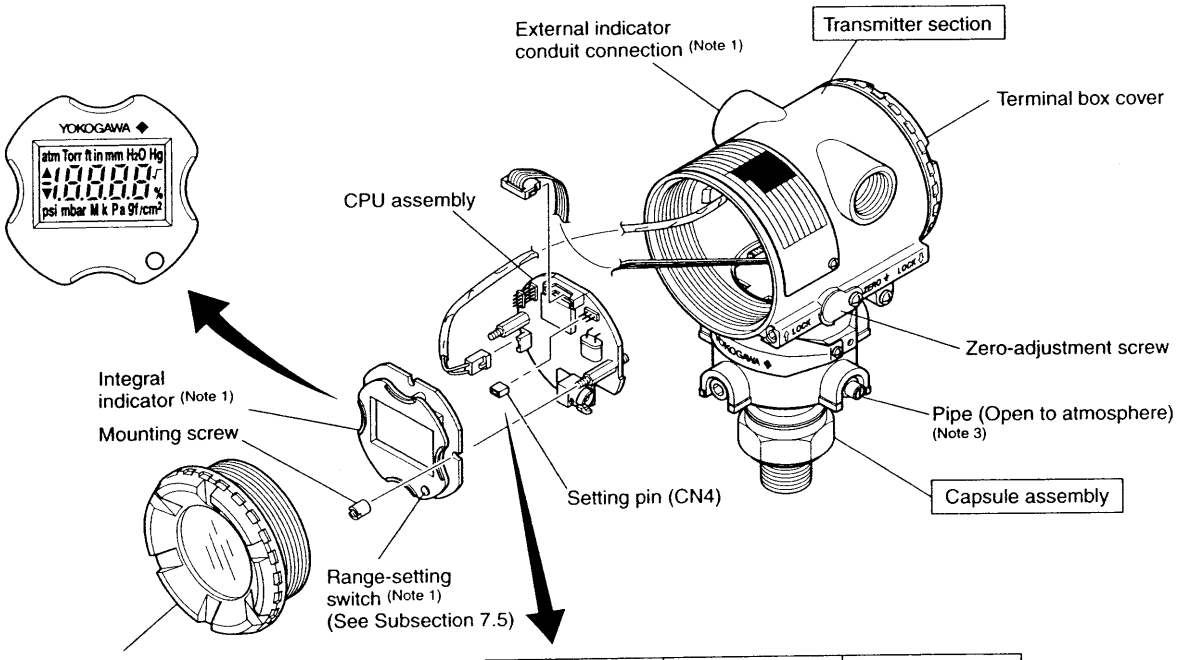
### (3) Operation

**CAUTION**

- The temperature and pressure of fluid should be applied under the normal operating condition.
- The ambient temperature should be applied under the normal operating condition.
- Please pay attention to prevent the excessive pressure like water hammer, etc. When water hammer is to be occurred, please take measures to prevent the pressure from exceeding PS by setting the safety valve, etc. at the system and the like.
- When external fire is to be occurred, please take safety measures at the device or system not to influence the transmitters.

# 3. COMPONENT NAMES




| Setting Pin (CN4) Position (Note 2) | Burn-Out Direction | Output at Burn-Out |
|---|---|---|
| H / L | HIGH | 110% or higher |
| H / L | LOW | −5% or lower |

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Note 1: See Subsection 10.2, "Model and Suffix Codes," for details.
Note 2: Insert the pin (CN4) as shown in the figure above to set the burn-out direction. The pin is set to the H side for delivery (unless option code /C1 is specified in the order).
The setting can be confirmed by calling up parameter D52 using the BRAIN TERMINAL. Refer to Subsection 8.3.3 (8).
Note 3: Applied to Model EJA530A with Measurement span code A, B, and C.

**Figure 3.1 Component Names**

**Table 3.1 Display Symbol**

| Display Symbol | Meaning of Display Symbol |
|---|---|
| ▲ | The output signal being zero-adjusted is increasing. |
| ▼ | The output signal being zero-adjusted is decreasing. |
| %, Pa, kPa, MPa, kgf/cm$^2$, gf/cm$^2$, mbar, bar, atm, mmHg, mm$H_2O$, in$H_2O$, inHg, ft$H_2O$, psi, Torr | Select one of these sixteen available engineering units for the display. |

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# 4. INSTALLATION

## 4.1 Precautions

Before installing the transmitter, read the cautionary notes in Section 2.4, "Selecting the Installation Location." For additional information on the ambient conditions allowed at the installation location, refer to Subsection 10.1 "Standard Specifications."

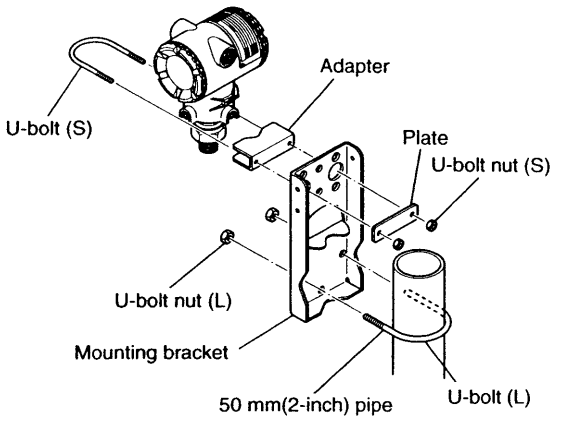
**IMPORTANT**

- When welding piping during construction, take care not to allow welding currents to flow through the transmitter.
- Do not step on this instrument after installation.

## 4.2 Mounting

- The impulse piping connection port of the transmitter is covered with a plastic cap to protect against dust. This cap must be removed before connecting the piping. (Be careful not to damage the threads when removing these caps. Never insert a screw driver or other tool between the cap and the port threads to remove the cap.)
- The transmitter can be mounted on a nominal 50 mm (2-inch) pipe using the mounting bracket supplied, as shown in Figure 4.2.1.
- The user should prepare the mating gasket for the transmitters with Process connection code 8 and 9. See Figure 4.2.2.

Vertical pipe mounting




Horizontal pipe mounting

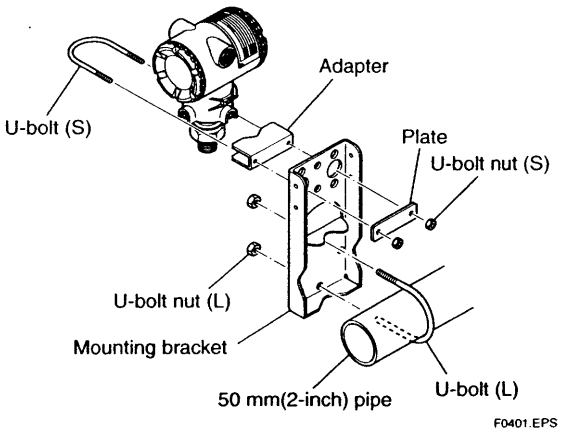



**Figure 4.2.1 Transmitter Mounting**

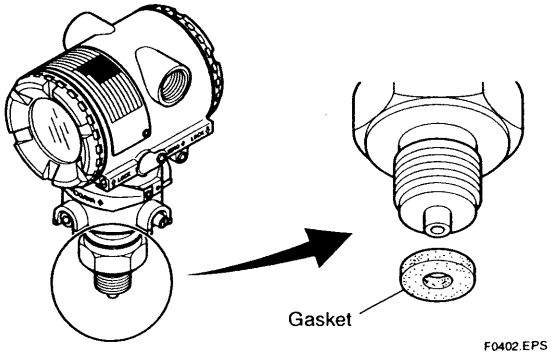



**Figure 4.2.2 Gasketing**

**IMPORTANT**

Tighten the hexagonal nut part of the capsule assembly. See Figure 4.2.3.

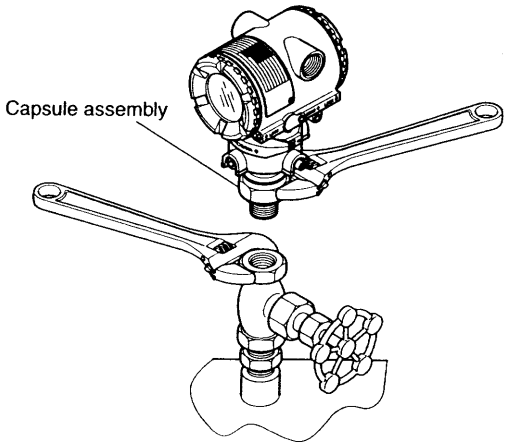



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**Figure 4.2.3 Tightening Transmitter**

## 4.3 Rotating Transmitter Section

The DPharp transmitter section can be rotated in 90° segments.

1) Remove the two Allen screws that fasten the transmitter section and capsule assembly, using the Allen wrench. Also, remove the pipe for the model EJA530A with Measurement span code A, B, and C, using the slotted screwdriver.
2) Rotate the transmitter section slowly in 90° segments.
3) Tighten the two Allen screws to a torque of 5 N·m, and replace the pipe if applied.

**IMPORTANT**

Do not rotate the transmitter section more than 180°.

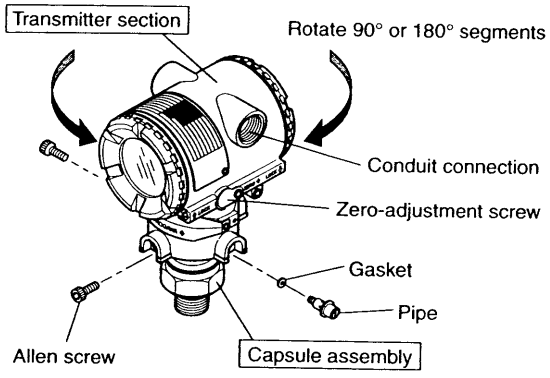


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**Figure 4.3 Rotating Transmitter Section**



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# 5. INSTALLING IMPULSE PIPING

## 5.1 Impulse Piping Installation Precautions

### 5.1.1 Connecting Impulse Piping to the Transmitter

**IMPORTANT**

The transmitter can be installed in horizontal impulse piping configuration, tilting the transmitter's position up to 90°. When tilting, observe that the zero-adjustment screw and the pipe (for Model EJA530A with Measurement span code A, B, and C) are positioned downwards, as shown in Figure 5.1.1.

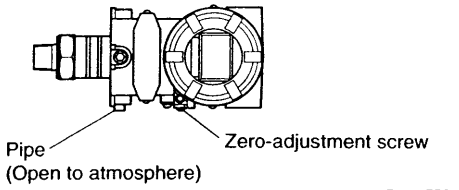



**Figure 5.1.1 Horizontal Impulse Piping Connection**

### 5.1.2 Routing the Impulse Piping

#### (1) Process Pressure Tap Angles

If condensate, gas, sediment or other extraneous material in the process piping gets into the impulse piping, pressure measurement errors may result. To prevent such problems, the process pressure taps must be angled as shown in Figure 5.1.2 according to the kind of fluid being measured.

**NOTE**

- If the process fluid is a gas, the taps must be vertical or within 45° either side of vertical.
- If the process fluid is a liquid, the taps must be horizontal or below horizontal, but not more than 45° below horizontal.
- If the process fluid is steam or other condensing vapor, the taps must be horizontal or above horizontal, but not more than 45° above horizontal.

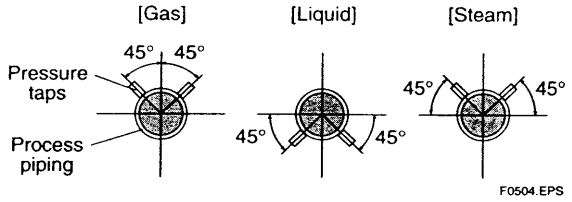



**Figure 5.1.2 Process Pressure Tap Angle (For Horizontal Piping)**

### (2) Position of Process Pressure Taps and Transmitter

If condensate (or gas) accumulates in the impulse piping, it should be removed periodically by opening the drain (or vent) plugs. However, this will generate a transient disturbance in the pressure measurement, and therefore it is necessary to position the taps and route the impulse piping so that any extraneous liquid or gas generated in the leadlines returns naturally to the process piping.

- If the process fluid is a gas, then as a rule the transmitter must be located higher than the process pressure taps.
- If the process fluid is a liquid or steam, then as a rule the transmitter must be located lower than the process pressure taps.

### (3) Impulse Piping Slope

The impulse piping must be routed with only an upward or downward slope. Even for horizontal routing, the impulse piping should have a slope of at least 1/10 to prevent condensate (or gases) from accumulating in the pipes.

### (4) Preventing Freezing

If there is any risk that the process fluid in the impulse piping or transmitter could freeze, use a steam jacket or heater to maintain the temperature of the fluid.

**NOTE**

After completing the connections, close the valves on the process pressure taps (*main valves*), the valves at the transmitter (*stop valves*), and the impulse piping drain valves, so that condensate, sediment, dust and other extraneous material cannot enter the impulse piping.

## 5.2 Impulse Piping Connection Examples

Figure 5.2 shows examples of typical impulse piping connections. Before connecting the transmitter to the process, study the transmitter installation location, the process piping layout, and the characteristics of the process fluid (corrosiveness, toxicity, flammability, etc.), in order to make appropriate changes and additions to the connection configurations.

Note the following points when referring to these piping examples.

- If the impulse piping is long, bracing or supports should be provided to prevent vibration.
- The impulse piping material used must be compatible with the process pressure, temperature, and other conditions.
- A variety of process pressure tap valves (main valves) are available according to the type of connection (flanged, screwed, welded), construction (globe, gate, or ball valve), temperature and pressure. Select the type of valve most appropriate for the application.

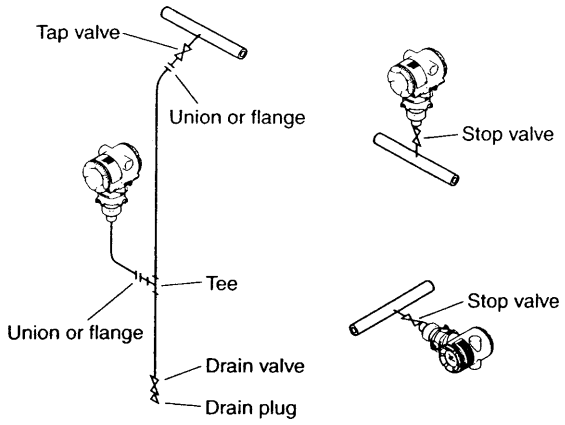



**Figure 5.2 Impulse Piping Connection Examples**

# 6. WIRING

## 6.1 Wiring Precautions

**IMPORTANT**

- Lay wiring as far as possible from electrical noise sources such as large capacity transformers, motors, and power supplies.
- Remove electrical connection dust cap before wiring.
- All threaded parts must be treated with waterproofing sealant. (A non-hardening silicone group sealant is recommended.)
- To prevent noise pickup, do not pass signal and power cables through the same ducts.
- Explosion-protected instruments must be wired in accordance with specific requirements (and, in certain countries, legal regulations) in order to preserve the effectiveness of their explosion-protected features.
- The terminal box cover is locked by an Allen head bolt (a shrouding bolt) on CENELEC and SAA flameproof type transmitters. When the shrouding bolt is driven clockwise by an Allen wrench, it is going in and cover lock is released, and then the cover can be opened by hand. See Subsection 9.4 "Disassembly and Reassembly" for details.

## 6.2 Selecting the Wiring Materials

(a) Use stranded leadwires or cables which are the same as or better than 600 V grade PVC insulated wire (JIS C3307) or equivalent.
(b) Use shielded wires in areas that are susceptible to electrical noise.
(c) In areas with higher or lower ambient temperatures, use appropriate wires or cables.
(d) In environment where oils, solvents, corrosive gases or liquids may be present, use wires or cables that are resistant to such substances.
(e) It is recommended that crimp-on solderless terminal lugs (for 4 mm screws) with insulating sleeves be used for leadwire ends.

## 6.3 Connections of External Wiring to Terminal Box

### 6.3.1 Power Supply Wiring Connection

Connect the power supply wiring to the SUPPLY + and – terminals.

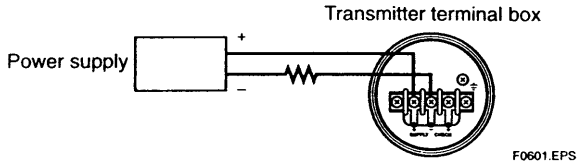



**Figure 6.3.1 Power Supply Wiring Connection**

### 6.3.2 External Indicator Connection

Connect wiring for external indicators to the CHECK + and – terminals.

(Note) Use a external indicator whose internal resistance is 10 Ω or less.

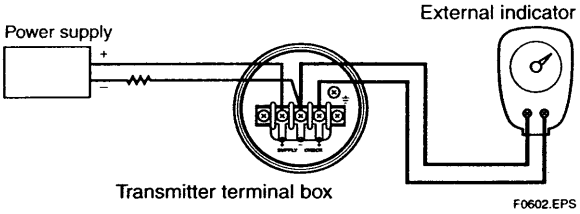



**Figure 6.3.2 External Indicator Connection**

### 6.3.3 BRAIN TERMINAL BT200 Connection

Connect the BT200 to the SUPPLY + and – terminals (Use hooks).

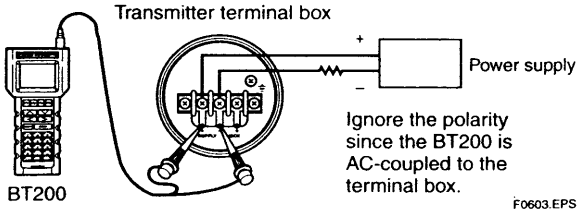



**Figure 6.3.3 BT200 Connection**

### 6.3.4 Check Meter Connection

Connect the check meter to the CHECK + and – terminals (use hooks).

- A 4 to 20 mA DC output signal from the CHECK + and – terminals.

(Note) Use a check meter whose internal resistance is 10 Ω or less.

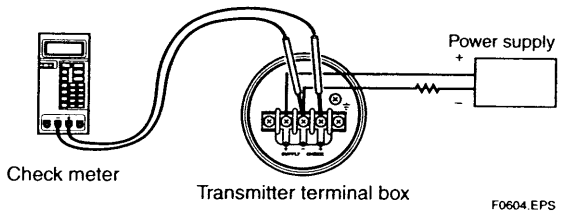



**Figure 6.3.4 Check Meter Connection**

## 6.4 Wiring

### 6.4.1 Loop Configuration

Since the DPharp uses a two-wire transmission system, signal wiring is also used as power wiring.

DC power is required for the transmitter loop. The transmitter and distributor are connected as shown below.

For details of the power supply voltage and load resistance, see Section 6.6; for communications line requirements, see Subsection 8.1.2.

#### (1) General-use Type and Flameproof Type

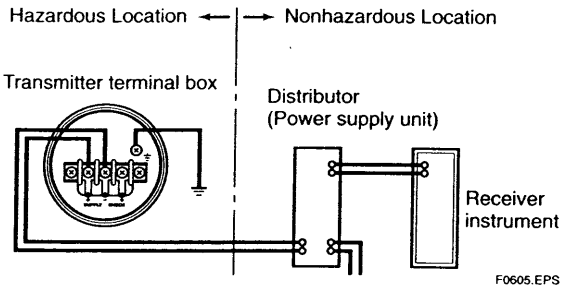



**Figure 6.4.1a Connection between Transmitter and Distributor**

#### (2) Intrinsically Safe Type

For intrinsically safe type, a safety barrier must be included in the loop.

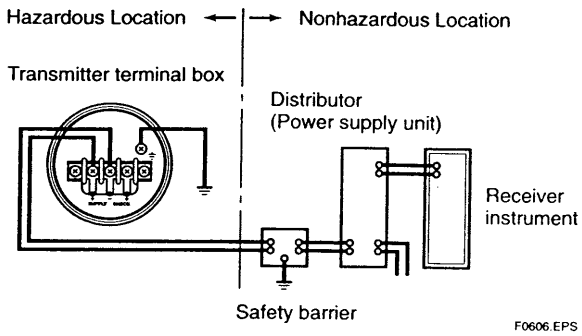



**Figure 6.4.1b Connection between Transmitter and Distributor**

### 6.4.2 Wiring Installation

#### (1) General-use Type and Intrinsically Safe Type

Make cable wiring using metallic conduit or waterproof glands.

- Apply a non-hardening sealant to the terminal box connection port and to the threads on the flexible metal conduit for waterproofing.

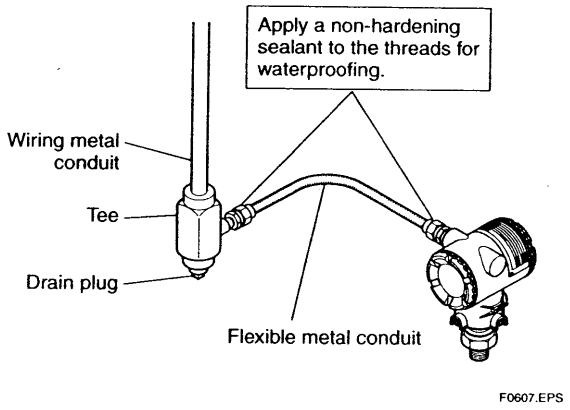



**Figure 6.4.2a Typical Wiring Using Flexible Metal Conduit**



18.4

(32)

### (2) Flameproof Type

Wire cables through a flameproof packing adapter, or using a flameproof metal conduit.

■ Wiring cable through flameproof packing adapter.

- Apply a nonhardening sealant to the terminal box connection port and to the threads on the flameproof packing adapter for waterproofing.

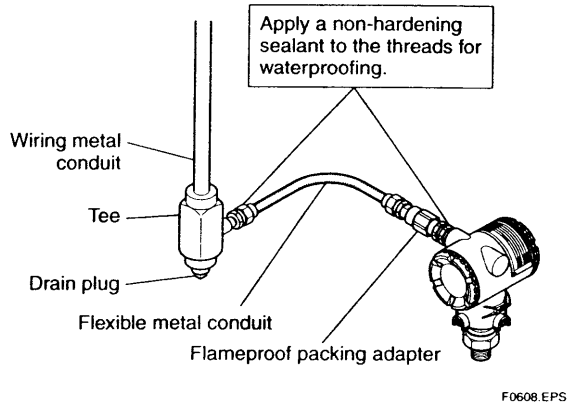



**Figure 6.4.2b Typical Cable Wiring Using Flameproof Packing Adapter**

■ Flameproof metal conduit wiring

- A seal fitting must be installed near the terminal box connection port for a sealed construction.
- Apply a non-hardening sealant to the threads of the terminal box connection port, flexible metal conduit and seal fitting for waterproofing.

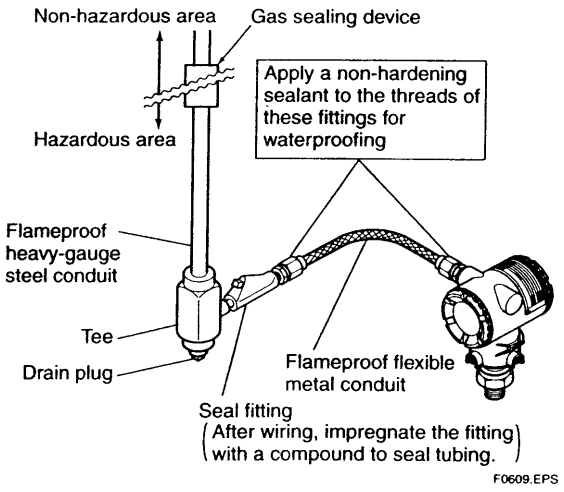



**Figure 6.4.2c Typical Wiring Using Flameproof Metal Conduit**

## 6.5 Grounding

Grounding is always required for the proper operation of transmitters. Follow the domestic electrical requirements as regulated in each country. For a transmitter with built-in lightning protector, grounding should satisfy ground resistance of 10Ω or less.

Ground terminals are located on the inside and outside of the terminal box. Either of these terminals may be used.

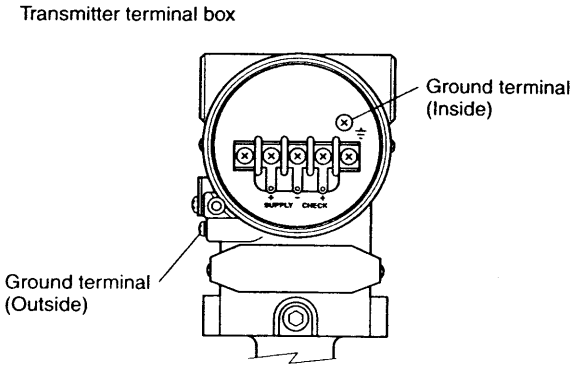



**Figure 6.5 Ground Terminals**

## 6.6 Power Supply Voltage and Load Resistance

When configuring the loop, make sure that the external load resistance is within the range in the figure below.

(Note) In case of an intrinsically safe transmitter, external load resistance includes safety barrier resistance.

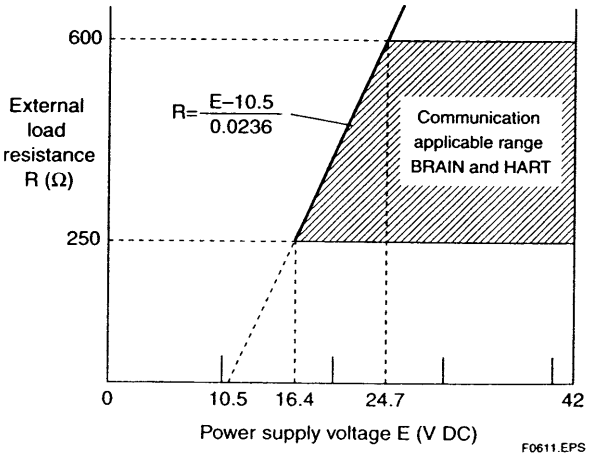



**Figure 6.6 Relationship between Power Supply Voltage and External Load Resistance**

# 7. OPERATION

## 7.1 Preparation for Starting Operation

This section describes the operation procedure for measuring a pressure as shown in Figure 7.1.

**NOTE**

Confirm that the process pressure tap valve, drain valve, and stop valve are closed.

(a) Introduce a process fluid into the impulse piping and then to the transmitter in the following procedure:

1) Open the tap valve (main valve) to fill the impulse piping with process fluid.
2) Gradually open the stop valve to introduce process fluid into the transmitter pressure-detector section.
3) Confirm that there is no pressure leak in the impulse piping, transmitter, or other components.

(b) Turn ON power and connect the BT200.

(c) Using the BT200, confirm that the transmitter is operating properly. Check parameter values or change the setpoints as necessary. See Chapter 8 for BT200 operation.

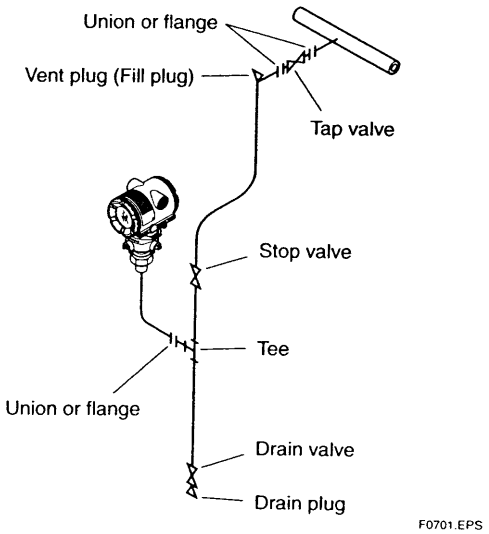
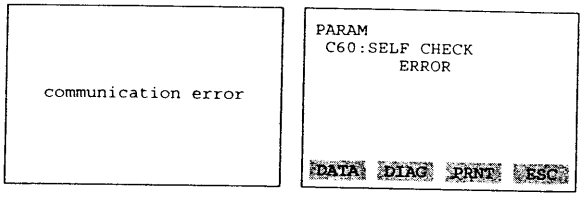



**Figure 7.1 Liquid Flow Measurement (Gauge Pressure Transmitters)**

### ■ Confirming that Transmitter is Operating Properly

Using the BT200

- If the wiring system is faulty, 'communication error' appears on the display.
- If the transmitter is faulty, 'SELF CHECK ERROR' appears on the display.

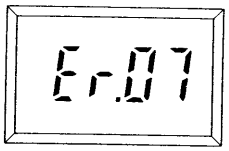



Communication error (Faulty wiring)

Self-diagnostic error (Faulty transmitter)

Using the integral indicator

- If the wiring system is faulty, the display stays blank.
- If the transmitter is faulty, an error code will appear on the display according to the nature of the error.




Self-diagnostic error on the integral indicator (Faulty transmitter)

**NOTE**

If any of the error indications above appears on the display of the integral indicator or BT200, refer to Subsection 8.5.2 for corrective action.

### ■ Verify and Change Transmitter Parameter Setting and Values

The following parameters are the minimum settings required for operation. The transmitter has been shipped with these parameters. To confirm or change the values, see Subsection 8.3.3.

- Measuring range.....See Subsection 8.3.3 (2)
- Operation mode.....See Subsection 8.3.3 (7)



18.4 (34)

## 7.2 Zero Point Adjustment

Adjust the zero point after operating preparation is completed.

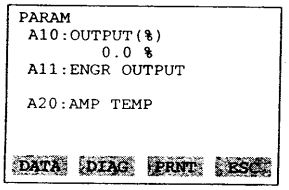
**IMPORTANT**

Do not turn off the power to the transmitter immediately after a zero adjustment. Powering off within 30 seconds after a zero adjustment will return the adjustment back to the previous settings.

The zero point adjustment can be made in either way: using the zero-adjustment screw of the transmitter or the BT200 operation.

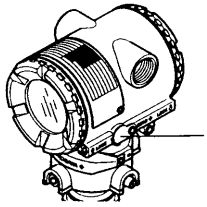
For output signal checking, display the parameter **A10: OUTPUT (%)** in the BT200.

●BT200




Output signal (%) display

●Zero-adjustment Screw



Zero-adjustment screw

F0704.EPS

After reviewing this parameter you are prepared to adjust the zero point. When making the zero adjustment on a pressure transmitter, the process pressure value does not have to be set to the low limit of the measurement range (0%). In such case, adjust the transmitter output signal to the actual measured value obtained from a high-accuracy pressure measuring instrument.

### 7.2.1 When you can obtain Low Range Value from actual measured value of 0% (0 kPa, atmospheric pressure);

For pressure measurement using gauge pressure transmitters, follow the step below before zero point adjustment.

1) Close the tap valve (main valve).
2) Loosen the fill plug so that the pressure applied to the transmitter is only the head of the seal liquid.
3) Adjust the zero point at this status.
4) After the adjustment, close the fill plug and then gradually open the tap valve.

#### ■ Using the Transmitter Zero-adjustment Screw

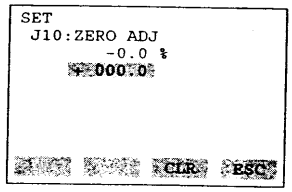
Before adjusting a screw, check that the parameter **J20: EXT ZERO ADJ** displays **ENABLE**. See Subsection 8.3.3 (11) for the setting procedure.

- Use a slotted screwdriver to turn the zero-adjustment screw. Turn the screw clockwise to increase the output or counterclockwise to decrease the output. The zero point adjustment can be made with a resolution of 0.01% of the setting range. Since the degree of zero adjustments varies with the screw turning speed, turn the screw slowly for fine adjustment and quickly for coarse adjustment.

#### ■ Using the BT200

Zero point can be adjusted by simple key operation of the BT200.

Select parameter **J10: ZERO ADJ**, and press the ENTER key twice. The zero point will be adjusted automatically to the output signal 0% (4 mA DC). Confirm that the setting value displayed for the parameter is '0.0%' before pressing the ENTER key. See Subsection 8.3.3 (11) for BT200 operating procedures.




Display when parameter J10 is selected.
Press [ENTER] key twice for 0% output 4 mA DC.

F0705.EPS

### 7.2.2 When you cannot obtain Low Range Value from actual measured value of 0%;

Convert the actual measured value obtained by a digital manometer or a glass gauge into %.

[Example]

The measuring range of 50 to 250 kPa; the actual measured value of 130 kPa.

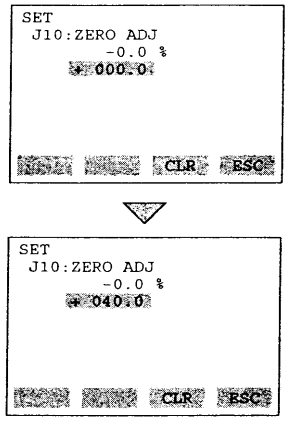
$$\text{Actual measured value} = \frac{130-50}{250-50} \times 100 = 40.0\%$$

■ Using the Transmitter Zero-Adjustment Screw

Turn the screw to match the output signal to the actual measured value in %.

■ Using the BT200

Select the parameter **J10: ZERO ADJ**. Change the set point (%) displayed for the parameter to the actual measured value (%), and press the ENTER key twice. See Subsection 8.3.3 (11) for operation details.




Display at J10

Change setting to the actually measured value (40.0%). Press [ENTER] key twice for 40% output 10.4 mA DC.

F0706.EPS

## 7.3 Starting Operation

After completing the zero point adjustment, follow the procedure below to start operation.

1) Confirm the operating status. If the output signal exhibits wide fluctuations (hunting) due to periodic variation in the process pressure, use BT200 to dampen the transmitter output signal. Confirm the hunting using a receiving instrument or the integral indicator, and set the optimum damping time constant. See Subsection 8.3.3 (3), "Damping Time Constant Setup."
2) After confirming the operating status, perform the following.

**IMPORTANT**

- Remove the BT200 from the terminal box, and confirm that none of the terminal screws are loosened.
- Close the terminal box cover and the amplifier cover. Screw each cover in tightly until it will not turn further.
- Two covers are required to be locked on the CENELEC and SAA Flameproof type transmitters. An Allen head bolts (shrouding bolts) are provided under edge of the each cover for locking. When a shrouding bolts are driven counterclockwise by an Allen wrench, it is coming out and locks up a cover. (See page 9-4) After locking, the covers should be confirmed not to be opened by hands.
- Tighten the zero-adjustment cover mounting screw to fix the cover in position.

## 7.4 Shutting Down Operation

Shut down the transmitter operation as follows.

1) Turn off the power.
2) Close the stop valve.
3) Close the tap valve.

**NOTE**

Whenever shutting down the transmitter for a long period, remove any process fluid from the transmitter pressure-detector section.

## 7.5 Setting the Range Using the Range-setting Switch

With actual pressure being applied to the transmitter, the range-setting switch (push-button) located on the optional /E integral indicator plate and the external zero-adjustment screw allow users to change (re-range) the low- and high-limit values for the measurement range (LRV and HRV) without using BT200. However, other changes in the display settings (scale range and engineering unit) for the integral indicator requires BT200.

Follow the procedure below to change the LRV and HRV settings.

[Example]

Rerange LRV to 0 and HRV to 3 MPa.

1) Connect the transmitter and apparatus as shown in Figure 9.3.1 and warm up for at least five minutes.
2) Press the range-setting push-button.
   The integral indicator then displays "LSET."
3) Apply a pressure of 0 kPa (atmospheric pressure) to the transmitter. (Note 1)
4) Turn the external zero-adjustment screw in the desired direction. The integral indicator displays the output signal in %. (Note 2)
5) Adjust the output signal to 0% (1 V DC) by rotating the external zero-adjustment screw. Doing so completes the LRV setting.
6) Press the range-setting push-button. The integral indicator then displays "HSET."
7) Apply a pressure of 3 MPa to the transmitter. (Note 1)
8) Turn the external zero-adjustment screw in the desired direction. The integral indicator displays the output signal in %. (Note 2)
9) Adjust the output signal to 100% (5 V DC) by rotating the external zero-adjustment screw. Doing so completes the HRV setting.
10) Press the range-setting push-button. The transmitter then switches back to the normal operation mode with the measurement range of 0 to 3 MPa.

Note 1: Wait until the pressure inside the pressure-detector section has stabilized before proceeding to the next step.

Note 2: If the pressure applied to the transmitter exceeds the previous LRV (or HRV), the integral indicator may display error number "Er.07" (In this case, the output signal percent and "Er.07" are displayed alternately every two seconds). Although "Er.07" is displayed, you may proceed to the next step. However, should any other error number be displayed, take the appropriate measure in reference to Subsection 8.5.2, "Errors and Countermeasures."

### IMPORTANT

- Do not turn off the power to the transmitter immediately after completion of the change in the LRV and/or HRV setting(s). Note that powering off within thirty seconds after setting will cause a return to the previous settings.
- Changing LRV automatically changes HRV to the following value.

HRV = previous HRV + (new LRV – previous LRV)

- If the range-setting push-button and external zero-adjustment screw are not touched during a range-change operation, the transmitter automatically switches back to the normal operation mode.

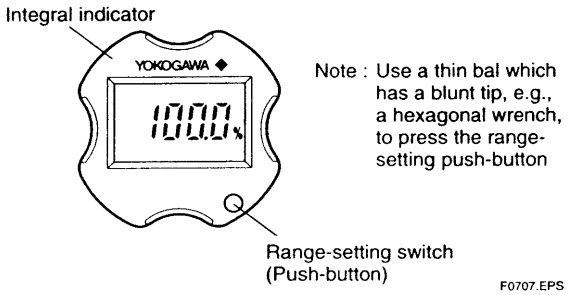



**Figure 7.5 Range-setting Switch**

# 8. BRAIN TERMINAL BT200 OPERATION

The DPharp is equipped with BRAIN communications capabilities, so that range changes, Tag No. setup, monitoring of self-diagnostic results, and zero point adjustment can be handled by remote control via BT200 BRAIN TERMINAL or CENTUM CS console. This section describes procedures for setting parameters using the BT200. For details concerning the BT200, see IM 01C00A11-01E, "BT200 User's Manual."

## 8.1 BT200 Operation Precautions

### 8.1.1 Connecting the BT200

The transmitter and the BT200 can be connected either to the BT200 connection hooks in the transmitter terminal box or to a relaying terminal board.

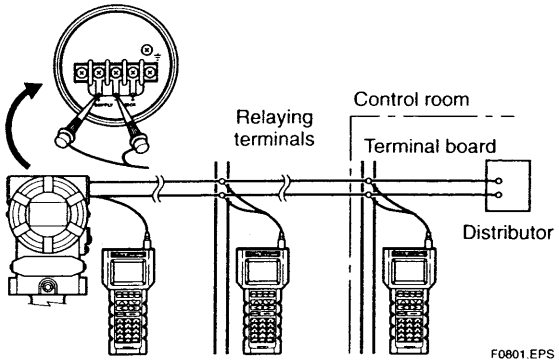



**Figure 8.1.1 Connecting the BT200**

### 8.1.2 Conditions of Communication Line

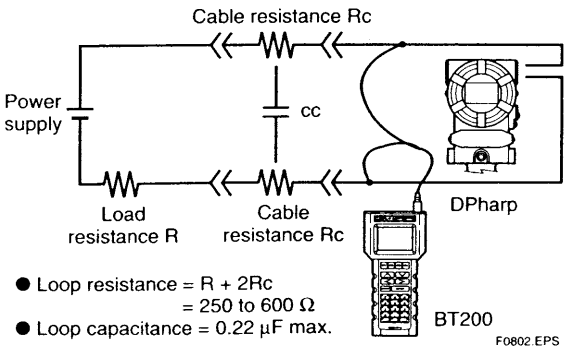



**Figure 8.1.2 Conditions of Communication Line**

## 8.2 BT200 Operating Procedures

### 8.2.1 Key Layout and Screen Display

Figure 8.2.1a shows the arrangement of the operating keys on the BT200 keypad, and Figure 8.2.1b shows the BT200 screen component.

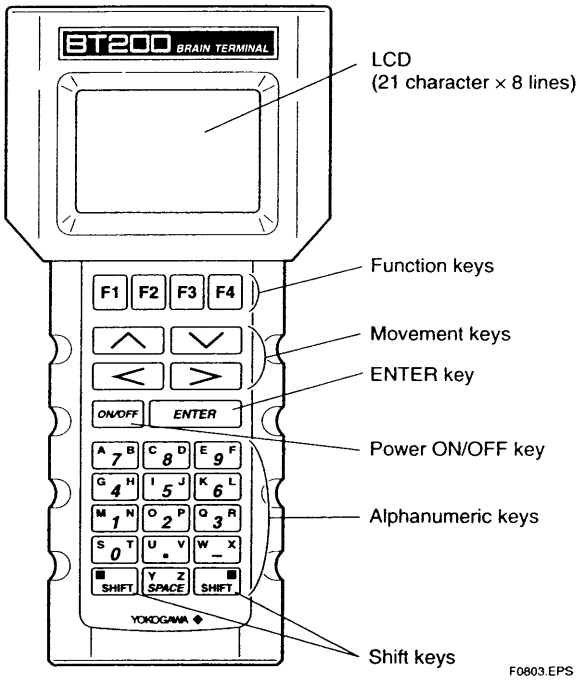



**Figure 8.2.1a BT200 Key Layout**

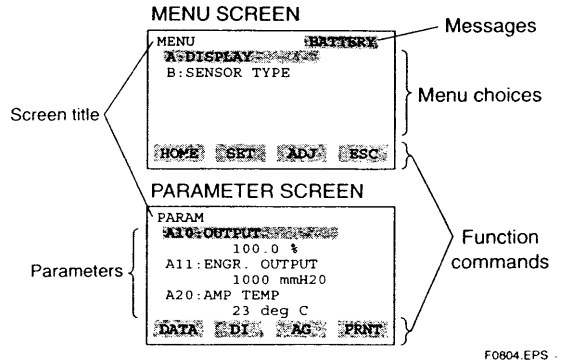



**Figure 8.2.1b BT200 Screen Component**



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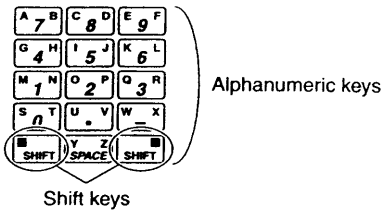
## 8.2.2 Operating Key Functions

### (1) Alphanumeric Keys and Shift Keys

You can use the alphanumeric keys in conjunction with the shift keys to enter symbols, as well as alphanumeric keys.

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#### a. Entering Digits, Symbols, and Spaces (0 to 9, ., 2, ␣)

Simply press the alphanumeric keys.

| Entry | Key-in Sequence |
|---|---|
| –4 | [–] [4] |
| 0.3 | [0] [.] [3] |
| 1 ␣ –9 | [1] [SPACE] [–] [9] |

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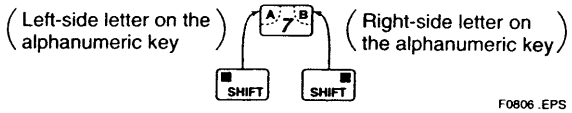
#### b. Entering Letters (A through Z)

Press an alphanumeric key following a shift key to enter the letter shown on that side which the shift key represents. You must press the shift key before entering each letter.

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| Entry | Key-in Sequence |
|---|---|
| W | [SHIFT] [–] |
| IC | [SHIFT] [5] [SHIFT] [8] |
| J. B | [SHIFT] [5] [.] [SHIFT] [7] |

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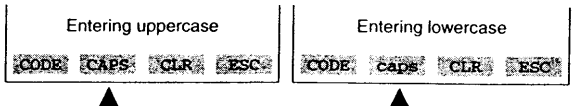
Use the function key [F2] CAPS to select between uppercase and lowercase (for letters only). The case toggles between uppercase and lowercase each time you press [F2] CAPS.




| Entry | Key-in Sequence |
|---|---|
| Boy | to lower case<br>[SHIFT] [7] [F2] [SHIFT] [2] [SHIFT] [SPACE]<br>( B ) ( o ) ( y ) |

F0807.EPS

Use the function key [F1] CODE to enter symbols. The following symbols will appear in sequence, one at a time, at the cursor each time you press [F1] CODE:

/ . – , + * ) ( ' & % $ # " !

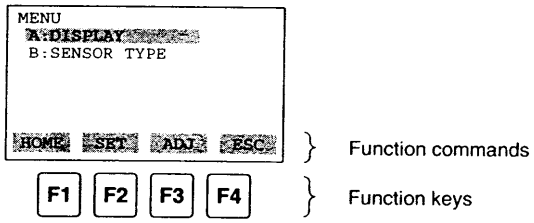
To enter characters next to these symbols, press [ > ] to move the cursor.

| Entry | Key-in Sequence |
|---|---|
| l/m | symbol command<br>[F2] [SHIFT] [6] [F1] [>] [SHIFT] [1]<br>( l ) ( / ) ( m ) |

T0803.EPS

### (2) Function Keys

The functions of the function keys depend on the function commands on display.

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### Function Command List

| Command | Function |
|---|---|
| ADJ | Displays the ADJ menu |
| CAPS/caps | Selects uppercase or lowercase |
| CODE | Selects symbols. |
| CLR | Erases input data or deletes all data |
| DATA | Updates parameter data |
| DEL | Deletes one character |
| DIAG | Calls the self-check panel |
| ESC | Returns to the most recent display |
| HOME | Displays the menu panel |
| NO | Quits setup and returns to the previous display |
| OK | Proceeds to the next panel |
| PARM | Enters the parameter number setup mode |
| SET | Displays the SET menu |
| SLOT | Returns to the slot selection panel |
| UTIL | Calls the utility panel |
| *COPY | Prints out parameters on display |
| *FEED | Paper feed |
| *LIST | Lists all parameters in the menu |
| *PON/POFF | Automatic printout mode on or off |
| *PRNT | Changes to the print mode |
| *GO | Starts printing |
| *STOP | Cancels printing |

* Available on BT200-P00 (with printer).

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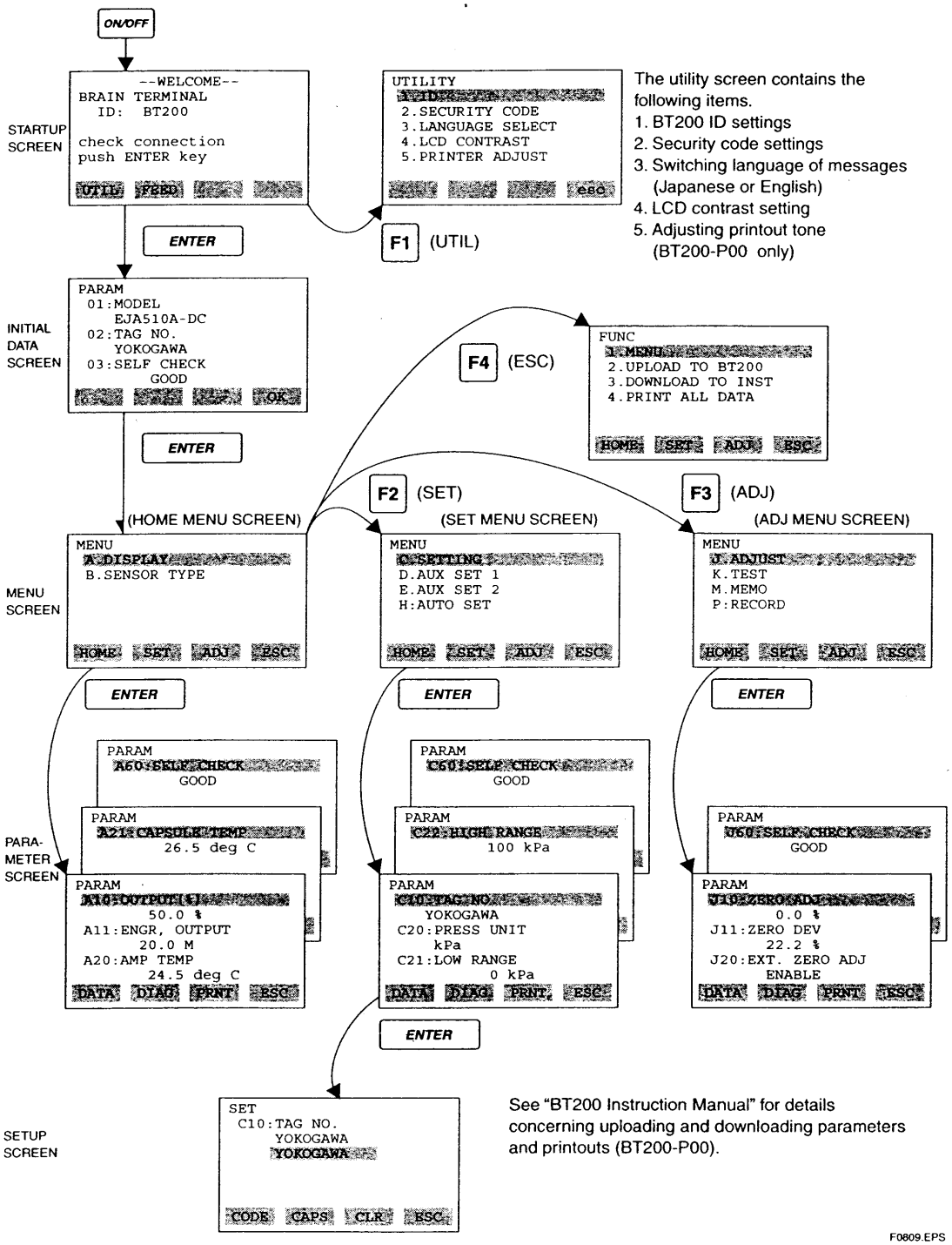
## 8.2.3 Calling Up Menu Addresses Using the Operating Keys




The utility screen contains the following items.
1. BT200 ID settings
2. Security code settings
3. Switching language of messages (Japanese or English)
4. LCD contrast setting
5. Adjusting printout tone (BT200-P00 only)

See "BT200 Instruction Manual" for details concerning uploading and downloading parameters and printouts (BT200-P00).

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# 8.3 Setting Parameters Using the BT200

## 8.3.1 Parameter Summary

Instruments to which applicable:
F: Differential pressure transmitters — EJA110A, EJA120A, and EJA130A
P: Pressure transmitters — EJA310A, EJA430A, EJA440A, EJA510A, and EJA530A
L: Liquid level transmitters — EJA210A and EJA220A

| No. | Item | Description | Rewritability | Remarks | Default Value | Applicability F | P | L |
|---|---|---|---|---|---|---|---|---|
| 01 | MODEL | Model+capsule type | – | | | o | o | o |
| 02 | TAG NO. | Tag number | – | 16 alphanumerics | | o | o | o |
| 03 | SELF CHECK | Self-diagnostic result | – | GOOD/ERROR | | o | o | o |
| A | DISPLAY | Measured data display | – | Menu name | | o | o | o |
| A10 | OUTPUT (%) | Output (in %) | – | –5 to 110%*3 | | o | o | o |
| A11 | ENGR. OUTPUT | Output (in engineering units) | – | –19999 to 19999 | | o | o | o |
| A20 | AMP TEMP | Amplifier temperature | – | Unit specified in D30 | | o | o | o |
| A21 | CAPSULE TEMP | Capsule temperature | – | Unit specified in D30 | | o | o | o |
| A30 | STATIC PRESS | Static pressure | – | Unit specified in D31*1 | | o | – | o |
| A40 | INPUT | Input (indicated in engineering DP unit) | – | –32000 to 32000 | | o | o | o |
| A60 | SELF CHECK | Self-diagnostic messages | – | GOOD/ERROR, CAP MODULE FAULT, AMP MODULE FAULT, OUT OF RANGE, OUT OF SP RANGE*1, OVER TEMP (CAP), OVER TEMP (AMP), OVER OUTPUT, OVER DISPLAY, ILLEGAL LRV, ILLEGAL HRV, ILLEGAL SPAN, and ZERO ADJ OVER | | o | o | o |
| B | SENSOR TYPE | Sensor type | – | Menu name | | o | o | o |
| B10 | MODEL | Model+span | – | 16 uppercase alphanumerics | | o | o | o |
| B11 | STYLE NO. | Style number | – | | | o | o | o |
| B20 | LRL | Lower range-limit | – | –32000 to 32000 | | o | o | o |
| B21 | URL | Upper range-limit | – | –32000 to 32000 | | o | o | o |
| B30 | MIN SPAN | Minimum span | – | –32000 to 32000 | | o | o | o |
| B40 | MAX STAT.P. | Maximum static pressure*4 | – | | | o | – | o |
| B60 | SELF CHECK | Self-diagnostic messages | – | Same as A60 | | o | o | o |
| C | SETTING | Setting data | – | Menu name | | o | o | o |
| C10 | TAG. NO. | Tag number | o | 16 alphanumerics | As specified when ordered. | o | o | o |
| C20 | PRESS UNIT | Measurement range units | o | Selected from $mmH_2O$, mmAq, mmWG, mmHg, Torr, Pa, hPa, kPa, MPa, mbar, bar, $gf/cm^2$, $kgf/cm^2$, $inH_2O$, inHg, $ftH_2O$, psi, or atm | As specified when ordered. | o | o | o |
| C21 | LOW RANGE | Measurement range, lower range value | o | –32000 to 32000(but within measurement range) | As specified when ordered. | o | o | o |
| C22 | HIGH RANGE | Measurement range, higher range value | o | –32000 to 32000(but within measurement range) | As specified when ordered. | o | o | o |
| C30 | AMP DAMPING | Damping time constant | o | Selected from 0.2*2, 0.5, 1.0, 2.0, 4.0, 8.0, 16.0, 32.0, or 64.0 sec. | 2.0 s | o | o | o |
| C40 | OUTPUT MODE | Output mode and integral indicator mode | o | Selected from OUT:LIN; DSP:LIN, OUT:LIN; DSP:SQR, OUT:SQR; DSP:SQR | As specified when ordered. If not specified, OUT: LIN; DSP: LIN. | o | – | – |
| C60 | SELF CHECK | Self-diagnostic messages | – | Same as A60 | | o | o | o |
| D | AUX SET 1 | Auxiliary setting data 1 | – | Menu name | | o | o | o |
| D10 | LOW CUT | Low cut | o | 0.0 to 20.0% | 10.0% | o | o | o |
| D11 | LOW CUT MODE | Low cut mode | o | LINEAR/ZERO | LINEAR | o | o | o |
| D20 | DISP SELECT | Display selection | o | NORMAL %/USER SET, USER & %/INP PRES, PRES & % | As specified when ordered. | o | o | o |
| D21 | DISP UNIT | Engineering unit for display | o | 8 uppercase alphanumerics | | o | o | o |
| D22 | DISP LRV | Engineering range, lower range value | o | –19999 to 19999 | As specified when ordered. | o | o | o |
| D23 | DISP HRV | Engineering range, higher range value | o | –19999 to 19999 | As specified when ordered. | o | o | o |

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| No. | Item | Description | Rewritability | Remarks | Default Value | Applicability F | P | L |
|---|---|---|---|---|---|---|---|---|
| D | AUX SET 1 | Auxiliary setting data 1 | – | Menu name | | o | o | o |
| D30 | TEMP UNIT | Temperature setting units | o | deg C/deg F | deg C | o | o | o |
| D31 | STAT. P. UNIT | Static pressure setting units | o | Selected from $mmH_2O$, mmAq, mmWG, mmHg, Torr, Pa, hPa, kPa, MPa, mbar, bar, $gf/cm^2$, $kgf/cm^2$, $inH_2O$, inHg, $ftH_2O$, psi, or atm | As specified when ordered. If not specified, MPa. | o | – | o |
| D40 | REV OUTPUT | Output reversal | o | NORMAL/REVERSE | If not specified, NORMAL. | o | o | o |
| D45 | H/L SWAP | Impulse piping accessing direction | o | NORMAL/REVERSE | NORMAL | o | – | – |
| D52 | BURN OUT | CPU error | – | HIGH/LOW, –5 to 110%*3 | HIGH | o | o | o |
| D53 | ERROR OUT | Hardware error | o | HOLD/HIGH/LOW, –5 to 110%*3 | HIGH | o | o | o |
| D60 | SELF CHECK | Self-diagnostic messages | – | Same as A60 | | o | o | o |
| E | AUX SET 2 | Auxiliary setting data 2 | – | Menu name | | o | o | o |
| E30 | BI DIRE MODE | Bidirectional mode | o | OFF/ON | OFF | o | – | – |
| E60 | SELF CHECK | Self-diagnostic messages | – | Same as A60 | | o | o | o |
| H | AUTO SET | Automatic setup | – | Menu name | | o | o | o |
| H10 | AUTO LRV | Automatic measurement range lower range value setup | o | –32000 to 32000 | Displays the same data as C21. | o | o | o |
| H11 | AUTO HRV | Automatic measurement range higher range value setup | o | –32000 to 32000 | Displays the same data as C22. | o | o | o |
| H60 | SELF CHECK | Self-diagnostic messages | – | Same as A60 | | o | o | o |
| J | ADJUST | Adjustment data | – | Menu name | | o | o | o |
| J10 | ZERO ADJ | Automatic zero adjustment | o | –5 to 110.0%*3 | | o | o | o |
| J11 | ZERO DEV. | Manual zero adjustment | o | | | o | o | o |
| J20 | EXT. ZERO ADJ | External zero-adjustment screw permission | o | ENABLE/INHIBIT | | o | o | o |
| J60 | SELF CHECK | Self-diagnostic messages | – | Same as A60 | | o | o | o |
| K | TEST | Tests | – | Menu name | | o | o | o |
| K10 | OUTPUT in % | Test output % setting | o | –5 to 110.0%*3 Displays 'ACTIVE' while executing | | o | o | o |
| K60 | SELF CHECK | Self-diagnostic messages | – | Same as A60 | | o | o | o |
| M | MEMO | Memo | – | Menu name | | o | o | o |
| M10 | MEMO 1 | Memo | o | 8 uppercase alphanumerics | | o | o | o |
| M20 | MEMO 2 | Memo | o | 8 uppercase alphanumerics | | o | o | o |
| M30 | MEMO 3 | Memo | o | 8 uppercase alphanumerics | | o | o | o |
| M40 | MEMO 4 | Memo | o | 8 uppercase alphanumerics | | o | o | o |
| M50 | MEMO 5 | Memo | o | 8 uppercase alphanumerics | | o | o | o |
| M60 | SELF CHECK | Self-diagnostic messages | – | Same as A60 | | o | o | o |
| P | RECORD | History of the errors | – | | | o | o | o |
| P10 | ERROR REC 1 | Last error | o | Display the error | | o | o | o |
| P11 | ERROR REC 2 | One time before | o | Display the error | | o | o | o |
| P12 | ERROR REC 3 | Two time before | o | Display the error | | o | o | o |
| P13 | ERROR REC 4 | Three time before | o | Display the error | | o | o | o |
| P60 | SELF CHECK | Self-diagnostic messages | – | Same as A60 | | o | o | o |

*1: In case of Model EJA120A, static pressure cannot be measured. The display is always 0 MPa, but this is not a measured value.
*2: When Optional code /F1 is specified, substitute the value with 0.1.
*3: When Optional code /F1 is specified, substitute the value –5 with –2.5.
*4: See MWP(max. working pressure) on the nameplate. B40 shows an approximate value of maximum pressure for the capsule.

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## 8.3.2 Parameter Usage and Selection

Before describing the procedure for setting parameters, we present the following table showing how the parameters are used and in what case.

**IMPORTANT**

If the transmitter is turned off within 30 seconds after parameters have been set, the set data will not be stored and the terminal returns to previous settings.

**Table 8.3.1 Parameter Usage and Selection**

| Setup Item | Description |
|---|---|
| **Tag No. setup** ▶ P.8-7 | Sets the Tag No. (using 16 alphanumeric characters).<br>Note: Up to 8 alphanumerics (upper case letters) can be used in the BT100. |
| **Calibration range setup** ▶ P.8-7 | Sets the calibration range for 4 to 20 mA DC. Sets three data items: range unit, input value at 4 mA DC (LRV), and input value at 20 mA DC (HRV).<br>Note: LRV and HRV can be specified with range value specifications up to 5 digits (excluding any decimal point) within the range of –32000 to 32000. |
| **Damping time constant setup** ▶ P.8-8 | Adjusts the output response speed for 4 to 20 mA DC.<br>Can be set in 9 increments from 0.2 to 64 s. |
| **Output signal low cut mode setup** ▶ P.8-9 | Used mainly to stabilize output near 0% if output signal is the square root mode.<br>Two modes are available: forcing output to 0% for input below a specific value, or changing to proportional output for input below a specific value. |
| **Integral indicator scale range and unit setup** ▶ P.8-10 | Sets the following 5 types of integral indicator scale ranges and units:<br>% scale indicator, user set scale indicator, alternate indication of user set scale and % scale, input pressure display, alternate indication of input pressure and % scale<br>When using the user set scale, 4 types of data can be set:<br>user set scale setting, unit (BT200 only), display value at 4 mA DC (LRV), and display value at 20 mA DC (HRV).<br>Note: LRV and HRV can be specified with range value specifications up to 5 digits (excluding any decimal point) within the range of –19999 to 19999. |
| **Unit setup for displayed temperature** ▶ P.8-11 | Sets a unit for temperatures displayed on the BT200. |
| **Operation mode (normal/reverse signal) setup** ▶ P.8-12 | Reverses the direction for 4 to 20 mA DC output relative to input.<br>Reverse mode is used for applications in which safety requires that output be driven toward 20 mA if input is lost. |
| **Output status display/setup when a CPU failure** ▶ P.8-12 | Displays the status of 4 to 20 mA DC output when a CPU failure. The parameter of the standard unit is fixed to the high limit value. |
| **Output status setup when a hardware error occurs** ▶ P.8-12 | Sets the status of the 4 to 20 mA DC output when an abnormal status is detected with the capsule or the amplifier as the result of self-diagnosis. One of the following statuses; last held, high limit, and low limit values, can be selected. |
| **Range change (while applying actual inputs)** ▶ P.8-12 | Range for 4 to 20 mA DC signal is set with actual input applied. Sets 20 mA DC output precisely with respect to user's reference instrument output. Note that DPharp is calibrated with high accuracy before shipment, so span should be set using the normal range setup. |
| **Zero point adjustment** ▶ P.8-13 | Adjusts zero point. This can be done either using the external zero-adjustment screw on the transmitteror using the BT200. |
| **Test output (fixed current output) setup** ▶ P.8-14 | Used for loop checks.<br>Output can be set freely from –5% to 110% in 1% steps. |
| **User memo fields** ▶ P.8-14 | Allows user to enter up to 5 items of any desired text in up to 8 uppercase alphanumeric characters per item. |

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### 8.3.3 Setting Parameters

Set or change the parameters as necessary. After completing these, do not fail to use the "DIAG" key to confirm that "GOOD" is displayed for the self-diagnostic result at **_60: SELF CHECK**.

#### (1) Tag No. Setup (C10: TAG NO)

Use the procedure below to change the Tag No. Up to 16 alphanumeric characters can be entered.

• Example: Set a Tag No. to FIC-1a

<When power is off>

Press the ON/OFF key to turn on the BT200.

```
      --WELCOME--
BRAIN TERMINAL
  ID:  BT200

check connection
push ENTER key
```

Connect DPharp and BT200 using a communication cable and press the ENTER key.

```
PARAM
 01:MODEL
   EJA110A-DM
 02:TAG NO.
   YOKOGAWA
 03:SELF CHECK
      GOOD
```

Displays the name of connected DPharp model, TAG NO. and diagnostics information. Press the F4 (OK) key after confirmation.

```
MENU
 A:DISPLAY SETTING
 B:SENSOR TYPE
```

Press the F2 (SET) key to display the SET menu panel.

```
MENU
 C:SETTING
 D:AUX SET 1
 E:AUX SET 2
 H:AUTO SET
```

Select C: SETTING and press the ENTER key.

```
MENU
 C10:TAG NO.
   YOKOGAWA
 C20:PRESS UNIT
      kPa
 C21:LOW RANGE
      0 kPa
```

Select C10: TAG NO. and press the ENTER key.

```
SET
 C10:TAG NO.
   YOKOGAWA
```

Set the new TAG NO. (FIC-1a).

| | |
|---|---|
| SHIFT + 9 F | FOKOGAWA |
| SHIFT + 5 J | FIKOGAWA |
| SHIFT + 8 D | FICOGAWA |
| W _ X | FIC-GAWA |
| M 1 N | FIC-1AWA |
| F2 + SHIFT + 7 B | FIC-1aWA |
| Y Z SPACE Y Z SPACE | FIC-1a␣␣ |

```
SET
 C10:TAG NO.
   YOKOGAWA
   FIC-1a
```

Set TAG NO. and press the ENTER key.

When you have made an entry mistake, return the cursor < using the key, then reenter.

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```
SET
 C10:TAG NO.
   YOKOGAWA
   FIC-1a
 PRINTER OFF
 F2:PRINTER ON
```

This is the panel for confirming set data. The set data items flash. When all items have been confirmed, press the ENTER again. (To go back to the setting panel, press the F3 (NO) key.

```
SET
 C10:TAG NO.
   FIC-1a
```

The DPharp TAG NO. was overwritten. Press the F4 (OK) key to return to the parameter panel. Press the F3 (NO) key to return to the setting panel.

```
PARAM
 C10:TAG NO.
   FIC-1a
 C20:PRESS UNIT
   kPa
 C21:LOW RANGE
        0 kPa
```

F0811.EPS

#### (2) Calibration Range Setup

##### a. Setting Calibration Range Unit (C20: PRESS UNIT)

The unit is set at the factory before shipment if specified at the time of order. Follow the procedure below to change the unit.

• Example: Change the unit from **mmH$_2$O** to **kPa**.

```
SET
 C20:PRESS UNIT
    mmH2O
  < mmWG >
  < mmHG >
  < Torr >
  < kPa >
```

Use the ^ or v key to select "kPa." Press the ENTER key twice to enter the setting.

```
SET
 C20:PRESS UNIT
    kPa
```

Press the F4 (OK) key.

mmH$_2$O
mmAq
mmWG
mmHg
Torr
Pa
hPa
kPa
MPa
mbar
bar
gf/cm$^2$
kgf/cm$^2$
inH$_2$O
inHg
ftH$_2$O
psi
atm

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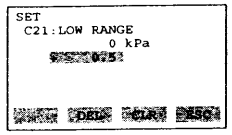
### b. Setting Calibration Range Lower Range Value and Higher Range Value (C21: LOW RANGE, C22: HIGH RANGE)

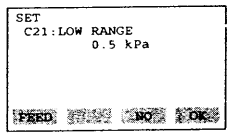
These range values are set as specified in the order before the instrument is shipped. Follow the procedure below to change the range.

- The measurement span is determined by the high and low range limit values. In this instrument, changing the low range value also automatically changes the high range value, keeping the span constant.

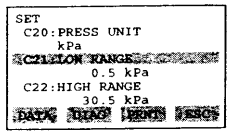
• Example 1: With present settings of 0 to 30 kPa, set the lower range value to 0.5 kPa.




Set **0.5**.
Press the [ENTER] key twice to enter the setting.




Press the [F4] (OK) key.




The higher range value is changed while the span remains constant.

( Span = Higher range value – Lower range value )

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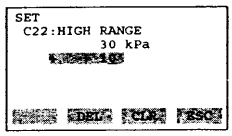
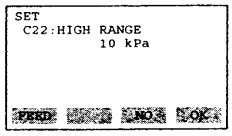
- Note, however, that changing the higher range value does not cause the lower range value to change. Thus, changing the higher range value also changes the span.
- Calibration range can be specified with range value specifications up to 5 digits (excluding any decimal point) for low or high range limits within the range of –32000 to 32000.

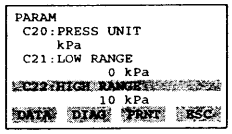
• Example 2: With present settings of 0 to 30 kPa, set the Higher range value to10 kPa.




Set **10**.
Press the [ENTER] key twice to enter the setting.




Press the [F4] (OK) key.



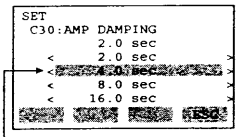

The low range value is not changed, so the span changes.

F0814.EPS

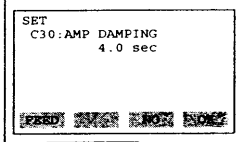
### (3) Damping Time Constant Setup (C30: AMP DAMPING)

When the instrument is shipped, the damping time constant is set at 2.0 seconds. Follow the procedure below to change the time constant.

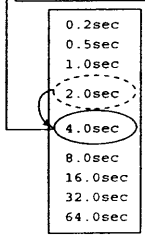
• Example: Change from 2.0 sec to 4.0 sec.




Use the [^] or [v] key to select **4.0 sec.**
Press the [ENTER] key twice to enter the setting.




Press the [F4] (OK) key.



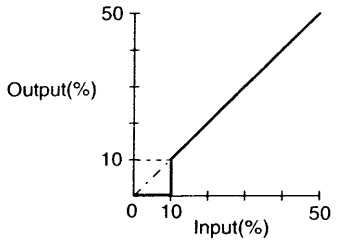

F0815.EPS

Note: The damping time constant set here is the damping time constant for the amplifier assembly. The damping time constant for the entire transmitter is the sum of the values for the amplifier assembly and for the capsule assembly. For the capsule assembly damping time constant (fixed), see the "General Specifications" found at the end of this manual. (See Chapter 10.)

### (4) Output Signal Low Cut Mode Setup (D10: LOW CUT, D11: LOW CUT MODE)

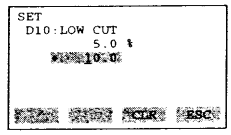
Low cut mode can be used to stabilize the output signal near the zero point. The low cut point can be set in a range from 0 to 20% of output. (Hysteresis of cut point: ±1%)

● LOW CUT at 10%

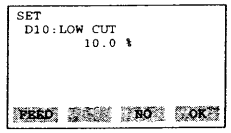



F0816.EPS

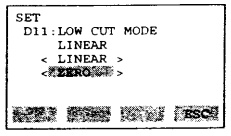
• Example: Change the low cut setting range from 5% to 10%, and the low cut mode from LINEAR to ZERO.



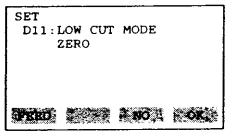

Set "10."
Press the [ENTER] key twice to enter the setting.



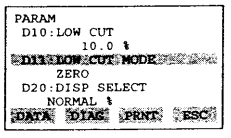

Press the [F4] (OK) key.
Next, the [D11: LOW CUT MODE] setting panel is displayed.




Use the [^] or [v] key to select ZERO.
Press the [ENTER] key twice to enter the setting.



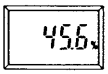
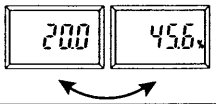
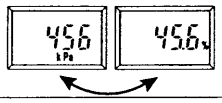

Press the [F4] (OK) key.




F0817.EPS

### (5) Integral Indicator Scale Setup

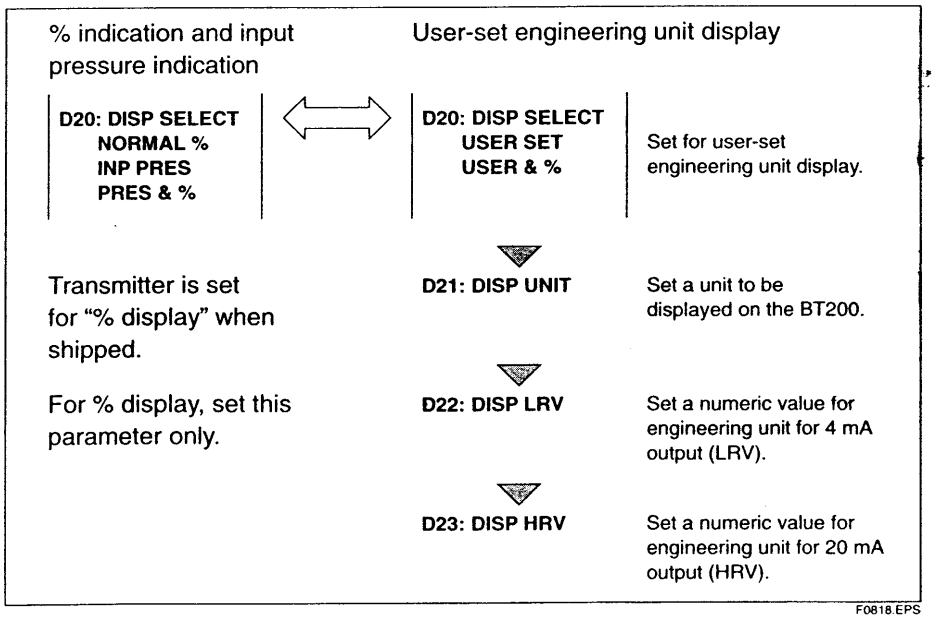
The following 5 displays are available for integral indicators.

| D20: DISP SELECT | Display | Related Parameters | Description |
|---|---|---|---|
| NORMAL % |  | A10:OUTPUT (%)<br>45.6 % | Indicates –5 to 110% range depending on the Measurement range (C21, C22). |
| USER SET | | A11:ENGR.OUTPUT<br>20.0 M | Indicates values depending on the Engineering range (D22, D23). (Note 1)<br>Units set using Engineering unit (D21) are not indicated. |
| USER & % |  | A10:OUTPUT (%)<br>45.6 %<br>A11:ENGR. OUTPUT<br>20.0 M | Indicates user set and % alternately in 3 second intervals. |
| INP PRES | | A40:INPUT<br>456 kPa | Indicates input pressure. Indication limits –19999 to 19999. |
| PRES & % |  | A10:OUTPUT (%)<br>45.6 %<br>A40:INPUT<br>456 kPa | Indicates input pressure and % alternately in 3 second intervals. |

(Note 1) Scale range can be specified with range limit specifications up to 5 digits (excluding any decimal point) for low or high range limits within the range of –19999 to 19999.

T0808.EPS

See (a.) through (c.) for each setting procedure.



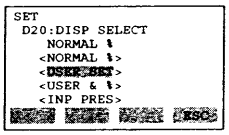

F0818.EPS

### a. Display Selection (D20: DISP SELECT)

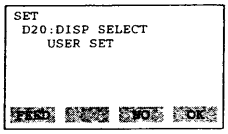
Follow the instructions given to the below to change the range of integral indication scales.

When **USER SET** is selected, the user set values of integral indication and **A11: ENGR. OUTPUT** parameter are indicated.

• Example: Set the integral indicator scale to engineering units display.




Use the ^ or v key to select "USER SET."
Press the ENTER key twice to enter the setting.




Press the F4 (OK) key.

The "%" disappears from the integral indicator display.

F0819.EPS

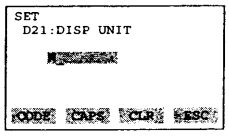
### b. Setting User-set Engineering Unit (D21: DISP UNIT)

This parameter allows entry of the engineering units to be displayed on the BT200. When the instrument is shipped, this is set as specified in the order.

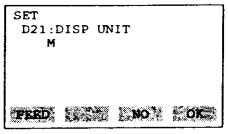
Follow the procedure below to change this setting.

This parameter need not be set for % display.

• Example: Set an engineering unit **M**.




Set "M."
Press the ENTER key twice to enter the setting.




Press the F4 (OK) key.

F0820.EPS

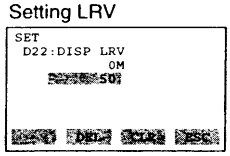
### c. Lower and Higher Range Value Setup in Engineering Unit (D22: DISP LRV, D23: DISP HRV)

These parameter items are used to set the lower and higher range values for the engineering unit display.

When the instrument is shipped, these are set as specified in the order. Follow the procedure below to change these settings. Note that these parameters need not be set for % display.

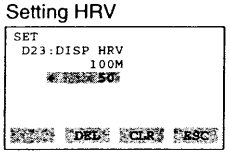
• Example: Set lower range value (LRV) to **–50** and higher range value (HRV) to **50**.

Setting LRV

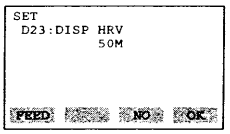



Set "–50."
Press the ENTER key twice to enter the setting.

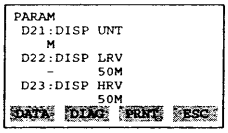
Setting HRV




Set "50."
Press the ENTER key twice to enter the setting.




Press the F4 (OK) key.

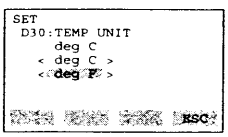



F0821.EPS

### (6) Unit Setup for Displayed Temperature (D30: TEMP UNIT)

When the instrument is shipped, the temperature units are set to **degC**. Follow the procedure below to change this setting. Note that changing the unit here changes the unit for **A20: AMP TEMP** (amplifier temperature) and **A21: CAPSULE TEMP** (capsule temperature).

• Example: Change the unit for the temperature display.



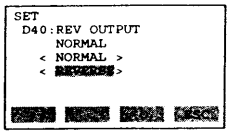

Use the ^ or v key to select "deg F."
Press the ENTER key twice to enter the setting.

F0822.EPS

### (7) Operation Mode Setup (D40: REV OUTPUT)

This parameter allows the direction of the 4 to 20 mA output to be reversed with respect to input. Follow the procedure below to make this change.

• Example: Change 4 to 20 mA output to 20 to 4 mA output.




Use the [^] or [v] key to select REVERSE.
Press the [ENTER] key twice to enter the setting.

F0823.EPS

### (8) Output Status Display/Setup when a CPU Failure (D52: BURN OUT)

This parameter displays the status of 4 to 20 mA DC output if a CPU failure occurs. In case of a failure, communication is disabled.

Setting of HIGH or LOW is enabled. This is done with the pin (CN4) on the CPU assembly. See Chapter 3 for details.

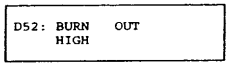
Standard specifications

The parameter is set to HIGH. If a failure, the transmitter outputs the signal of 110% or higher. The parameter **D53: ERROR OUT** is set to HIGH from the factory.

Optional code/C1

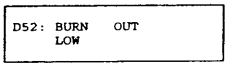
The parameter is set to LOW. If a failure, output which is –5% or lower is generated. The parameter **D53: ERROR OUT** is set to LOW from the factory.

• Example: Standard specifications




pin (CN4) position: H

• Example: Optional code/C1




pin (CN4) position: L

F0824.EPS

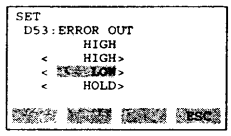
### (9) Output Status Setup when a Hardware Error Occurs (D53: ERROR OUT)

This parameter allows the setting of the output status when a hardware error occurs. The following three selections are available.

(a) HOLD; Outputs the last value held before the error occurred.
(b) HIGH; Outputs an output of 110% when an error has occurred.
(c) LOW; Outputs an output of –5% when an error has occurred.

Note: A hardware error means CAP MODULE FAULT of Er.01 or AMP MODULE FAULT of Er. 02 which are shown in 8.5.2 "Errors and Countermeasures.")

• Example: Set the output status to LOW when a hardware error occurs.




Use the [^] or [v] key to select "LOW."
Press the [ENTER] key twice to enter the setting.

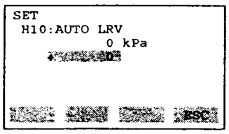
F0825.EPS

### (10) Range Change while Applying Actual Inputs (H10: AUTO LRV, H11: AUTO HRV)

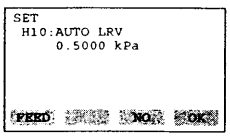
This feature allows the lower and higher range values to be set up automatically with the actual input applied. If the lower and higher range values are set, **C21: LOW RANGE** and **C22: HIGH RANGE** are changed at this same time.

Follow the procedure in the figure below.
The measurement span is determined by the higher and lower range values. Changing the lower range value results in the higher range value changing automatically, keeping the span constant.

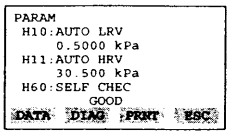
• Example 1: When changing the lower range value to 0.5 kPa for the present setting of 0 to 30 kPa, take the following action with input pressure of 0.5 kPa applied.




Press the [ENTER] key twice.
The lower range value is changed to 0.5 kPa.




Press the [F4] (OK) key.

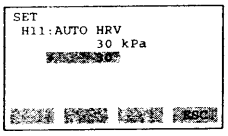



The higher range value is changed keeping the span constant.
Parameters **C21** and **C22** are changed at the same time.

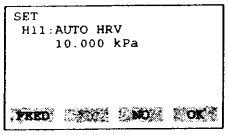
F0826.EPS

Note that changing the higher range value does not cause the lower range value to change but does change the span.

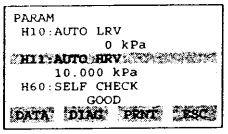
• Example 2: When the higher range value is to be changed to 10 kPa with the present setting of 0 to 30 kPa, take the following action with an input pressure of 10 kPa applied.




Press the ENTER key twice. The higher range value is changed to 10 kPa.




Press the F4 (OK) key.




The lower range value is not changed, so the span changes. Parameter **C22** is changed at the same time.

F0827.EPS

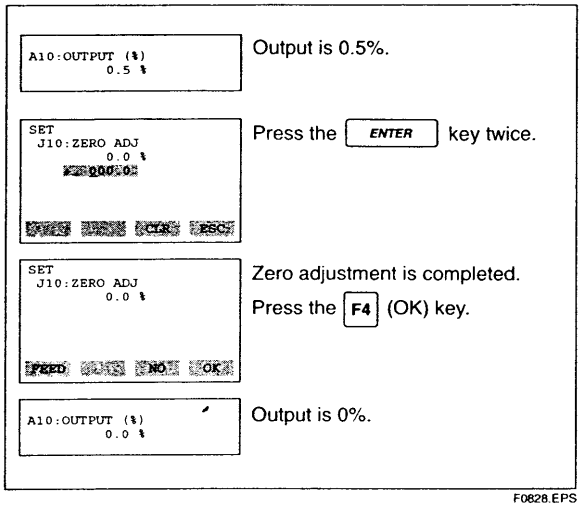
### (11) Zero Point Adjustment (J10: ZERO ADJ, J11: ZERO DEV, J20: EXT ZERO ADJ)

The DPharp supports several adjustment methods. Select the method best suited for the conditions of your application.
Note that output signal can be checked by displaying parameter **A10:OUTPUT (%)** on the BT200.

| Adjustment Method | Description |
|---|---|
| **Using the BT200** | **Set the present input to 0%.** Adjust for 0% output at input level of 0%. |
| | **Adjust output to the reference value obtained using other means.** If the input level cannot easily be made 0% (because of tank level, etc.), adjust output to the reference value obtained using other means, such as a sight glass. |
| **Using the external zero-adjustment screw ▶ P.8-14** | Adjust zero point using the zero-adjustment screw on the transmitter. This permits zero adjustment without using the BT200. Accurately adjust the output current to 4 mA DC or other target output value using an ammeter that accurately reads output currents. |

T0809.EPS

(a) Follow the procedure below when setting the present output to 0% (4 mA).




F0828.EPS

(b) In tank level measurement, if the actual level cannot be brought to zero for zero adjustment, then the output can be adjusted to correspond to the actual level obtained using another measuring instrument such as a glass gauge.

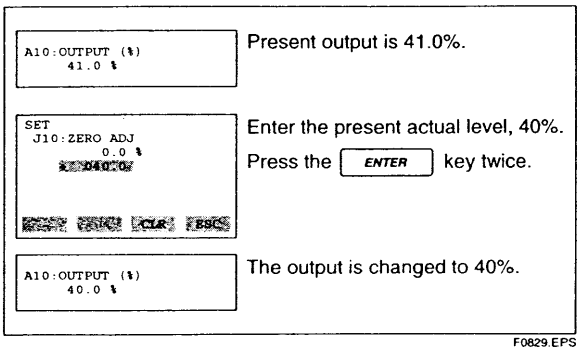
[Example]

Measurement range: 50 to 250 kPa, Actual value: 130 kPa.

$$\text{Actual value(\%)} = \frac{\text{Actual value} - \text{Measurement range lower range value}}{\text{Measurement range higher range value} - \text{Measurement range lower range value}} \times 100$$

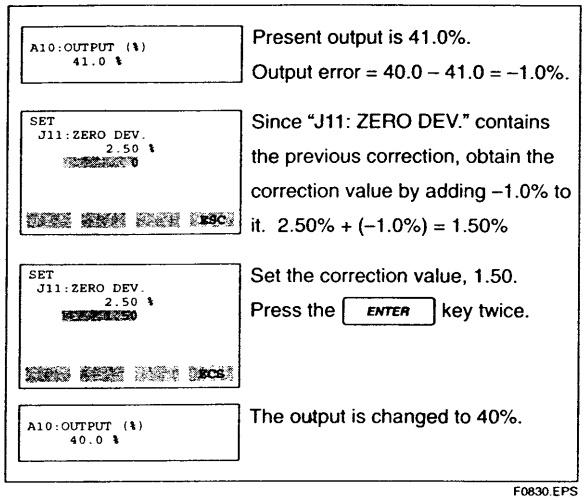
$$= \frac{130-50}{250-50} \times 100 = 40.0\%$$

(b)-1 Follow the procedure below to use **J10: ZERO ADJ**.




F0829.EPS

(b)-2 Follow the procedure below to use **J11: ZERO DEV.**



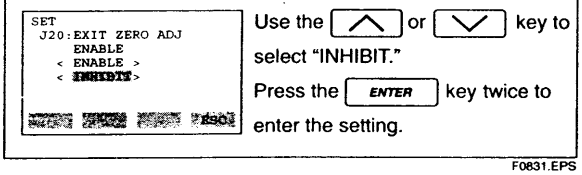

F0830.EPS

(c) Zero Point Adjustment Using the External Zero Adjustment Screw

• Enabling/inhibiting of zero point adjustment using the external zero-adjustment screw on the transmitter (J20: EXT ZERO ADJ)

Follow the procedure below to enable or inhibit zero point adjustment from the zero-adjustment screw on the transmitter.
This is set to "ENABLE" when the instrument is shipped.

• Example: Inhibiting zero adjustment by the external zero-adjustment screw

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• Zero point adjustment using external zero-adjustment screw on the transmitter

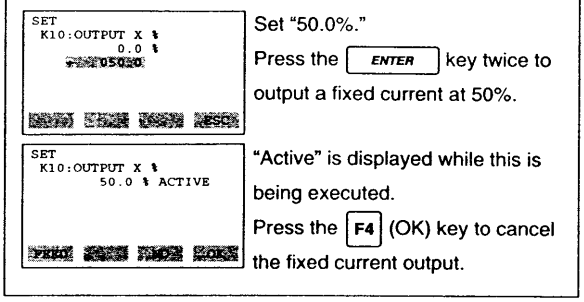
Turn the zero-adjustment screw on the outside of the transmitter case using a slotted screwdriver. Turn the screw to the right to increase the zero point or to the left to decrease the zero output; the zero adjusts in increments of 0.01% of the range setting.
Note that the amount of adjustment to the zero point changes according to the speed at which the screw is turned. To make fine adjustments, turn the screw slowly; to make coarse adjustments, turn the screw quickly.

Note: When a zero point adjustment has been made, do not turn off the transmitter less than 30 seconds after adjustment.

## (12) Test Output Setup (K10: OUTPUT X%)

This feature can be used to output a fixed current from 3.2 mA (–5%) to 21.6 mA (110%) for loop checks.

• Example: Output 12 mA (50%) fixed current.

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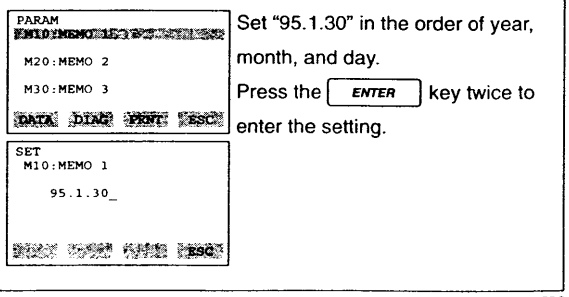
**IMPORTANT**

1. Test output is held for approximately 10 minutes, and then released automatically after the time has elapsed. Even if the BT200 power supply is turned off or the communication cable is disconnected during test output, it is held for approximately 10 minutes.
2. Press the F4 (OK) key to release test output immediately.

## (13) User Memo Fields (M: MEMO)

This feature provides 5 user memo fields, each holding up to 8 alphanumeric characters. Up to 5 items such as inspection date, inspector, and other information can be saved in these fields.

• Example: Save an inspection date of January 30, 1995.

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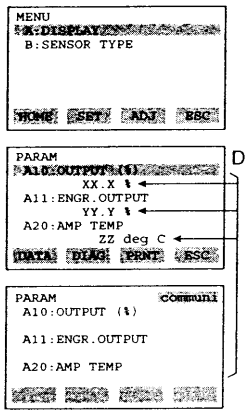
# 8.4 Displaying Data Using the BT200

## 8.4.1 Displaying Measured Data

The BT200 can be used to display measured data.

The measured data is updated automatically every 7 seconds. In addition, the display can be updated to the present data value at any time by pressing the F1 (DATA) key. For parameters associated with the display of measured data, see Subsection 8.3.1, "Parameter Summary."

• Example: Display output.




Display "A10: OUTPUT (%)."

Data is updated automatically at 7-second intervals.

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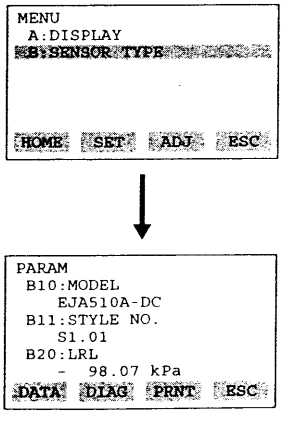
## 8.4.2 Display Transmitter Model and Specifications

The BT200 can be used to display the model and specifications of the transmitter.

• Example: View transmitter model name.




Press ENTER.

For the associated parameters, see Subsection 8.3.1, "Parameter Summary."

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# 8.5 Self-Diagnostics

## 8.5.1 Checking for Problems

### (1) Identifying Problems with BT200

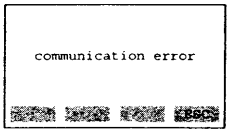
The following four areas can be checked.

(a) Whether connections are good.
(b) Whether BT200 was properly operated.
(c) Whether settings were properly entered.
(d) History of the errors.

See examples below.

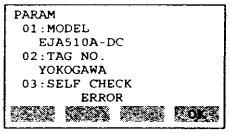
• Example 1: Connection errors

Press the ON/OFF key.
When the panel shown on the left appears, press the ENTER key.

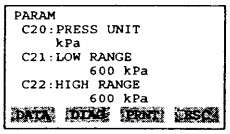



Since communications will be unsuccessful if there is a problem in the connection to the BT200, the display at the left will appear.
Recheck the connection.
Press the F4 (OK) key.

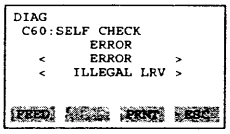
• Example 2: Setting entry errors




The initial data panel shows the result of current transmitter diagnostics.




Press the F2 (DIAG) key in the parameter panel to go to the diagnostics panel (C60: SELF CHECK).




An error message is displayed when an error occurs in the diagnostics panel.

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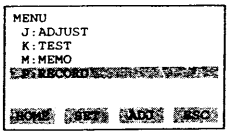
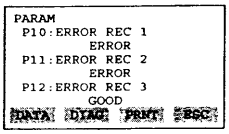
• Example 3: Checking the history of the errors

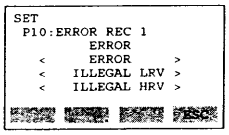



Connect the BT200 to the transmitter, and call item "P."




P10: "ERROR REC 1" displays the last error.
P11: "ERROR REC 2" displays the error one time before the last error occurred.
P12: "ERROR REC 3" displays the error two times before the last error occurred.
P13: "ERROR REC 4" displays the error three times before the last error occurred.

The history of up to four errors can be stored. When the 5th error has occurred, it is stored in "P10". The error stored in "P13" will be deleted, and then, the error in "P12" will be copied to "P13". In this sequence, the history of the most previously occurred error will be removed from memory. "GOOD" will be displayed if there was no previous error.




Select P10: ERROR REC1 and press the ENTER key to display the error message.

<(a) SETUP PANEL>

For the details of the messages listed below, see Table 8.5.1 Error Message Summary.

| | | |
|---|---|---|
| CAP MODULE FAULT | OVER TEMP (CAP) | ILLEGAL LRV |
| AMP MODULE FAULT | OVER TEMP (AMP) | ILLEGAL HRV |
| OUT OF RANGE | OVER OUTPUT | ILLEGAL SPAN |
| OUT OF SP RANGE | OVER DISPLAY | ZERO ADJ OVER |

Note 1: Press the ENTER key twice in the setting panel (panel 1) to clear all error message (P10 to P13) information.
Note 2: After two hours from when an error occurs, the error message of that error will be recorded. Therefore, if you switch off the transmitter within two hours from when the error occurs, there is no history of that error stored in the transmitter, and this function is meaningless.

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## (2) Checking with Integral Indicator

### NOTE

If an error is detected in the self-diagnostic, an error number is displayed on the integral indicator. If there is more than one error, the error number changes at two-second intervals. See Table 8.5.1 regarding the error numbers.

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**Figure 8.5.1 Identifying Problems Using the Integral Indicator**

## 8.5.2 Errors and Countermeasures

The table below shows a summary of error messages.

**Table 8.5.1 Error Message Summary**

| Integral Indicator Display | BT200 Display | Cause | Output Operation during Error | Countermeasure |
|---|---|---|---|---|
| None | GOOD | | | |
| ---- | ERROR | | | |
| Er. 01 | CAP MODULE FAULT | Capsule problem.*1 | Outputs the signal (Hold, High, or Low) set with parameter D53. | Replace capsule.*2 |
| Er. 02 | AMP MODULE FAULT | Amplifier problem. | Outputs the signal (Hold, High, or Low) set with parameter D53. | Replace amplifier. |
| Er. 03 | OUT OF RANGE | Input is outside measurement range limit of capsule. | Outputs high range limit value or low range limit value. | Check input. |
| Er. 04 | OUT OF SP RANGE | Static pressure exceeds specified range.*3 | Displays present output. | Check line pressure (static pressure). |
| Er. 05 | OVER TEMP (CAP) | Capsule temperature is outside range (–50 to 130°C). | Displays present output. | Use heat insulation or make lagging to keep temperature within range. |
| Er. 06 | OVER TEMP (AMP) | Amplifier temperature is outside range (–50 to 95°C). | Displays present output. | Use heat insulation or make lagging to keep temperature within range. |
| Er. 07 | OVER OUTPUT | Output is outside high or low range limit value. | Outputs high or low range limit value. | Check input and range setting, and change them as needed. |
| Er. 08 | OVER DISPLAY | Displayed value is outside high or low range limit value. | Displays high or low range limit value. | Check input and display conditions and modify them as needed. |
| Er. 09 | ILLEGAL LRV | LRV is outside setting range. | Holds output immediately before error occurrence. | Check LRV and modify as needed. |
| Er. 10 | ILLEGAL HRV | HRV is outside setting range. | Holds output immediately before error occurrence. | Check HRV and modify as needed. |
| Er. 11 | ILLEGAL SPAN | SPAN is outside setting range. | Holds output immediately before error occurrence. | Check SPAN and change as needed. |
| Er. 12 | ZERO ADJ OVER | Zero adjustment is too large. | Displays present output. | Readjust zero point. |

*1: For Model EJA510A and EJA530A, this error code appears when an illegal overpressure is applied to the pressure sensor in addition to the capsule problem. The Er. 01 will remain even if the normal input pressure is regained.

*2: For Model EJA510A and EJA530A, restart the power to the transmitter. Then if no error code appears, perform necessary adjustments such as zero-adjustment to continue the operation. If the error code still exists, replace the capsule assembly.

*3: For Model EJA120A, static pressure cannot be measured. The display is always 0 MPa, but this is not a measured value.

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# 9. MAINTENANCE

## 9.1 Overview

**WARNING**

Since the accumulated process fluid may be toxic or otherwise harmful, take appropriate care to avoid contact with the body, or inhalation of vapors even after dismounting the instrument from the process line for maintenance.

Maintenance of the transmitter is easy due to its modular construction. This chapter describes the procedures for calibration, adjustment, and the disassembly and reassembly procedures required for component replacement.

Since the transmitters are precision instruments, carefully and thoroughly read the following sections for proper handling during maintenance.

**IMPORTANT**

- As a rule, maintenance of this transmitter should be implemented in a maintenance service shop where the necessary tools are provided.
- The CPU assembly contains sensitive parts that may be damaged by static electricity. Exercise care so as not to directly touch the electronic parts or circuit patterns on the board, for example, by preventing static electrification by using grounded wrist straps when handling the assembly. Also take precautions such as placing a removed CPU assembly into a bag with an antistatic coating.

## 9.2 Calibration Instruments Selection

Table 9.2.1 shows the instruments required for calibration. Select instruments that will enable the transmitter to be calibrated or adjusted to the required accuracy.

The calibration instruments should be handled carefully so as to maintain the specified accuracy.

## 9.3 Calibration

Use the procedure below to check instrument operation and accuracy during periodic maintenance or trouble-shooting.

1) Connect the instruments as shown in Figure 9.3.1 and warm up the instruments for at least five minutes.

**IMPORTANT**

- To adjust the transmitter for highest accuracy, make adjustments with the power supply voltage and load resistance including leadwire resistances set close to the conditions under which the transmitter is installed.
- If the measurement range 0% point is 0 kPa or shifted in the positive direction (suppressed zero), the reference pressure should be applied as shown in the figure.
  If the measurement range 0% point is shifted in the negative direction (elevated zero), the reference pressure should be applied using a vacuum pump.

2) Apply reference pressures of 0%, 50%, and 100% of the measurement range to the transmitter. Calculate the errors (differences between digital voltmeter readings and reference pressures) as the pressure is increased from 0% to 100% and is decreased from 100% to 0%, and confirm that the errors are within the required accuracy.

**Table 9.2.1 Instruments Required for Calibration**

| Name | Yokogawa-recommended Instrument | Remarks |
|---|---|---|
| Power supply | Model SDBT or SDBS distributor | 4 to 20 mA DC signal |
| Load resistor | Model 2792 standard resistor [250 Ω ±0.005%, 3 W] | |
| | Load adjustment resistor [100 Ω ±1%, 1 W] | |
| Voltmeter | Model 2501 A digital multimeter<br>Accuracy (10V DC range): ±(0.002% of rdg + 1 dgt) | |
| Digital manometer | Model MT220 precision digital manometer<br>1) For 10 kPa class<br>Accuracy: ±(0.015% of rdg + 0.015% of F.S.) ..... for 0 to 10 kPa<br>±(0.2% of rdg + 0.1% of F.S.) ..... for -10 to 0 kPa<br>2) For 130 kPa class<br>Accuracy: ±0.02% of rdg ..... for 25 to 130 kPa<br>±5digits ..... for 0 to 25 kPa<br>±(0.2% of rdg + 0.1% of F.S.) ..... for -80 to 0 kPa<br>3) For 700 kPa class<br>Accuracy: ±(0.02% of rdg + 3digits) ..... for 100 to 700 kPa<br>±5 digits ..... for 0 to 100 kPa<br>±(0.2% of rdg + 0.1% of F.S.) ..... for -80 to 0 kPa<br>4) For 3000 kPa class<br>Accuracy: ±(0.02% of rdg + 10 digits) ..... for 0 to 3000 kPa<br>±(0.2% of rdg + 0.1% of F.S.) ..... for -80 to 0 kPa<br>5) For 130 kPa abs class<br>Accuracy: ±(0.03% of rdg + 6 digits) ..... for 0 to 130 kPa abs | Select a manometer having a pressure range close to that of the transmitter. |
| Pressure generator | Model 7674 pneumatic pressure standard for 200 kPa {2 kgf/cm$^2$}, 25 kPa {2500 mm$H_2O$}<br>Accuracy: ±0.05% of F.S. | Requires air pressure supply. |
| | Dead weight gauge tester 25 kPa {2500mm$H_2O$}<br>Accuracy: ±0.03% of setting | Select the one having a pressure range close to that of the transmitter. |
| Pressure source | Model 6919 pressure regulator (pressure pump)<br>Pressure range: 0 to 133 kPa {1000 mmHg} | Prepare the vacuum pump for negative pressure ranges. |

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Note: The above table contains the instruments capable of performing calibration to the 0.2% level. Since special maintenance and management procedures involving traceability of each instrument to higher-level standards are required for calibration to the 0.1% level, there are difficulties in calibration to this level in the field. For calibration to the 0.1% level, contact Yokogawa representatives from which the instrument was purchased or the nearest Yokogawa office.

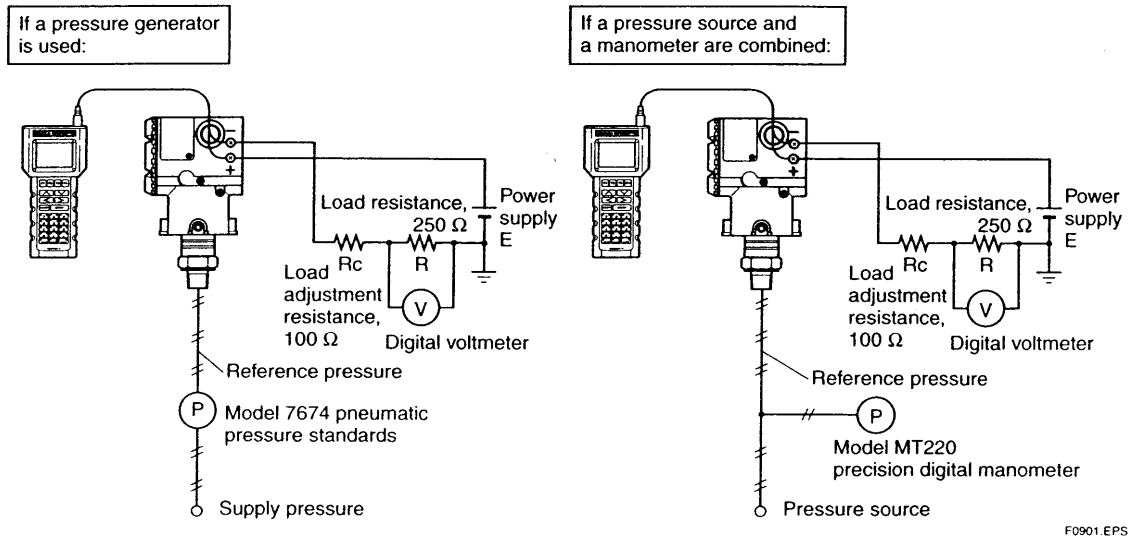


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**Figure 9.3.1 Instrument Connections**

## 9.4 Disassembly and Reassembly

**CAUTION**

**Precautions for CENELEC and SAA Flameproof Type Transmitters**

- Flameproof type transmitters must be, as a rule, removed to a non-hazardous area for maintenance and be disassembled and reassembled to the original state.
- On the flameproof type transmitters the two covers are locked, each by an Allen head bolt (shrouding bolt). When a shrouding bolt is driven clockwise by an Allen wrench, it is going in and cover lock is released, and then the cover can be opened by hand.

When a cover is closed it should be locked by a shrouding bolt without fail. Tighten the shrouding bolt to a torque of 0.7 N·m.

This section describes procedures for disassembly and reassembly for maintenance and component replacement.

Always turn OFF power and shut off and release pressures before disassembly. Use proper tools for all operations. Table 9.4.1 shows the tools required.

**Table 9.4.1 Tools for Disassembly and Reassembly**

| Tool | Quantity | Remarks |
|---|---|---|
| Phillips screwdriver | 1 | JIS B4633, No. 2 |
| Slotted screwdriver | 1 | |
| Allen wrenches | 2 | JIS B4648<br>One each, nominal 3 and 5 mm Allen wrenches |
| Wrench | 1 | Width across flats, 17 mm |
| Torque wrench | 1 | |
| Adjustable wrench | 1 | |
| Socket wrench | 1 | Width across flats, 16 mm |
| Socket driver | 1 | Width across flats, 5.5 mm |
| Tweezers | 1 | |

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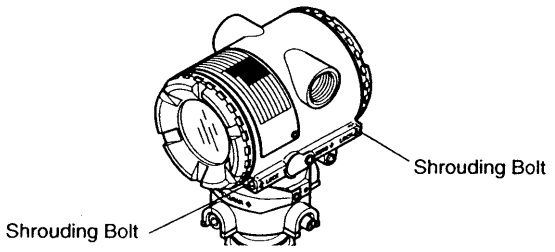


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**Figure 9.4 Shrouding Bolts**

### 9.4.1 Replacing the Integral Indicator

**CAUTION**

**Cautions for Flameproof Type Transmitters**

Users are prohibited by law from modifying the construction of a flameproof type transmitter. This would invalidate the agency approval and the transmitter's use in such rated area. Thus the user is prohibited from using a flameproof type transmitter with its integral indicator removed, or from adding an integral indicator to a transmitter. If such modification is absolutely required, contact Yokogawa.

This subsection describes the procedure for replacing an integral indicator. (See Figure 9.4.1)

#### ■ Removing the Integral Indicator

1) Remove the cover.
2) Supporting the integral indicator by hand, loosen its two mounting screws.
3) Dismount the LCD board assembly from the CPU assembly.
   When doing this, carefully pull the LCD board assembly straight forward so as not to damage the connector pins between it and the CPU assembly.

#### ■ Attaching the Integral Indicator

1) Align both the LCD board assembly and CPU assembly connectors and engage them.
2) Insert and tighten the two mounting screws.
3) Replace the cover.

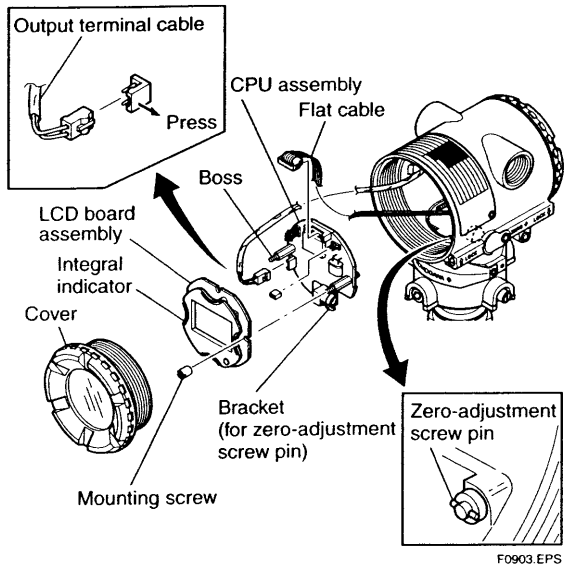


**Figure 9.4.1 Removing and Attaching LCD Board Assembly and CPU Assembly**

## 9.4.2 Replacing the CPU Board Assembly

This subsection describes the procedure for replacing the CPU assembly. (See Figure 9.4.1)

### ■ Removing the CPU Assembly

1) Remove the cover. If an integral indicator is mounted, refer to Subsection 9.4.1 and remove the indicator.
2) Turn the zero-adjustment screw to the position (where the screw head slot is horizontal) as shown in Figure 9.4.1.
3) Disconnect the output terminal cable (cable with brown connector at the end). When doing this, lightly press the side of the CPU assembly connector and pull the cable connector to disengage.
4) Use a socket driver (width across flats, 5.5mm) to loosen the two bosses.
5) Carefully pull the CPU assembly straight forward to remove it.
6) Disconnect the flat cable (cable with black connector at the end) that connects the CPU assembly and the capsule.

**NOTE**

Be careful not to apply excessive force to the CPU assembly when removing it.

### ■ Mounting the CPU Assembly

1) Connect the flat cable (with black connector) between the CPU assembly and the capsule.
2) Connect the output terminal cable (with brown connector).

**NOTE**

Make certain that the cables are free of pinching between the case and the CPU assembly edge.

3) Align and engage the zero-adjustment screw pin with the groove on the bracket on the CPU assembly. Then insert the CPU board assembly straight onto the post in the amplifier case.
4) Tighten the two bosses. If the transmitter is equipped with an integral indicator, refer to Subsection 9.4.1 to mount the indicator.

**NOTE**

Confirm that the zero-adjustment screw pin is placed properly in the groove on the bracket prior to tightening the two bosses. If it is not, the zero-adjustment mechanism will be damaged.

5) Replace the cover.

## 9.4.3 Cleaning and Replacing the Capsule Assembly

This subsection describes the procedures for cleaning and replacing the capsule assembly. (See Figure 9.4.2.)

**CAUTION**

**Cautions for Flameproof Type Transmitters**

Users are prohibited by law from modifying the construction of a flameproof type transmitter. If you wish to replace the capsule assembly with one of a different measurement range, contact Yokogawa.

The user is permitted, however, to replace a capsule assembly with another of the same measurement range. When doing so, be sure to observe the following.

- The replacement capsule assembly must have the same part number as the one being replaced.



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- The section connecting the transmitter and capsule assembly is a critical element in preservation of flameproof performance, and must be checked to verify that it is free of dents, scratches, and other defects.
- After completing maintenance, be sure to securely tighten the Allen screws that fasten the transmitter section and pressure-detector section together.

### ■ Removing the Capsule Assembly

**IMPORTANT**

Exercise care as follows when cleaning the capsule assembly.

- Handle the capsule assembly with care, and be especially careful not to damage or distort the diaphragms that contact the process fluid.
- Do not use a chlorinated or acidic solution for cleaning.
- Rinse thoroughly with clean water after cleaning.

1) Remove the CPU assembly as shown in Subsection 9.4.2.
2) Remove the two Allen screws and the pipe (shown in Figure 9.4.2) for the model EJA530A with Measurement span code A, B, and C, which connect the transmitter section and capsule assembly.
3) Separate the transmitter section and capsule assembly.
4) Clean the capsule assembly or replace with a new one.

### ■ Reassembling the Capsule Assembly

1) Insert the capsule assembly to the transmitter section. For the model EJA530A with Measurement span code A, B, and C with the pipe (shown in Figure 9.4.2), insert the capsule assembly in a way that the direction of the pipe screw thread matches to that of the zero-adjustment screw of the transmitter section.
2) Tighten the two Allen screws to a torque of 5 N·m and the pipe with gasket if applied.
3) Install the CPU assembly according to Subsection 9.4.2.
4) After completing reassembly, adjust the zero point and check the parameters.

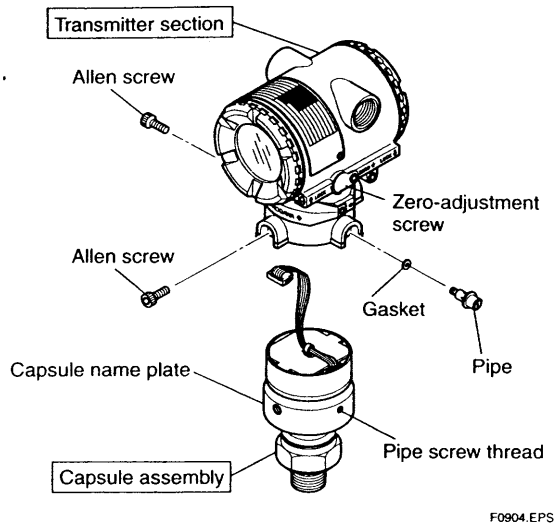



**Figure 9.4.2 Removing and Mounting the Capsule Assembly**

## 9.5 Troubleshooting

If any abnormality appears in the measured values, use the troubleshooting flow chart below to isolate and remedy the problem. Since some problems have complex causes, these flow charts may not identify all. If you have difficulty isolating or correcting a problem, contact Yokogawa service personnel.

### 9.5.1 Basic Troubleshooting

First determine whether the process variable is actually abnormal or a problem exists in the measurement system.

If the problem is in the measurement system, isolate the problem and decide what corrective action to take.

This transmitter is equipped with a self-diagnostic function which will be useful in troubleshooting; see Section 8.5 for information on using this function.

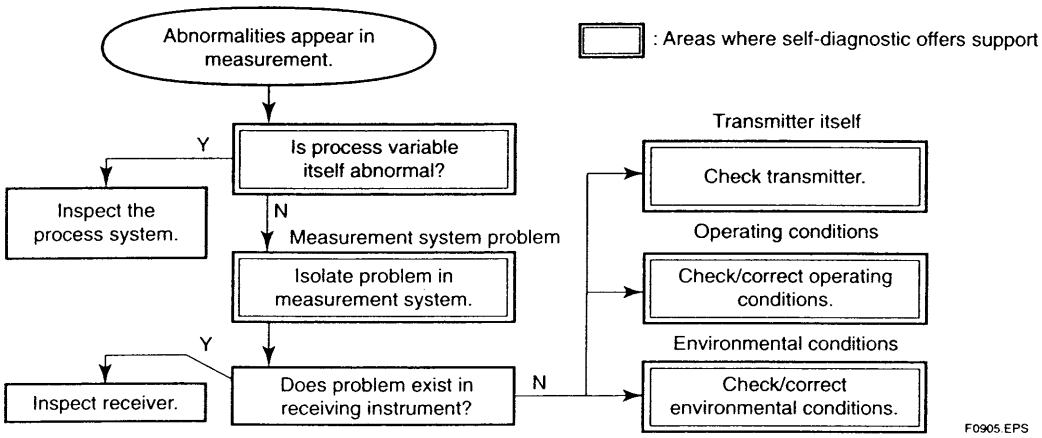
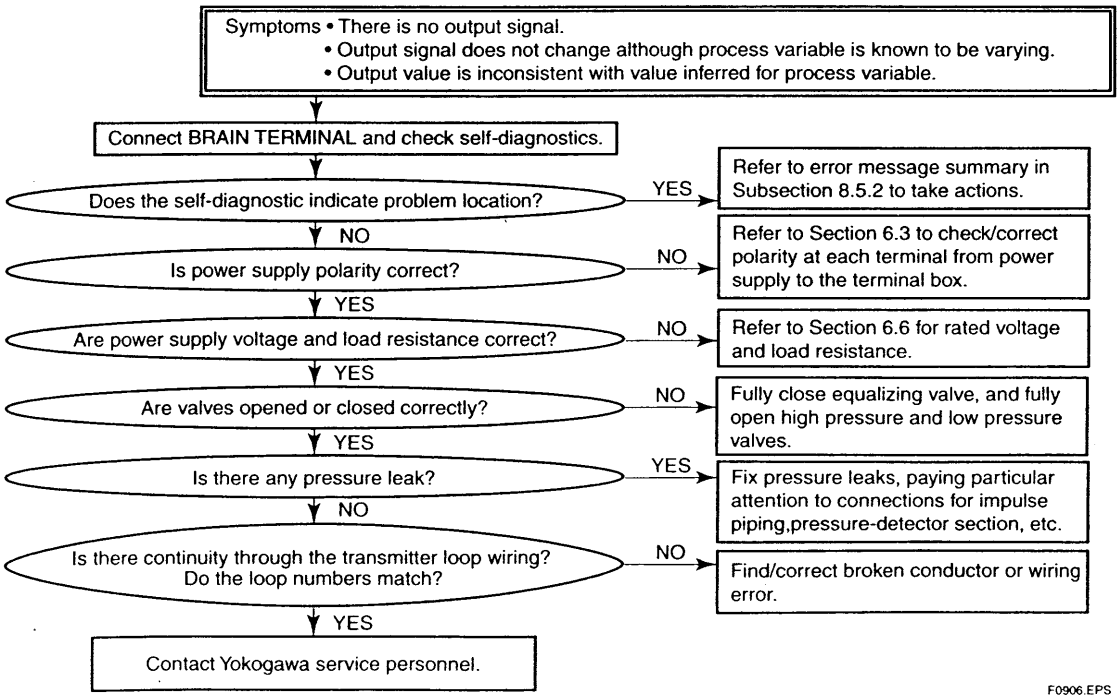
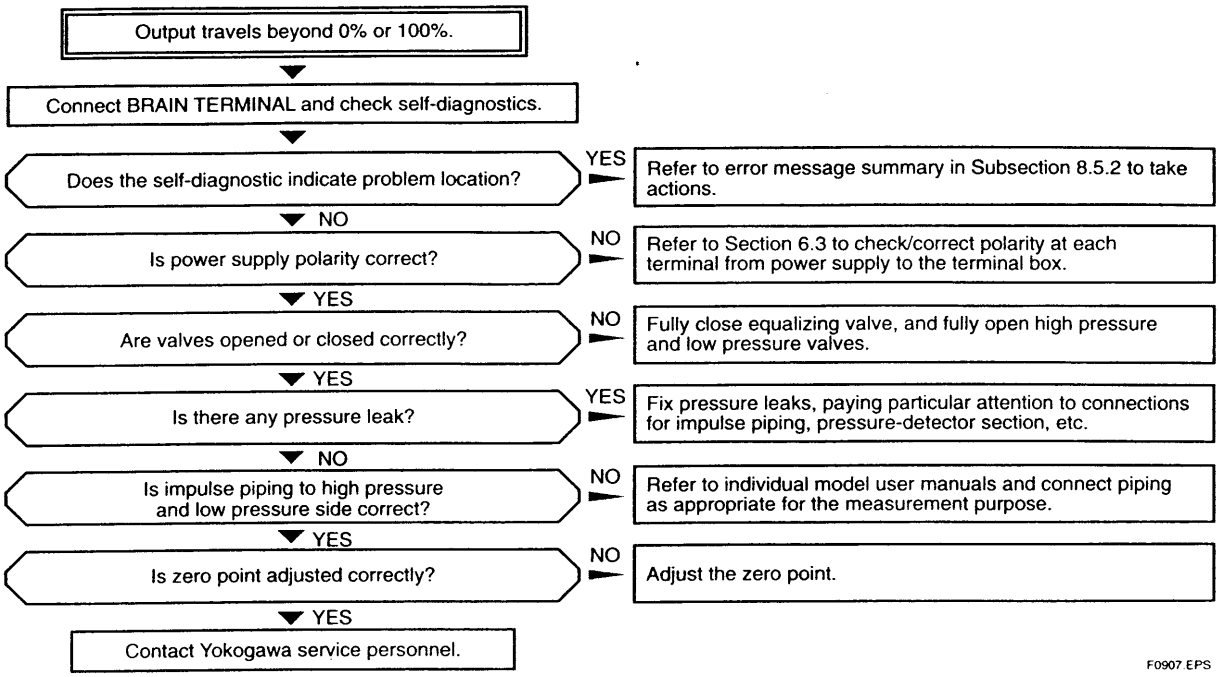



**Figure 9.5.1 Basic Flow and Self-Diagnostics**

### 9.5.2 Troubleshooting Flow Charts



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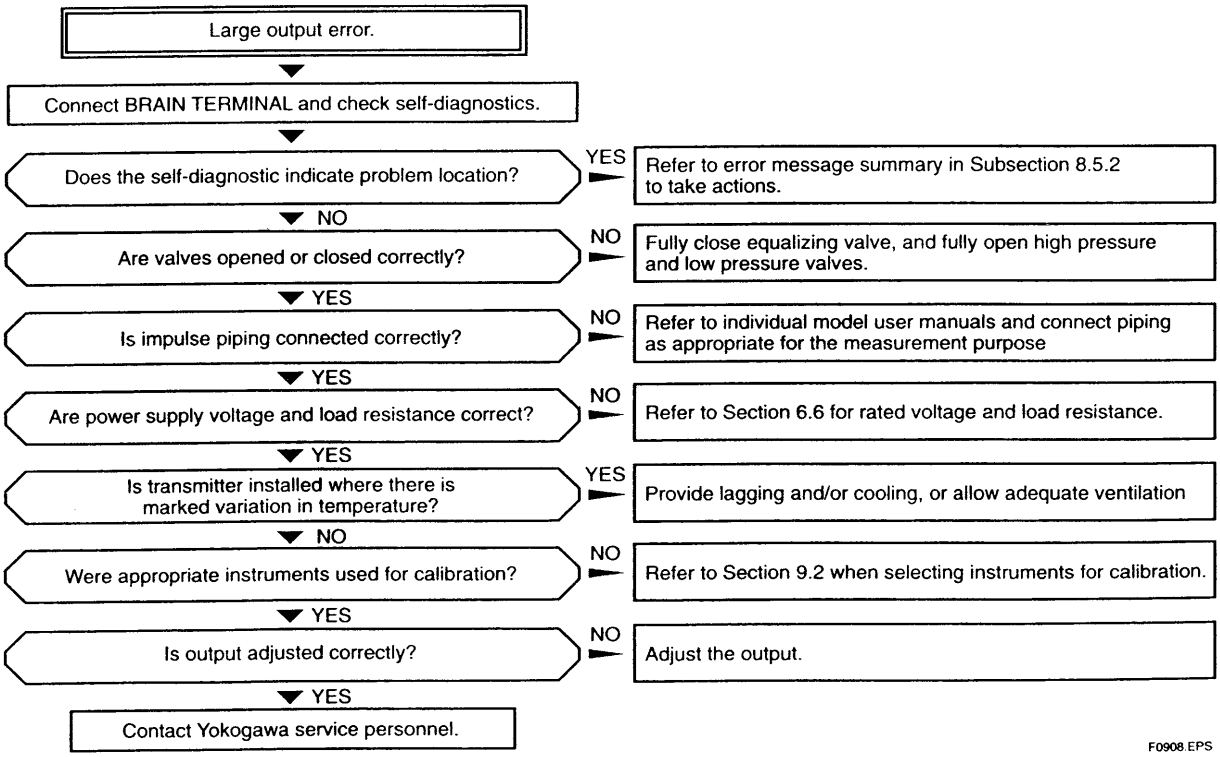


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# 10. GENERAL SPECIFICATIONS

## 10.1 Standard Specifications

### ● Performance Specifications

See General Specifications sheet, GS 01C21F01-E.

### ● Functional Specifications

#### Span & Range Limits

**EJA510A and EJA530A:**

| Measurement Span and Range | | MPa | psi (/D1) | bar (/D3) | kgf/cm²(/D4) |
|---|---|---|---|---|---|
| A | Span | 10 to 200 kPa | 1.45 to 29 | 0.1 to 2 | 0.1 to 2 |
| | Range | 0 to 200 kPa | 0 to 29 | 0 to 2 | 0 to 2 |
| B | Span | 0.1 to 2 | 14.5 to 290 | 1 to 20 | 1 to 20 |
| | Range | 0 to 2 | 0 to 290 | 0 to 20 | 0 to 20 |
| C | Span | 0.5 to 10 | 72.5 to 1450 | 5 to 100 | 5 to 100 |
| | Range | 0 to 10 | 0 to 1450 | 0 to 100 | 0 to 100 |
| D | Span | 5 to 50 | 720 to 7200 | 50 to 500 | 50 to 500 |
| | Range | 0 to 50 | 0 to 7200 | 0 to 500 | 0 to 500 |

Values in absolute for EJA510A. T1001.EPS

**Zero Adjustment Limits:**

Zero can be fully elevated or suppressed, within the Lower and Upper Range Limits of the capsule.

**External Zero Adjustment:**

External zero is continuously adjustable with 0.01% incremental resolution of span. Span may be adjusted locally using the digital indicator with range switch.

**Output:**

Two wire 4 to 20 mA DC output with digital communications, linear or square root programmable. BRAIN or HART FSK protocol are superimposed on the 4 to 20 mA signal.

**Damping Time Constant (1st order):**

The sum of the amplifier and capsule damping time constant must be used for the overall time constant. Amp damping time constant is adjustable from 0.2 to 64 seconds.

| Capsule (Silicone Oil) | A, B, C, and D |
|---|---|
| Time Constant (approx. sec) | 0.2 |

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**Ambient Temperature Limits:**

* Safety approval codes may affect limits.
–40 to 85°C (–40 to 185°F),
–30 to 80°C (–22 to 176°F) with LCD Display

**Process Temperature Limits:**

* Safety approval codes may affect limits.
–40 to 120°C (–40 to 248°F)

**Maximum Overpressure:**

| Capsule | Capsule EJA510A | Capsule EJA530A |
|---|---|---|
| A | 4 MPa abs{580 psia} | 4 MPa {580 psig} |
| B | 4 MPa abs{580 psia} | 4 MPa {580 psig} |
| C | 20 MPa abs{2900 psia} | 20 MPa {2900 psig} |
| D | 60 MPa abs{8500 psia} | 60 MPa {8500 psig} |

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**Working Pressure Limits (Silicone Oil)**
**Maximum Pressure Limit:**

| Capsule | Capsule EJA510A | Capsule EJA530A |
|---|---|---|
| A | 200 kPa abs{29 psia} | 200 kPa {29 psig} |
| B | 2 MPa abs{290 psia} | 2 MPa {290 psig} |
| C | 10 MPa abs{1450 psia} | 10 MPa {1450 psig} |
| D | 50 MPa abs{7200 psia} | 50 MPa {7200 psig} |

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**Minimum Pressure Limit:**

EJA510A: 0.013 kPa abs
EJA530A: Lower limit of measurement range

### ● Installation

**Supply & Load Requirements:**

* Safety approvals can affect electrical requirements. See Section 6.6, 'Power Supply Voltage and Load Resistance.'

**Supply Voltage "◇":**

10.5 to 42 V DC for general use and flameproof type
10.5 to 32 V DC for lightning protector (Optional code /A)
10.5 to 30 V DC for intrinsically safe, Type n, nonincendive, or non-sparking type
Minimum voltage limited at 16.4 V DC for digital communications, BRAIN and HART

**EMC Conformity Standards:** CE , N200

EN61326, AS/NZS 2064

**Communication Requirements:**

**BRAIN**

**Communication Distance;**

Up to 2 km (1.25 miles) when using CEV polyethylene-insulated PVC-sheathed cables.
Communication distance varies depending on type of cable used.

**Load Capacitance;**

0.22 μF or less (see note)

**Load Inductance;**

3.3 mH or less (see note)

**Input Impedance of communicating device;**

10 kΩ or more at 2.4 kHz.

Note: For general-use and Flameproof type.
For Intrinsically safe type, please refer to 'Optional Specifications.'



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**HART**

**Communication Distance;**

Up to 1.5 km (1 mile) when using multiple twisted pair cables. Communication distance varies depending on type of cable used.
Use the following formula to determine cable length for specific applications:

$$L = \frac{65 \times 10^6}{(R \times C)} - \frac{(C_f + 10{,}000)}{C}$$

Where:
L = length in meters or feet
R = resistance in Ω (including barrier resistance)
C = cable capacitance in pF/m or pF/ft
$C_f$ = maximum shunt capacitance of receiving devices in pF/m or pF/ft

## ● Physical Specifications

**Wetted Parts Materials:**

**· Diaphragm and Process connector;**
See 'Model and Suffix Codes.'

**Non-wetted Parts Materials:**

**Housing;**
Low copper cast-aluminum alloy with polyurethane paint (Munsell 0.6GY3.1/2.0)

**Degrees of Protection**
IP67, NEMA4X, JIS C0920 immersion proof

**Cover O-rings;**
Buna-N

**Data plate and tag;**
SUS304

**Fill Fluid;**
Silicone or Fluorinated oil (optional)

**Weight:**
1.6 kg (3.5 lb) without integral indicator and mounting bracket.

**Connections:**
See 'Model and Suffix Codes.'

## <Settings When Shipped>

| | |
|---|---|
| Tag Number | As specified in order *1 |
| Output Mode | 'Linear' |
| Display Mode | 'Linear' |
| Operation Mode | 'Normal' unless otherwise specified in order |
| Damping Time Constant | '2 sec.' |

| | |
|---|---|
| Calibration Range Lower Range Value | As specified in order |
| Calibration Range Higher Range Value | As specified in order |
| Calibration Range Units | Selected from $mmH_2O$, mmAq, mmWG, mmHg, Torr, Pa, hPa, kPa, MPa, mbar, bar, $gf/cm^2$, $kgf/cm^2$, $inH_2O$, inHg, $ftH_2O$, psi, or atm.(Only one unit can be specified) |

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Note 1: If Tag No. is no more than 16 alphanumeric characters (including - and ·), it will be written into the tag plate and amplifier memory settings.

## 10.2 Model and Suffix Codes

### ● Model EJA510A and EJA530A

| Model | Suffix Codes | | Description |
|---|---|---|---|
| **EJA510A** | ····· | | Absolute pressure transmitter |
| **EJA530A** | ····· | | Gauge pressure transmitter |
| Output Signal | **-D** ····· | | 4 to 20 mA DC with digital communication (BRAIN protocol) |
| | **-E** ····· | | 4 to 20 mA DC with digital communication (HART protocol, see IM 01C22T01-01E) |
| | **-F** ····· | | Digital communication (FOUNDATION Fieldbus protocol, see IM 01C22T02-01E) |
| Measurement span (capsule) | **A** ····· | | 10 to 200 kPa{0.1 to 2 kgf/cm$^2$} |
| | **B** ····· | | 0.1 to 2 MPa{1 to 20 kgf/cm$^2$} |
| | **C** ····· | | 0.5 to 10 MPa{5 to 100 kgf/cm$^2$} |
| | **D** ····· | | 5 to 50 MPa{50 to 500 kgf/cm$^2$} |
| Wetted parts material | | | [Process Connection] [Diaphragm] |
| | **S** ····· | | SUS316L Hastelloy C-276 |
| | **H** ····· | | Hastelloy C-276 Hastelloy C-276 |
| Process connection | **4** ····· | | 1/2 NPT female |
| | **7** ····· | | 1/2 NPT male |
| | **8** ····· | | G 1/2 DIN 16 288 male |
| | **9** ····· | | M20×1.5 DIN 16 288 male |
| — | **N** ····· | | Always N |
| — | **-0** ····· | | Always 0 |
| Electrical connection | **0** ····· | | G1/2 female, one electrical connection |
| | **2** ····· | | 1/2 NPT female, two electrical connections without blind plug |
| | **3** ····· | | Pg 13.5 female, two electrical connections without blind plug |
| | **4** ····· | | M20 female, two electrical connections without blind plug |
| | **5** ····· | | G1/2 female, two electrical connections and a blind plug |
| | **7** ····· | | 1/2 NPT female, two electrical connections and a blind plug |
| | **8** ····· | | Pg 13.5 female, two electrical connections and a blind plug |
| | **9** ····· | | M20 female, two electrical connections and a blind plug |
| Integral indicator | **D** ··· | | Digital indicator |
| | **E** ··· | | Digital indicator with the range setting switch |
| | **N** ··· | | (None) |
| Mounting bracket | **E** ·· | | SECC Carbon steel 2-inch pipe mounting |
| | **F** ·· | | SUS304 2-inch pipe mounting |
| | **N** ·· | | (None) |
| Optional codes | | | /□ Optional specification |

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## 10.3 Optional Specifications

| Item | Description | Code |
|---|---|---|
| Factory Mutual (FM) | FM Explosionproof Approval<br>Explosionproof for Class I, Division 1, Groups B, C and D<br>Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G<br>Hazardous (classified) locations, indoors and outdoors ( NEMA 4X )<br>Temperature class: T6<br>Amb. Temp.:–40 to 60 °C (–40 to 140 °F) | **FF1** |
| | FM Intrinsically safe Approval<br>Intrinsically Safe for Class I, Division 1, Groups A, B, C & D, Class II, Division 1, Groups E, F & G and Class III, Division 1 Hazardous Locations.<br>Nonincendive for Class I, Division 2, Groups A, B, C & D, Class II, Division. 2, Groups E, F & G, and Class III, Division 1 Hazardous Locations.<br>Enclosure: "NEMA 4X", Temp. Class: T4, Amb. Temp.: –40 to 60 °C (–40 to 140 °F)<br>Intrinsically Safe Apparatus Parameters<br>[Groups A, B, C, D, E, F and G]<br>Vmax=30 V, Imax=165 mA, Pmax=0.9 W, Ci=22.5 nF, Li=730 μH<br>[Groups C, D, E, F and G]<br>Vmax=30 V, Imax=225 mA, Pmax=0.9 W, Ci=22.5 nF, Li=730 μH | **FS1** |
| | Combined FF1and FS1 | **FU1** |
| CENELEC ATEX | CENELEC ATEX (KEMA) Flameproof Approval<br>II 2G EExd IIC T4, T5, T6<br>Amb. Temp.: T5; –40 to 80 °C ( –40 to 176 °F), T4 and T6; –40 to 75°C( –40 to 176°F)<br>Max. process Temp.: T4; 120 °C (248 °F), T5; 100 °C (212 °F), T6; 85 °C (185 °F) | **KF2** |
| | CENELEC ATEX (KEMA) Intrinsically safe Approval<br>II 1G EEx ia IIC T4, Amb. Temp.: –40 to 60 °C(–40 to 140 °F)<br>Ui=30 V, Ii=165 mA, Pi=0.9 W, Ci=22.5 nF, Li=730 μH | **KS2** |
| | Combined KF2, KS2, Type n, and Dust Approval<br>Type n: II 3G Ex nL IIC T4, Amb. Temp.: –40 to 60°C (–40 to 140°F)<br>Ui=30 V, Ci=22.5 nF, Li=730 μH<br>Dust: II 1D Maximum surface temperature T65°C (Tamb.: 40°C), T85°C (Tamb.: 60°C), and T105°C (Tamb.: 80°C) | **KU2** |
| Canadian Standards Association (CSA) | CSA Explosionproof Approval<br>Explosionproof for Class I, Division 1, Groups B, C and D<br>Dustignitionproof for Class II/III, Division 1, Groups E, F and G<br>Division2 'SEALS NOT REQUIRED' , Temp. Class : T4, T5, T6 Encl Type 4x<br>Max. Process Temp.: T4; 120 °C (248 °F), T5; 100 °C (212 °F), T6; 85 °C (185 °F)<br>Amb. Temp.:–40 to 80 °C (–40 to 176 °F) | **CF1** |
| | CSA Intrinsically safe Approval<br>Class I, Groups A, B, C and D Class II and III, Groups E, F and G<br>Encl Type 4x, Temp. Class: T4, Amb. Temp.: –40 to 60 °C (–40 to 140 °F)<br>Vmax=30 V, Imax=165 mA, Pmax=0.9 W, Ci=22.5 nF, Li=730 μH | **CS1** |
| | Combined CF1 and CS1 | **CU1** |
| Standards Association of Australia (SAA) | SAA Flameproof, Intrinsically safe and Non-sparking Approval<br>Ex d IIC T4/T5/T6, IP67 class I, Zone 1, Amb. Temp. : –40 to 80 °C (–40 to 176 °F)<br>Max. Process Temp.: T4; 120 °C (248 °F), T5; 100 °C (212 °F), T6; 85 °C (185 °F)<br>Ex ia IIC T4, IP67 class I, Zone 0<br>Ex n IIC T4, IP67 class I, Zone 2<br>Ui=30 V DC, Ii=165 mA DC, Wi=0.9 W, Amb. Temp.: –40 to 60 °C (–40 to 140 °F) | **SU1** |

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| Item | | Description | | Code |
|---|---|---|---|---|
| Painting | Color change | Amplifier cover only | | P□ |
| | Coating change | Epoxy resin-baked coating | | X1 |
| Lightning protector | | Transmitter power supply voltage: 10.5 to 32 V DC (10.5 to 30 V DC for intrinsically safe type, 9 to 32 V DC for Fieldbus communication type.)<br>Allowable current: Max. 6000 A (1×40 μs), Repeating 1000 A (1×40 μs) 100 times | | A |
| Oil-prohibited use | | Degrease cleansing treatment | | K1 |
| | | Degrease cleansing treatment and with fluorinated oil filled capsule.<br>Operating temperature: –20 to 80°C | | K2 |
| Calibration units | | P calibration (psi unit) | (See Table for Span and Range Limits.) | D1 |
| | | bar calibration (bar unit) | | D3 |
| | | M calibration (kgf/cm² unit) | | D4 |
| Fast response | | Update time: 0.125 sec or less, see GS for the response time. | | F1 |
| Failure alarm down-scale *1 | | Output status at CPU failure and hardware error is –5%, 3.2 mA or less. | | C1 |
| NAMUR NE43 compliant *1 | | Output signal limits: 3.8 mA to 20.5 mA | Failure alarm down-scale: output status at CPU failure and hardware error is –5%, 3.2 mA or less. | C2 |
| | | | Failure alarm up-scale: output status at CPU failure and hardware error is 110%, 21.6 mA or more. | C3 |
| Stainless steel amplifier housing | | Amplifier housing material; SCS14A stainless steel (equivalent to SUS316 cast stainless steel or ASTM CF-8M) | | E1 |
| Stainless steel tag plate | | JIS SUS304 stainless steel tag plate wired onto transmitter | | N4 |
| High Accuracy type | | High Accuracy (Applicable only for Model EJA530A) | | HAC |
| European Pressure Equipment Directive | | PED 97/23/EC<br>CATEGORY: III, Module: H, Type of Equipment: Pressure Accessory - Vessel,<br>Type of Fluid: Liquid and Gas,<br>Group of Fluid: 1 and 2 | | PE3 |
| Mill Certificate | | Process connector | | M15 |
| Pressure test/ Leak test Certificate | | Test Pressure: 200 kPa (2 kgf/cm²) | Nitrogen ($N_2$) Gas<br>Retention time: 10 minutes | T05 |
| | | Test Pressure: 2 MPa (20 kgf/cm²) | | T06 |
| | | Test Pressure: 10 MPa (100 kgf/cm²) | | T07 |
| | | Test Pressure: 50 MPa (500 kgf/cm²) | | T08 |

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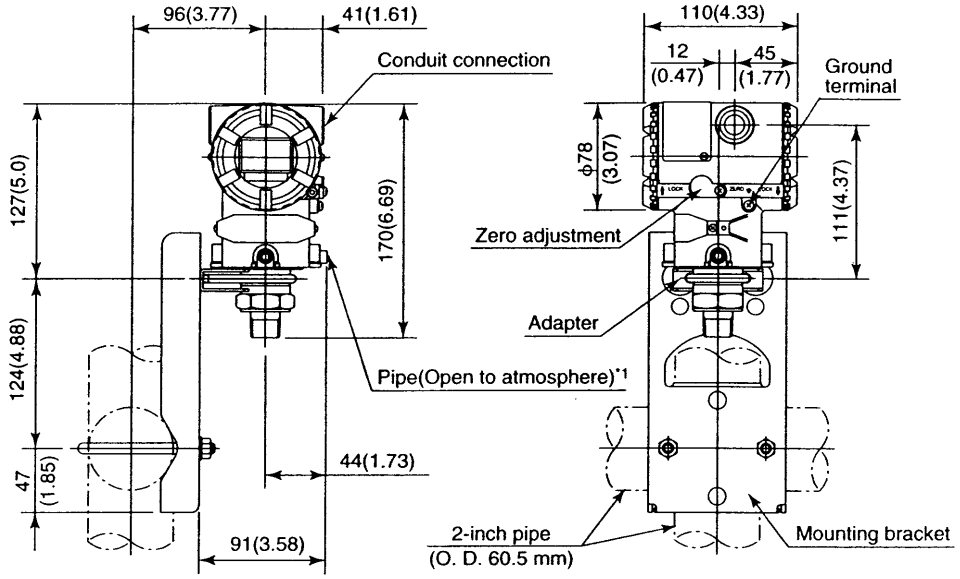
*1: Applicable for Output signal code D and E. The hardware error indicates faulty amplifier or capsule. When combining with Optional code F1, output status for down-scale is –2.5%, 3.6 mA DC or less.

# 10.4 Dimensions

## ● Model EJA510A and EJA530A [Style: S2]

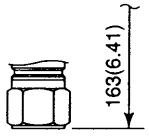
◆ With Process Connection code 7

Unit: mm(Approx. inch)

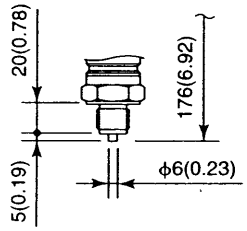



*1: Applied to Model EJA530A with Measurement span code A, B, and C.

◆ For Process Connection code 4




◆ For Process Connection code 8 and 9

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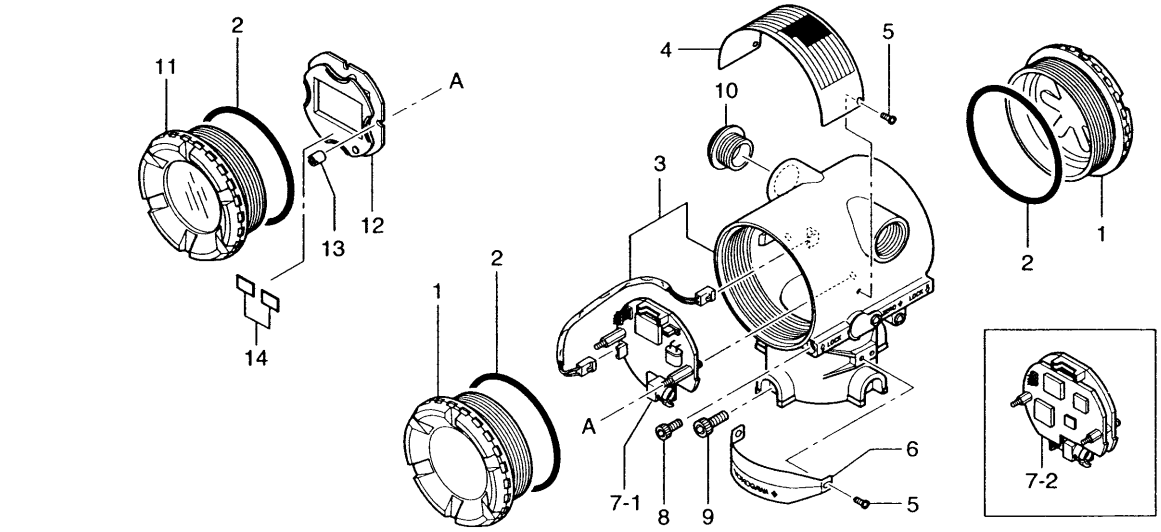
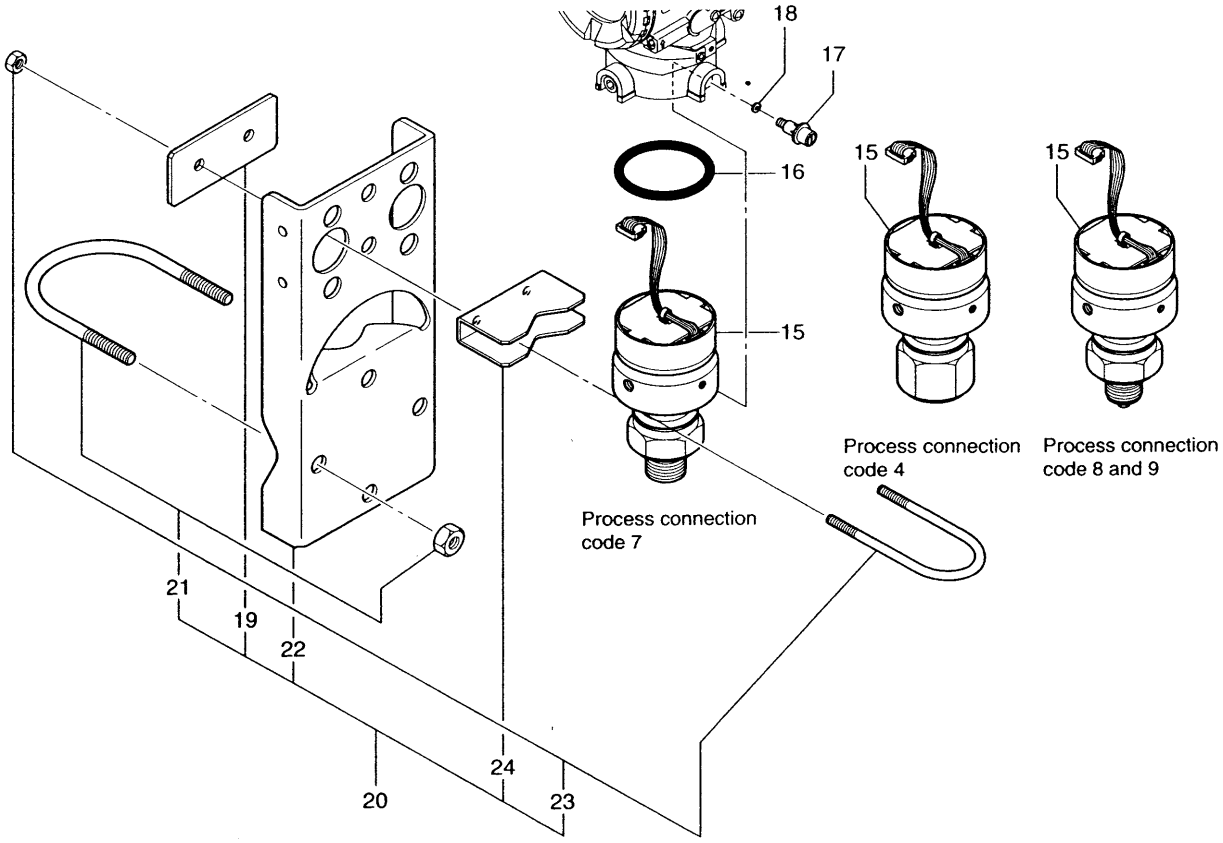
# Customer Maintenance Parts List

Model EJA510A and EJA530A
Absolute and Gauge
Pressure Transmitter

DPharp

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CMPL 01C21F01-01E
4th Edition: Aug. 2002(YK)

| Item | Part No. | Qty | Description |
|---|---|---|---|
| 1 | Bellow | 2 | Cover |
| | F9341RA | | Cast-aluminum alloy |
| | F9341RJ | | SCS14A stainless steel |
| 2 | F9341JP | 2 | O-ring |
| 3 | Below | 1 | Case Assembly (Note 1) |
| | F9341AA | | Cast-aluminum alloy for G1/2 |
| | F9341AC | | Cast-aluminum alloy for G1/2 (two electrical connections) |
| | F9341AE | | Cast-aluminum alloy for 1/2 NPT (two electrical connections) |
| | F9341AH | | Cast-aluminum alloy for M20 (two electrical connections) |
| | F9341AJ | | Cast-aluminum alloy for Pg13.5 (two electrical connections) |
| | F9341AR | | SCS14A stainless steel for 1/2 NPT (two electrical connections) |
| 4 | F9341KA | 1 | Name Plate |
| 5 | Bellow | 4 | Screw |
| | F9300AG | | For cast-aluminum alloy case assembly |
| | F9303JU | | For SCS14A stainless steel case assembly |
| 6 | F9341KL | 1 | Tag Plate |
| 7-1 | Below | 1 | CPU Assembly |
| | F9342AB | | For BRAIN protocol version |
| | F9342AL | | For HART protocol version |
| | F9342AF | | For BRAIN protocol version (Optional code /F1) |
| | F9342AM | | For HART protocol version with write protection switch (Optional code /F1) |
| 7-2 | F9342BF | 1 | For FOUNDATION Fieldbus protocol version |
| | F9342BG | | For FOUNDATION Fieldbus protocol version with PID/LM function (Optional code /LC1) |
| 8 | Y9406ZU | 2 | Cap Screw |
| 9 | Y9612YU | 2 | Screw |
| 10 | Below | 1 | Plug |
| | F9340NW | | For Pg13.5 |
| | F9340NX | | For M20 |
| | G9330DK | | For G1/2 |
| | G9612EB | | For 1/2 NPT |
| 11 | Bellow | 1 | Cover Assembly (For integral indicator) |
| | F9341FM | | Cast-aluminum alloy |
| | F9341FJ | | SCS14A stainless steel |
| 12 | Below | 1 | LCD Board Assembly |
| | F9342BL | | Without range-setting switch |
| | F9342BM | | With range-setting switch |
| 13 | F9342MK | 2 | Mounting Screw |
| 14 | F9300PB | 2 | Label |
| 15 | — | 1 | Capsule Assembly (See Table 1.)(Note 2) |
| 16 | F9300AJ | 1 | O-ring |
| 17 | Below | 1 | Pipe (for EJA530A with Measurement Span code A, B, and C) |
| | F9385XK | | Polypropylene resin |
| | F9385XM | | SUS316 Stainless Steel (Optional code /E1) |
| 18 | F9385XL | 1 | O-ring (for EJA530A with Measurement Span code A, B, and C) |
| 19 | F9385XZ | 1 | Plate, SUS304 Stainless Steel |
| 20 | Below | 1 | Bracket Assembly |
| | F9385XV | | SECC carbon steel |
| | F9385XT | | SECC carbon steel (for epoxy resin-baked coating) |
| | F9385XU | | SUS304 stainless steel |
| 21 | D0117XL-A | 1 | U-bolt/Nut Assembly (L), SUS304 Stainless Steel |
| 22 | Below | 1 | Bracket |
| | F9270AX | | SECC carbon steel |
| | F9300TN | | SECC carbon steel (for epoxy resin-baked coating) |
| | F9300TE | | SUS304 Stainless Steel |
| 23 | F9385XW | 1 | U-bolt/Nut Assembly (S), SUS304 Stainless Steel |
| 24 | F9385XY | 1 | Adapter, SUS304 Stainless Steel |

(Note 1) Applicable for BRAIN and HART protocol versions (Output signal code D and E).
For FOUNDATION Fieldbus protocol version (Output signal code F), consult Yokogawa local office.
(Note 2) In case of Degrease cleansing treatment (Optional code /K1), consult Yokogawa local office.

Table 1. Capsule Assembly Part Number (Item 15)

| Process connection | Capsule Code | EJA510A | | | | EJA530A | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | S(*1) | S, /K2(*2) | H(*1) | H, /K2(*2) | S(*1) | S, K2(*2) | H(*1) | H, K2(*2) |
| 1/2 NPT female | A | F9421AB | F9421AP | F9421NB | F9421NP | F9420AB | F9420AP | F9420NB | F9420NP |
| | B | F9421BB | F9421BP | F9421PB | F9421PP | F9420BB | F9420BP | F9420PB | F9420PP |
| | C | F9421CB | F9421CP | F9421QB | F9421QP | F9420CB | F9420CP | F9420QB | F9420QP |
| | D | F9421DB | F9421DP | F9421RB | F9421RP | F9420DB | F9420DP | F9420RB | F9420RP |
| 1/2 NPT male | A | F9421AD | F9421AR | F9421ND | F9421NR | F9420AD | F9420AR | F9420ND | F9420NR |
| | B | F9421BD | F9421BR | F9421PD | F9421PR | F9420BD | F9420BR | F9420PD | F9420PR |
| | C | F9421CD | F9421CR | F9421QD | F9421QR | F9420CD | F9420CR | F9420QD | F9420QR |
| | D | F9421DD | F9421DR | F9421RD | F9421RR | F9420DD | F9420DR | F9420RD | F9420RR |
| G1/2 male (DIN) | A | F9421AE | F9421AS | F9421NE | F9421NS | F9420AE | F9420AS | F9420NE | F9420NS |
| | B | F9421BE | F9421BS | F9421PE | F9421PS | F9420BE | F9420BS | F9420PE | F9420PS |
| | C | F9421CE | F9421CS | F9421QE | F9421QS | F9420CE | F9420CS | F9420QE | F9420QS |
| | D | F9421DE | F9421DS | F9421RE | F9421RS | F9420DE | F9420DS | F9420RE | F9420RS |
| M20×1.5 male | A | F9421AF | F9421AT | F9421NF | F9421NT | F9420AF | F9420AT | F9420NF | F9420NT |
| | B | F9421BF | F9421BT | F9421PF | F9421PT | F9420BF | F9420BT | F9420PF | F9420PT |
| | C | F9421CF | F9421CT | F9421QF | F9421QT | F9420CF | F9420CT | F9420QF | F9420QT |
| | D | F9421DF | F9421DT | F9421RF | F9421RT | F9420DF | F9420DT | F9420RF | F9420RT |

*1: Silicone oil filled capsule (Standard)
*2: Fluorinated oil filled capsule (for oil-prohibited use: Optional code /K2)

# REVISION RECORD

Title: Model EJA510A and EJA530A Absolute Pressure and Gauge Pressure Transmitter

Manual No.: IM 01C21F01-01E

| Edition | Date | Page | Revised Item |
|---|---|---|---|
| 1st | June 1999 | – | New publication |
| 2nd | June 2000 | CONTENTS | Page 3 • Add REVISION RECORD. |
| | | 2-8 | 2.9.4 b. • Add maximum process temperature of –40 to 75°C for KEMA Flameproof type T6.<br>• Change wating period when opening terminal cover after power off from 1 min. to 10 min.<br>• Add note for using heat-resisting cables. |
| | | 8-4 | 8.3.1 • Add footnote *2 for amp. damping time constant when Optional code /F1 is specified. |
| | | 8-5 | • Add footnote *3 for low side output status at failure alarm when Optional code /F1 is specified. |
| | | 10-4 | 10.3 • Change explosion protected type Optional code from /□□1 to /□□11.<br>• Add maximum process temperature of –40 to 75°C for KEMA Flameproof type T6. |
| | | 10-5 | • Add Optional code /F1 and /N4. |
| | | CMPL | CMPL 1C21F1-01E 1st ⇒ 2nd<br>Page 2 • Change Part No. on Item 7, CPU Assembly.<br>F9342BP ⇒ F9342AB<br>F9342BQ ⇒ F9342AL<br>• Add Part No. on Item 7, CPU Assembly.<br>F9342AF for BRAIN protocol, Optional code /F1<br>F9342AM for HART protocol, Optional code /F1 |
| 3rd | Aug. 2001 | – | • Style change from S1 to S2. |
| | | 2-8 | 2.10 • Change EMC Conformity number. |
| | | 8-4, 8-5 | 8.3.1 • Add footnote (*4) to B40, Maximum static pressure in Parameter Summary. |
| | | 10-1 | 10.1 • Change Maximum Over pressure for Capsule code A from 400 kPa to 4 MPa. |
| | | 10-4 | 10.3 • Change explosion protected type Optional code from /□□11 to /□□1. |
| | | 10-6 | 10.4 • Change dimensions. |
| | | CMPL | CMPL 1C21F1-01E 2nd ⇒ CMPL 01C21F01-01E 3rd<br>• Change Part No. on Item 15, Capsule Assembly and followings.<br>• Item 17; F9374MS ⇒ F9385XK, F9385XM<br>• Item 18; F9374MU ⇒ F9385XL<br>• Item 19; F9374NZ ⇒ F9385XZ<br>• Item 20; F9374MX ⇒ F9385XV, F9374NX ⇒ F9385XT, F9374MW ⇒ F9385XU<br>• Item 23; F9374MY ⇒ F9385XW<br>• Item 24; F9374NY ⇒ F9385XY |
| 4th | May 2002 | 1-2 | 1.1 • Add "1.1 For Safety Using." |
| | | 2-7 | 2.9.4 • Add descriptions based on ATEX directive. |
| | | 10-4 | 10.3 • Add Optional code K□2. |
| | | 10-5 | • Add Optional code C2 and C3. |
| 5th | Apr. 2003 | 2-8 | 2.9.4 • Add Option code KU2 |
| | | 2-10 | 2.11 • Add PED (Pressure Equipment Directive) |
| | | 10-3 | 10.2 • Add Output Signal code F. |
| | | 10-4 | 10.3 • Add Option code KU2. |
| | | 10-5 | 10.3 • Add Option code HAC and PE3. |
| | | CMPL | CMPL 01C21F01-01E 3rd ⇒ 4th<br>• Add part No. on Item 7-2, CPU Assembly for fieldbus protocol. |

REVISION RECORD.EPS



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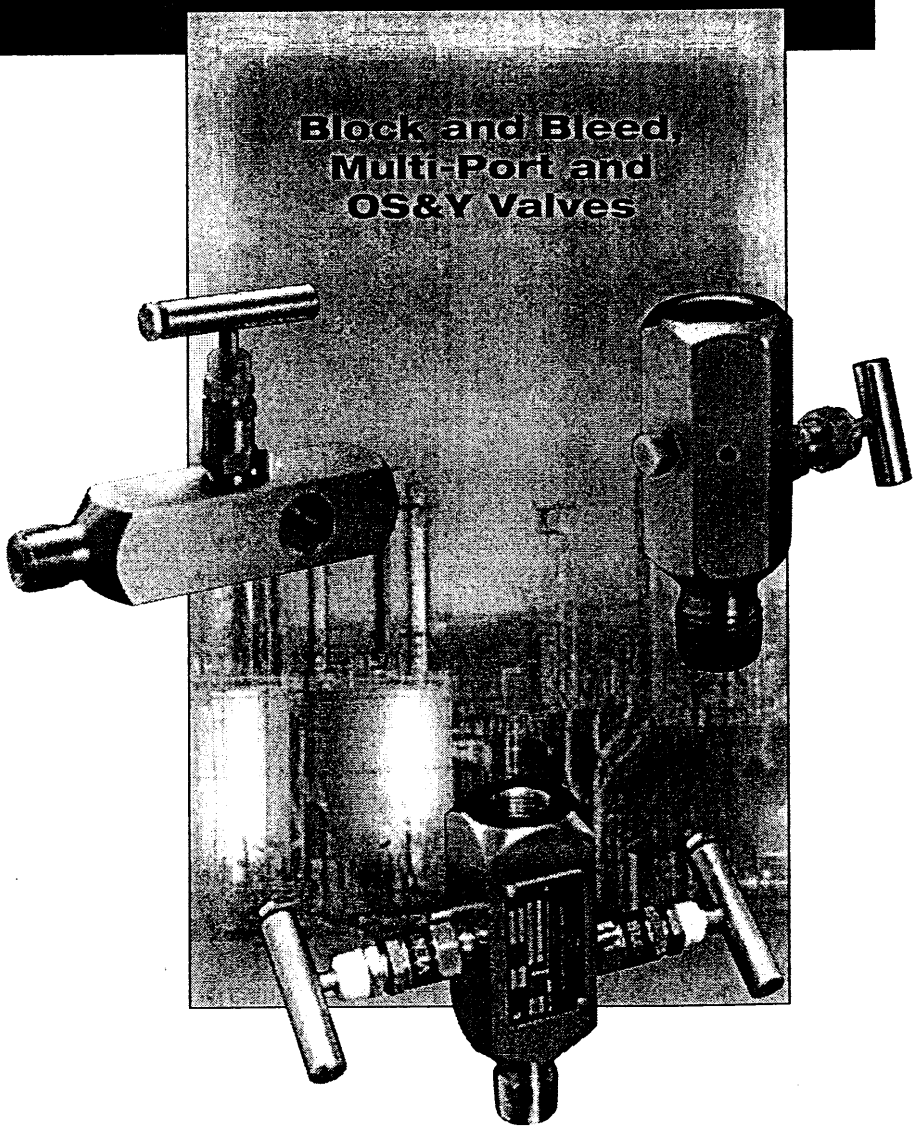
# Anderson Greenwood Instrumentation Products - Gauge Valves

*Total Flow Control Solutions™*




tyco / Flow Control

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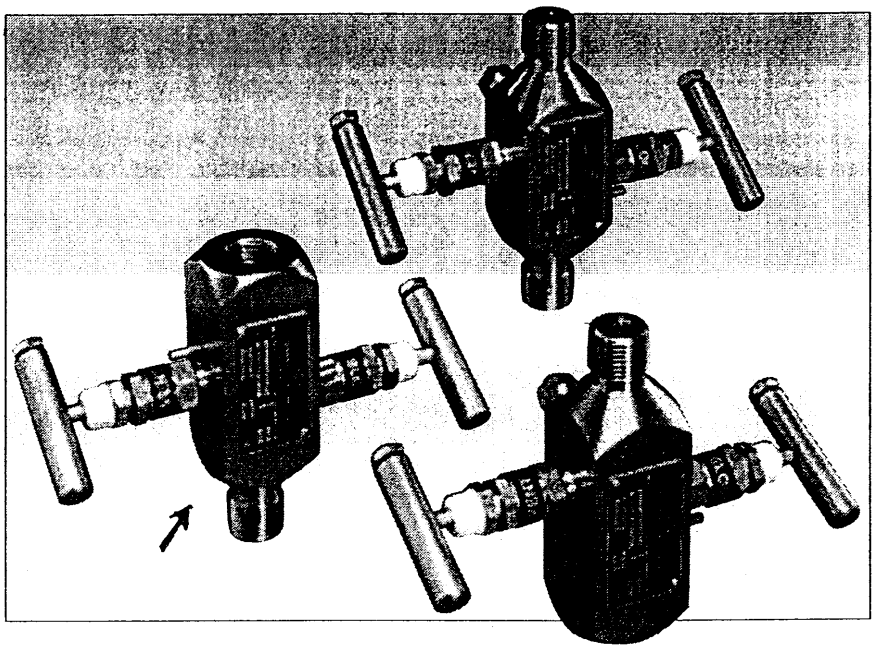
# Block and Bleed Gauge Valves – M25 and M251

## Product Overview

The M25 and M251 are two-valve single outlet gauge valves that combine isolating, calibrating, and venting facilities in a single compact unit. These valves enable gauges, pressure transmitters, or switches to be reliably installed and serviced, by reducing potential leak points.

The vent port is threaded 1/4-inch NPT on all valves and is fitted with a plug. This facilitates installation of exhaust piping/tubing on hazardous services, which in turn contributes to operator safety.



## Features and Benefits

- **Compact design** requires minimum space for operation and installation. Lower valve weight increases strength at the process connection and reduces gauge whip.
- **Cost savings** from reduced number of components required for instrument installation, also decreases possible leak points.
- **Easy instrument check calibration** using 1/4-inch FNPT vent/test port.
- **Ball end stem** eliminates seat galling, provides bubble-tight shutoff and long life. The hardened, non-rotating ball ensures perfect alignment closure.
- **Packing below threads** prevents lubricant washout, thread corrosion, and keeps solids from entering the thread area, which can cause galling. It also prevents process contamination.
- **Adjustable packing** adjusts easily – loosen jam nut, tighten bushing slightly, then retighten jam nut. Decreases packing replacement downtime and increases valve life.
- **Safety back seating** prevents stem blowout or accidental removal while in operation and provides a metal-to-metal secondary stem seal while in the full open position.
- **Dust cover** prevents lubricant washout and keeps contaminants (dirt, rain, etc.) out of bonnet assembly.
- **Panel mount** (optional) affords opportunity to use high quality products in racks or panels.
- **Chrome plating of 316 SS** prevents galling or freezing of stem threads when similar metals mate. CS valves use a 303 SS stem.
- **Rolled threads** provide additional thread strength. The stem, bonnet, and male NPT threads are rolled, not cut.
- **Mirror stem finish** burnished to a 16 RMS finish in the packing area enables smooth stem operation and extends packing life.
- **Body-to-bonnet seal** is metal-to-metal in constant compression, isolating the bonnet threads from process fluid corrosion. Eliminates possible tensile breakage of bonnet, and gives a reliable seal point.
- **Bonnet lock pin** is another safety feature which prevents the accidental separation of the bonnet from the body. However, normal valve maintenance and repair are still easily accomplished.

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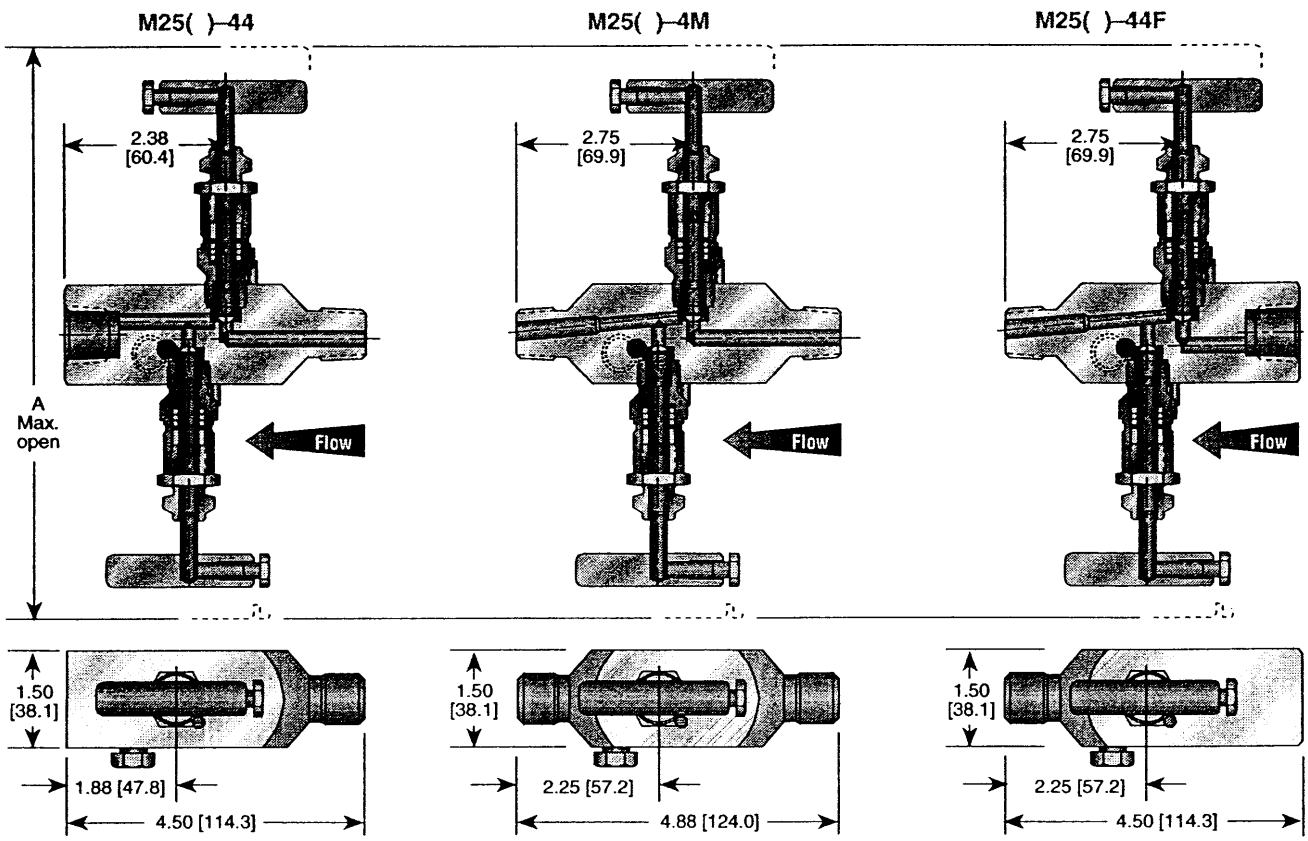
# Block and Bleed Gauge Valves – M25 and M251 Specifications

## Dimensions, inches [mm]




## Standard Materials

| Valve | Body | Bonnet | Stem | Ball | Packing |
|---|---|---|---|---|---|
| CS[1] | A105 CS | A108 CS | A581-303 SS | 17-4 PH | Teflon® |
| CS[1] | A105 CS | A105 CS | A581-303 SS | 17-4 PH | GRAFOIL® Low Emissions Graphite |
| SS | A479-316 SS | A479-316 SS | A276-316 SS | 316 SS | Teflon® |
| SS | A479-316 SS | A479-316 SS | A276-316 SS | 316 SS | GRAFOIL® Low Emissions Graphite |
| SG[2] | A479-316 SS | A479-316 SS | Monel® 400 | Monel® K500 | Teflon® |
| SG[2] | A479-316 SS | A479-316 SS | Monel® 400 | Monel® K500 | GRAFOIL® Low Emissions Graphite |
| SG3[3] | Hastelloy® C-276 | Hastelloy® C-276 | Hastelloy® C-276 | Stellite | Teflon® |
| SG3[3] | Hastelloy® C-276 | Hastelloy® C-276 | Hastelloy® C-276 | Monel® | GRAFOIL® Low Emissions Graphite |

## Pressure and Temperature Ratings

**Teflon® Packing**

| | | |
|---|---|---|
| CS, SS, SG SG3 | 6000 psig @ 200°F [414 barg @ 93°C] | 4000 psig @ 500°F [276 barg @ 260°C] |

**GRAFOIL® and Low Emissions Graphite Packing**

| | | |
|---|---|---|
| CS, SS, SG SG3 | 6000 psig @ 200°F [414 barg @ 93°C] | 1500 psig @ 850°F [103 barg @ 454°C] |
| SS, SG SG3 | 6000 psig @ 200°F [414 barg @ 93°C] | 1500 psig @ 1000°F [103 barg @ 538°C] |

## Notes

1. CS is zinc-cobalt plated to prevent corrosion.
2. SG (Sour Gas) meets the requirements of NACE MR0175-2002.
3. SG3 (Sour Gas) meets the requirements of NACE MR0175-2003.

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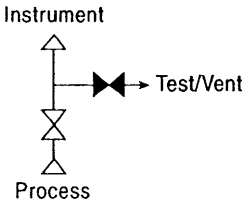
# Block and Bleed Gauge Valves – M25 and M251 Specifications

## Dimensions, inches [mm]

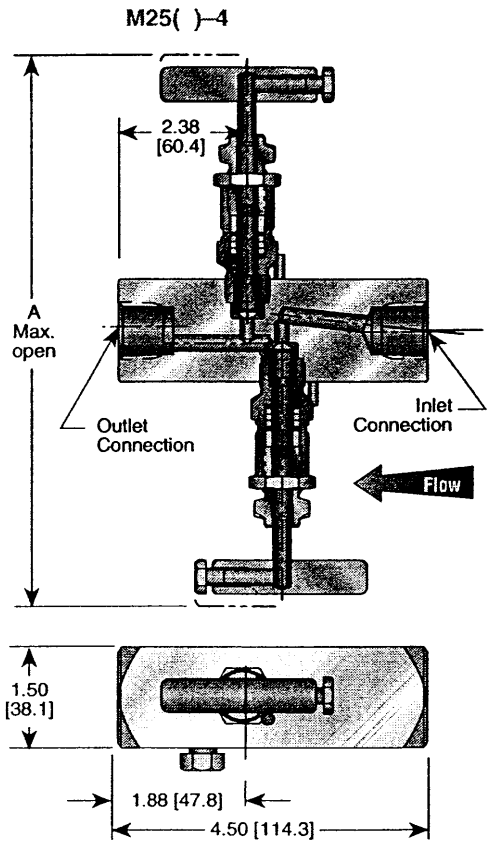
| Packing | A |
|---|---|
| Low Emissions (E) GRAFOIL® (H) | 8.14 [206.8] |
| Teflon® (V) M251 only | 6.84 [173.7] |

## Notes

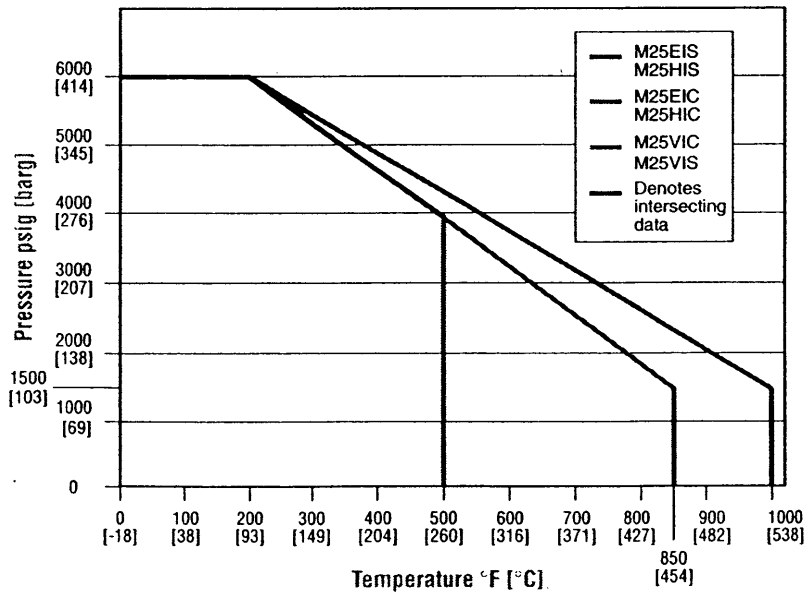
1. Approximate valve weight M25( )–44 and M25( )–44F 3.6 lb [1.63 kg]. M25( )–4M 3.8 lb [1.72 kg]. Valve $C_v$ 0.52 maximum.
2. M25( )–4 body length 4.5-inch [114.3].
3. For Hastelloy® and SG3 call factory for dimensions and weights.



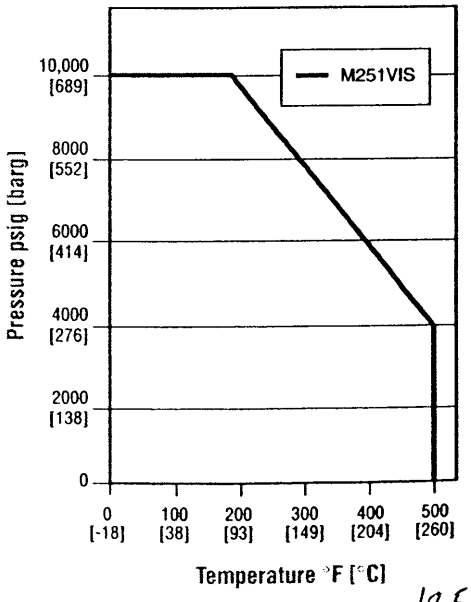

## Dimensions, inches [mm]




## Pressure vs. Temperature – M25




## Pressure vs. Temperature – M251

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# Block and Bleed Gauge Valves – M25 and M251 Specifications

## Ordering Information

M25 V I S – 44C – SG

### Model Number

M25, (M251)

### Packing

(V) – Teflon®
H – GRAFOIL®
E – Low Emissions Graphite

### Seat Material

(I) – Integral

### Body Material[1]

C – CS
(S) – 316 SS
M – Monel®
J – Hastelloy®

### Connections (Inlet/Outlet)[2]

4M – 1/2-inch MNPT x 1/2-inch MNPT
(44) – 1/2-inch MNPT x 1/2-inch FNPT
44F – 1/2-inch FNPT x 1/2-inch MNPT
46 – 3/4-inch MNPT x 1/2-inch FNPT
4 – 1/2-inch FNPT x 1/2-inch FNPT (body length 4.5-inch [114.5 mm])

C – Male plain end (CS is black oxide coated)

### Options

(BL) – Bonnet Lock Device (patent protected)
CLC – Chlorine Cleaning
HD – Hydrostatic Testing (100%)(MSS-SP-61)
OC – Oxygen Cleaning
SG – Sour Gas meets the requirements of NACE MR0175-2002 (SS only)
SP – Special Requirements - please specify
AM – AGCO Mount
SG3 – Sour Gas meets the requirements of NACE MR0175-2003

### Notes

1. For other body materials, consult factory.
2. Consult factory for other optional connections.

REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT
✓
REVISE & RESUBMIT
REJECTED
DATE Nov 7/05 BY DC
EARTH TECH (CANADA) INC.

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# Chapter 19 PLANT FLOW TRANSMITTER

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## 19.1 MAGNETIC FLOW METER

### 19.1.1 AXFA14C-E2-21/CF1/SCT "REMOTE HEAD"

### 19.1.2 19.2 #AXF150C-E2AL1-CA11-21B/CF1 "FLOW TUBE"

**END OF CHAPTER 19**

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ADMAG AXF
DATE Nov7/05 BY Oc
EARTH TECH (CANADA) INC.

# General Specifications

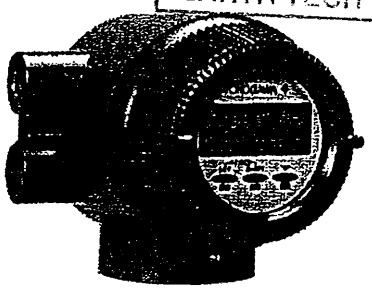
GS 01E20C02-01E-A

## AXFA14 Magnetic Converter for Remote Flowtube

*The AXFA14 magnetic converter has been developed based on Yokogawa's decades long experience in magnetic flowmeters. The AXFA14 continues the tradition of high quality and reliability that has become synonymous with the Yokogawa name and in addition features an even higher level of performance and increased functionality.*

*Retaining all the features and functions of the Admag series of converters, in addition the AXFA14 offers an enhanced dual frequency excitation method as an option for difficult applications as well as new diagnostics to detect electrode coating. Combined with a flowtube utilizing the optional replaceable electrode design, the user benefits through the ability to schedule maintenance for reduced process downtime and in turn a lower total cost of ownership.*

Note: The "Dual Frequency Excitation Method" is Yokogawa's unique technology.



AXFA14C-E2-21/CF1/SC1

## ■ FEATURES

**• Optional enhanced dual frequency excitation method**

The user can select a 165 Hz high frequency component for very high concentration slurries to ensure greater stability and quicker response.

**• Minimum fluid conductivity of 1 μS/cm**

With the newly designed AXF flow converter, improvements to the input circuit now permit the measurement of fluids with conductivity as low as 1μS/cm.

**• Diagnostics to detect insulating coatings on the electrodes**

By constantly monitoring the change in the impedance of the electrode circuit due to the build-up of insulating coatings, the AXF converter will display 4 different levels of coating and provide an alarm function.

**• Improved accuracy specification**

The standard performance specification for AXF is 0.35% of reading. Also available is an optional high accuracy calibration rated at 0.2% of reading.

**• Three line display with infrared switches**

The LCD indicator employs a large, backlit, full dot matrix display. One to three lines are available and these can be programmed to indicate a wide variety of display possibilities, including a bar graph for flow rate indication and a graphical representation of the extent to which the electrodes may be coating. Infrared switches permit programming through the glass without the need to open the enclosure cover.

**• High speed pulse output**

The pulse output can be programmed up to 10,000 pulses/second for high-speed applications such as short batch processes.

**• "Easy Setup" Parameters**

The most frequently used parameters are arranged in one location for easy, quick access.

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## ■ STANDARD SPECIFICATIONS

**Excitation Method**
- Standard dual frequency excitation:
  Size 2.5 to 400 mm (0.1 to 16 in.)
  Combined with AXF Remote Flowtube
- Enhanced dual frequency excitation:
  Size 25 to 200 mm (1.0 to 8.0 in.)
  Combined with AXF Remote Flowtube
  (Option code HF2)

**Input Signal:**
One Status Input: Dry contact
Load resistance: 200 Ω or less (ON), 100 kΩ or more (OFF)

**Output Signals(*1):**
- One Current Output: 4 to 20 mA DC (load resistance: 0 to 750 Ω, including cable resistance)
- One Pulse Output (*1):
  Transistor contact output (open collector)
  Contact capacity: 30 V DC (OFF), 200 mA (ON)
  Output rate 0.0001 to 10,000 pps (pulse/second)
- One Alarm Output (*1):
  Transistor contact output (open collector)
  Contact capacity: 30 V DC (OFF), 200 mA (ON)
- Two Status Outputs (*1):
  Transistor contact output (open collector)
  Contact capacity: 30 V DC (OFF), 200 mA (ON)

**Communication Signals:**
BRAIN or HART communication signal
(Superimposed on the 4 to 20 mA DC signal)

**Communication Line Conditions:**
Load resistance: 250 to 600 Ω (including cable resistance)
Distance from power line: 15 cm (6 in.) or more (Parallel wiring should be avoided.)

**BRAIN:**

**Communication Distance:**
Up to 2 km (1.25 miles), when polyethylene insulated PVC-sheathed cables (CEV cables) are used.
Communication distance varies depending on the type of cable and wiring used.

**Load Capacitance:** 0.22 µF or less

**Load Inductance:** 3.3 mH or less

**Input Impedance of Communicating Device:**
10 kΩ or more (at 24 kHz)

**HART:**

**Communication Distance:**
Up to 1.5 km (0.9 mile), when using multiple twisted pair cables. Communication distance varies depending on the type of cable used.

Note 1: See "Terminal Wiring" on page 6 for possible input/output combinations.

**Cable Length for Specific Applications:**
Use the following formula to determine the cable length for specific applications:

$$L = \frac{65\times10^6}{(R\times C)} - \frac{(Cf+10{,}000)}{C}$$

where:
L = length in meters or feet
R = resistance in Ω (including barrier resistance)
C = cable capacitance in pF/m or pF/ft
Cf = maximum shunt capacitance of receiving devices in pF/m or pF/ft

Note: HART is a registered trademark of the HART Communication Foundation.

**Data Security During Power Failure:**
Data (parameters, totalizer value, etc.) storage by EEPROM. No back-up battery required.

**Indicator:**
Full dot-matrix LCD (32×132 pixels)

**Lightning Protector:**
A lightning protector is built into the excitation current output, the current output, pulse/alarm/status input and output terminals. If option code A is selected, the lightning protector is built into the power terminals.

**Protection:**
IP67, NEMA4X

**Coating:**
Case and Cover: Polyurethane corrosion-resistant
Coating Color: Mint green (Munsell 5.6 BG 3.3/2.9 or its equivalent)

**Converter Material:**
Case and Cover: Aluminum alloy

**Mounting: 2 inch pipe**

**Electrical Connection:**
ANSI 1/2 NPT female

**Terminal Connection:**
M4 size screw terminal

**Grounding:**
Grounding resistance 100 Ω or less
When option code A is selected, Class C grounding (grounding resistance 10 Ω or less) shall be applied.
* In case of explosion proof type, the protective grounding must be connected to a suitable IS grounding system.

**Converter Interchange:**
In instances where the AXFA14 converter has been paired with a remote AXF flowtube and the converter is changed to the AXFA11 converter, a flow calibration must be performed to arrive at the meter factors for the new combination.

## Functions

**How to Set Parameters:**
The indicator's LCD and three infra-red switches enable users to set parameters without opening the case cover. Parameters can also be set by means of the HHT.

**Displayed Languages:**
English or Japanese.
German, French, Italian, Spanish are under development.

**Instantaneous Flow Rate/Totalized Value Display Functions (for models with an indicator):**
The full dot-matrix LCD enables user selection of displays from one line to three lines for:
- Instantaneous flow rate
- Instantaneous flow rate (%)
- Instantaneous flow rate (bar graph)
- Current output value (mA)
- Totalized value
- Tag No.
- Results of electrode coating diagnostics

**Totalizer Display Function:**
For forward/reverse ranges, the totalized values of the flow direction (forward or reverse) and the flow rate are displayed on the indicator together with the units. The difference values between the forward and reverse flow rate totalized values can be displayed. The reverse flow rate is not counted for a forward single range.

**Damping Time Constant:**
Time constant can be set from 0.1 second to 200.0 seconds (63% response).

**Span Setting Function:**
Span flows can be set in units such as volume flow rate, mass flow rate, time, or flow rate value. The velocity unit can also be set.
Volume Flow Rate Unit: kcf, cf, mcf, Mgal (US), kgal (US), gal (US), mgal (US), kbbl (US)*, bbl (US)*, mbbl (US)*, µbbl (US)*, Ml (megaliter), $m^3$, kl (kiloliter), l (liter), $cm^3$
Mass Flow Rate Unit (Density must be set.): klb (US), lb (US), t (ton), kg, g
Velocity Unit: ft, m (meter)
Time Unit: s (sec), min, h (hour), d (day)
* "US Oil" or "US Beer" can be selected

**Pulse Output:**
Scaled pulse can be output by setting a pulse weight.
Pulse Width: Duty 50% or fixed pulse width (0.05, 0.1, 0.5, 1, 20, 33, 50, 100 ms) can be selected.
Output Rate: 0.0001 to 10,000 pps (pulse/second)

**Multi-range Function:**
Status input enables the switching of up to two ranges. For automatic range switching, the status of up to four ranges can be shown via status outputs and on the indicator.

**Forward and Reverse Flow Measurement Functions:**
Flows in both forward and reverse directions can be measured. The status is shown via status outputs and on the indicator during the reverse flow measurement.

**Totalization Switch:**
If a totalized value becomes equal to or greater than the set value, a status output is generated..

**Preset Totalization:**
A parameter setting or status input enables a totalized value to be reset to a preset value or zero.

**0% Signal Lock:**
Status input fixes the instantaneous flow rate display, current output, pulse output, and flow rate totalization to 0%.

**Alarm Selection Function:**
Alarms are classified into System Alarms (hard failures), Process Alarms (such as 'Empty Pipe', 'Signal Overflow' and 'Coating Alarm'), Setting Alarms, and Warnings. Whether alarms should be generated or not can be selected for each item. The current output generated for an alarm can be selected from among 2.4 mA or less, fixed to 4 mA, 21.6 mA or more, or HOLD.

**Alarm Output:**
Alarms are generated only for the items selected via the 'Alarm Selection Function' if relevant failures occur.

**Self Diagnostics Functions:**
If alarms are generated, details of the System Alarms, Process Alarms, Setting Alarms and Warnings are displayed together with descriptions of countermeasures.

**Flow Upper/Lower Limit Alarms:**
If a flow rate is greater or smaller than the set value, this alarm is generated. In addition, two upper limits (H, HH) and two lower limits (L, LL) can be set.
If a flow rate is greater or smaller than any of the set values, the status is output.

**Electrode Coating Diagnostics Function:**
This function enables monitoring of the coating of insulating substances on the electrodes. Depending on the status, users are notified by a warning or an alarm via status outputs. If replaceable electrodes are used, they can be removed and cleaned if coating occurs.

## ■ HAZARDOUS AREA CLASSIFICATION

**FM:**

Explosion proof for Class I, Division 1, Groups A, B, C & D.
Dust-ignition proof for Class II/III, Division 1, Groups E, F & G.
"SEAL ALL CONDUITS WITHIN 18 INCHES"
"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"
Excitation Circuit: 140V max
Enclosure: NEMA 4X
Temp. Code: T6
Ambient Temp.: –40°C to +60°C (–40°F to +140°F)
Note: Installation shall be in accordance with the manufacturer's instructions and National Electric code, ANSI/NFPA-70.

**CSA:**

**For CSA C22.2 Series**

Explosion proof for Class I, Division 1, Group A, B, C, & D.
Dust-ignition proof for Class II/III, Division 1, Group E, F & G.
"SEAL ALL CONDUITS WITHIN 50 cm OF THE ENCLOSURE"
"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"

**For CSA E79 Series**

Flame proof for Zone 1, Ex d IIC T6

Excitation Circuit: 140V max
Enclosure: Type 4X, IP66, IP67
Temp. Code: T6
Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

## ■ STANDARD PERFORMANCE

**Reference Conditions:**

Similar to BS EN 29104 (1993); ISO9104 (1991)

- Fluid temperature: +10°C to +30°C (+50°F to +86°F)
- Ambient temperature: +20°C to +30°C (+68°F to +86°F)
- Warm-up time: 30 min
- Straight runs
  Upstream > 10 × DN
  Downstream > 5 × DN
- Properly grounded
- Properly centered

**Accuracy (Combined with AXF Remote Flowtube at reference conditions)**

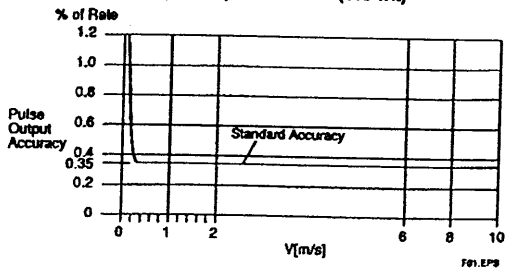
**Pulse Output:**

**PFA/Ceramics Lining:**

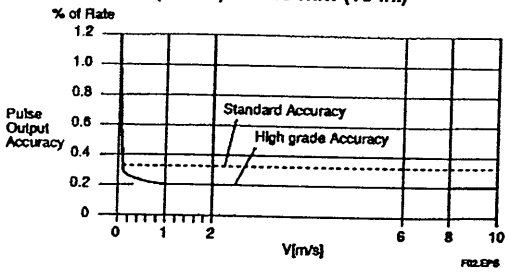
| Size mm (in.) | Flow Velocity V m/s (ft/s) | Standard Accuracy (Calibration code B) | Flow Velocity V m/s (ft/s) | High grade Accuracy (Calibration code C) |
|---|---|---|---|---|
| 2.5 (0.1) to 15 (0.5) | V < 0.3 (1) | 1.0 mm/s | — | |
| | 0.3 ≦ V ≦ 10 (1) (33) | 0.35% of Rate | | |
| 25 (1.0) to 200 (8.0) | V < 0.15 (0.5) | 0.5 mm/s | V < 0.15 (0.5) | 0.5 mm/s |
| | 0.15 ≦ V ≦ 10 (0.5) (33) | 0.35% of Rate | 0.15 ≦ V < 1 (0.5) (3.3) | 0.18% of Rate + 0.2mm/s |
| | | | 1 ≦ V ≦ 10 | 0.2% of Rate |
| 250 (10) to 400 (16) | V < 0.15 (0.5) | 0.5 mm/s | — | |
| | 0.15 ≦ V ≦ 10 (0.5) (33) | 0.35% of Rate | | |

T01.EPS

**Size 2.5 mm (0.1 in.) to 15 mm (0.5 in.)**




**Size 25 mm (1.0 in.) to 400 mm (16 in.)**

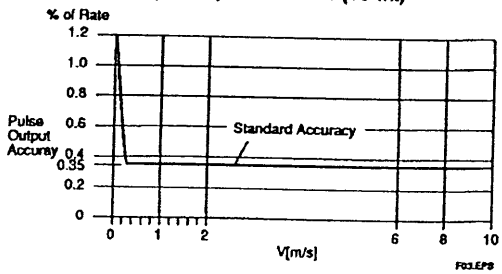



**Polyurethane Lining**

| Size mm (in.) | Flow Velocity V m/s (ft/s) | Standard Accuracy (Calibration code B) |
|---|---|---|
| 25 (1.0) to 400 (16) | V < 0.3 (1.0) | 1.0 mm/s |
| | 0.3 ≦ V ≦ 10 (1.0) (33) | 0.35% of Rate |

T02.EPS

**Size 25 mm (1.0 in.) to 400 mm (16 in.)**



**Enhanced dual frequency excitation (Combined with AXF Remote Flowtube Optional code HF2):**
Standard Accuracy +1 mm/s

**Current Output:** Plus 0.05% of Span

**Repeatability:**
0.1% of Rate (V ≥ 1 m/s (3.3 ft/s))
0.05% of Rate + 0.5 mm/s (V < 1 m/s (3.3 ft/s))

**Maximum Power Consumption:**
Combined with AXF Remote Flowtube: 12 W

**Insulation Resistance (*1):**
100 MΩ between power terminals and ground terminal at 500 V DC
100 MΩ between power terminals and each output/status input terminal at 500 V DC
20 MΩ between ground terminal and each output/status input terminal at 100 V DC
20 MΩ between output/status input terminals at 100 V DC

**Withstand Voltage (*1):**
1350 V AC between power terminals and ground terminal for two seconds
160 V AC between excitation terminals and ground terminal for two seconds
200 V AC between excitation terminals and each output/status input terminal for two seconds

**⚠ CAUTION**

*1: Before performing the Insulation Resistance Test or the Voltage Breakdown Test, disconnect the ground terminal if the power terminal has a lightning protector (option code A). Following the relevant test, wait for more than 10 seconds after the power supply has been turned off before removing the cover. After testing, be sure to use a resistance for discharge and return the short bar to its correct position. Screws must be tightened to a torque of 1.18 N-m or more. After closing the cover, the power supply can be restored.

**Safety Requirement Standards:**
EN61010
- Altitude at installation site: Max. 2000 m above sea level
- Installation category based on IEC1010:
  Overvoltage category II ("II" applies to electrical equipment which is supplied from a fixed installation-like distribution board.)
- Pollution degree based on IEC1010
  Pollution degree 2 ("Pollution degree" describes the degree to which a solid, liquid, or gas which deteriorates dielectric strength or surface resistivity is adhering. "2" applies to a normal indoor atmosphere.)

**EMC Conformity Standards:**
EN61326
EN61000-3-2, EN61000-3-3
AS/NZS 2064

## ■ NORMAL OPERATING CONDITIONS

**Ambient Temperature: –40°C to +60°C (–40°F to +140°F)**
- Indicator's operating range: –20°C to +60°C (–4°F to +140°F)
- Maximum temperature is 50°C for Power Supply Code 2.

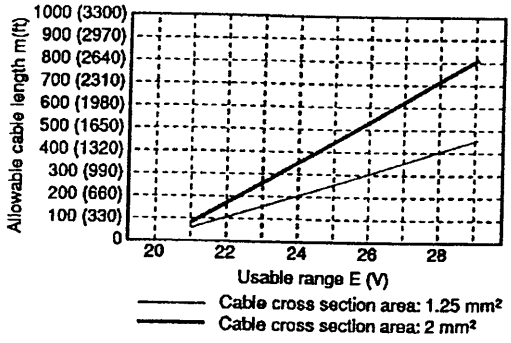
**Ambient Humidity: 0 to 100%**
Lengthy continuous operation at 95% or more is not recommended.

**Power Supply**

**Power supply code 1:**
- AC specifications
  Rated power supply: 100 to 240 V AC, 50/60 Hz
  (Operating voltage range: 80 to 264 V AC)
- DC specifications
  Rated power supply: 100 to 120 V DC
  (Operating voltage range: 90 to 130 V DC)

**Power supply code 2:**
- AC specifications
  Rated power supply: 24 V AC, 50/60 Hz
  (Operating voltage range: 20.4 to 28.8 V AC)
- DC specifications
  Rated power supply: 24 V DC
  (Operating voltage range: 20.4 to 28.8 V DC)

**Supplied Power and Cable Length for Power Supply Code 2**




F04.EPS

**Vibration Conditions:**
Level of vibration in conformity with IEC 60068-2-6 (SAMA31. 1-1980)
1 G or less (frequency 500 Hz or less)
Note: Avoid locations with much vibration (with a vibration frequency of 500 Hz or more), which may cause damage to the equipment.

## ■ ACCESSORIES

Fuse (T2.0A, 250 V): 1 pc.
*Time lag fuse
Mounting bracket: 1 set
Hexagonal wrench: 1 pc.

## ■ MODEL AND SUFFIX CODE

**AXFA14 Magnetic Flowmeter Remote Converter:**

| Model | Suffix Code | | Description |
|---|---|---|---|
| AXFA14 | | | Magnetic Flowmeter Remote Converter |
| Use | C | | Explosion proof type For Remote Flowtube of Size 2.5 to 400 mm (0.1 in. to 16 in.) |
| Output Signal and Communication | -D | | 4 to 20 mA DC, BRAIN Communication |
| | -E | | 4 to 20 mA DC, HART Communication |
| Power Supply | 1 | | 100 V to 240 V AC or 100 to 120 V DC |
| | 2 | | 24 V AC/DC |
| Electrical Connection | -2 | | ANSI 1/2 NPT female |
| Indicator (*1) | | 1 | With Indicator (Horizontal) |
| | | 2 | With Indicator (Vertical) |
| | | N | None |
| Option | | / | Optional code (See the Table of Optional Specifications) |

*1: 1 2 N

T03.EPS

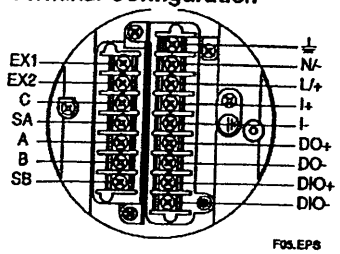
over

**Signal Cable:**

Note:
- The cable is constructed with double shielding over the two conductors, and uses heat-resistant vinyl as the outer covering material.
  Finished diameter: 10.5 mm (0.41 in.)
  Maximum temperature: +80°C (+175°F)
- Not neccessary to order the above cable for submersible type flowtube because the flowtube is wired with 30 m (98 ft) cable.
- Excitation cable is supplied by the customer.

**Recommended Excitation, Power and Output Cable:**
Use polyvinyl chloride insulated and sheathed control cable or Polyvinyl chloride insulated and sheathed portable power cables.
- Outer Diameter: 6.5 to 12 mm (0.26 to 0.47 in.)
- Nominal Cross Section: 0.5 to 2.5 mm²

### ● Terminal Configuration




F05.EPS

### ● Terminal Wiring

| Terminal Symbols | Description |
|---|---|
| EX1 | Excitation current Output |
| EX2 | |
| C | Flow singal input |
| SA | |
| A | |
| B | |
| SB | |

| Terminal Symbols | Description |
|---|---|
| ⏚ | Functional grounding |
| N/– | Power supply |
| L/+ | |
| I+ | Current output 4 to 20mA DC |
| I– | |
| DO+ | Pulse output/ Alarm output/ Status output |
| DO– | |
| DIO+ | Alarm output/ Status output/ Status input |
| DIO– | |
| ⏚ | Protective grounding (Outside of the terminal) |

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## ■ OPTIONAL SPECIFICATIONS FOR AXFA14 REMOTE CONVERTER

o : Available –: Not available

| Item | Specification | | General-Purpose use | Explosion proof | Code |
|---|---|---|---|---|---|
| Lightning Protector | A lightning protector is built into the power terminals. | | o | o | A |
| Burn Out Down | The output level is set to 0 mA during a CPU failure and is set 2.4 mA or less during an alarm. Standard products are delivered with a setting 25 mA during a CPU failure and 21.6 mA or more during an alarm. | | o | o | C1 |
| NAMUR NE43 Compliant | Output signal limits: 3.8 to 20.5 mA | Failure alarm down-scale: Output status at a CPU failure or an alarm is 2.4 mA (–10%) or less. | o | o | C2 |
| | | Failure alarm up-scale. Output status at a CPU failure or an alarm is 21.6 mA (110%) or more. | o | o | C3 |
| Active Pulse Output | Active pulses are output in order to drive an external electromagnetic or electronic counter directly using the converter's internal power supply. (Nullifies the standard transistor contact pulse output.)<br>Output voltage: 24 V DC ±20%<br>Pulse specifications:<br>• At the drive current of 30 to 150 mA<br>Pulse rate: 0.0001 to 2 pps (pulse/second); Pulse width: 20, 33, 50, or 100 ms | | o | o | EM |
| Stainless Steel Mounting Bracket | Provided with a JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) stainless steel mounting bracket in lieu of the standard carbon steel bracket. | | o | o | SB |
| Stainless Steel Tag Plate | Screwed JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) stainless steel tag plate. Choose this option when an SS tag plate is required in addition to the standard nameplate with the tag number inscribed on it. | | o | o | SCT |
| Epoxy Resin Coating | Epoxy resin coating instead of standard polyurethane resin coating. The color is same as standard type. | | o | o | X1 |
| FM Approval | Explosion proof<br>See "HAZARDOUS AREA CLASSIFICATION" | | – | o | FF1 |
| CSA Certification | Explosion proof<br>See "HAZARDOUS AREA CLASSIFICATION" | | – | o | CF1 |

T05.EPS

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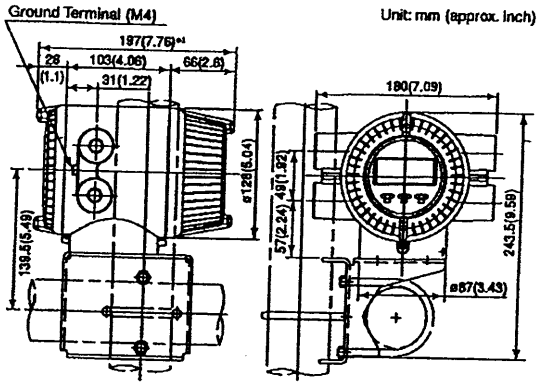
## ■ EXTERNAL DIMENSIONS

### ● Remote Converter AXFA14

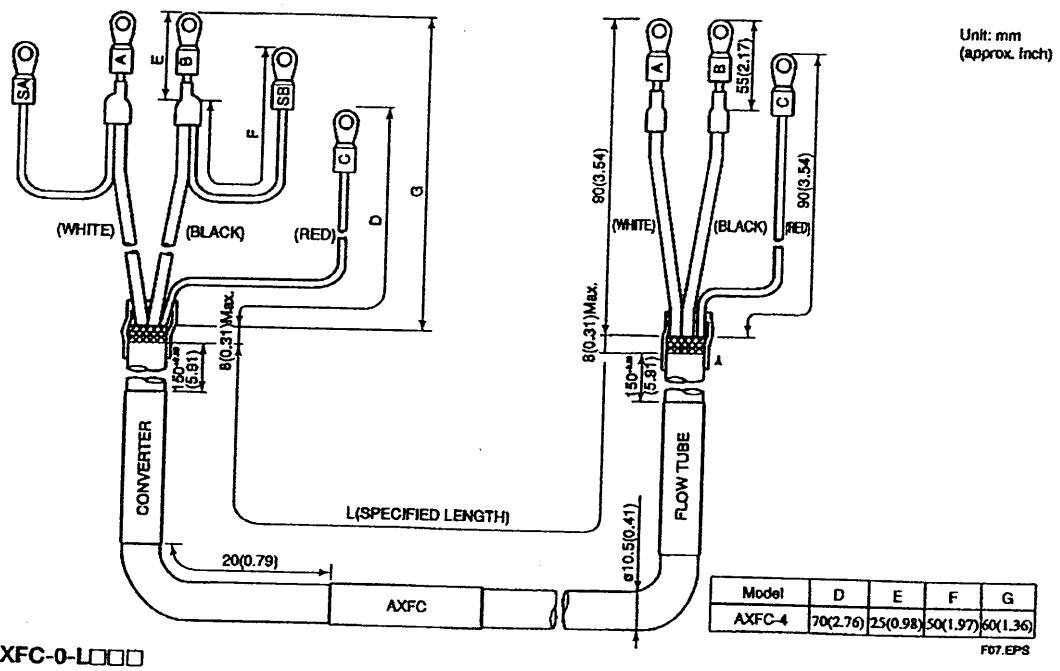



*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
For explosion proof type with indicator, add 5 mm (0.2 inch) to it.

F08.EPS

### ● Dedicated Signal Cable

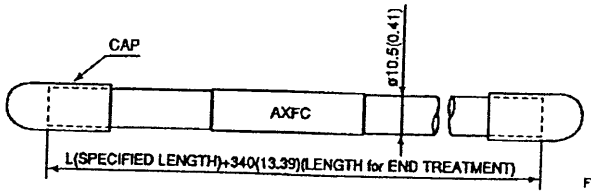
**AXFC-4-L□□□**




| Model | D | E | F | G |
|---|---|---|---|---|
| AXFC-4 | 70(2.76) | 25(0.98) | 50(1.97) | 60(1.36) |

F07.EPS

**AXFC-0-L□□□**




F08.EPS

## ORDERING INFORMATION

Note 1: When ordering a remote flowtube and/or a remote converter, specify the flow span, unit, pulse weight, and totalizer display pulse weight. These parameters will then be set in the combined converter before shipment.

Note 2: Some options, if ordered, require the relevant specifications be supplied.

1. Model, specification and option codes.
2. Tag number

   Each tag number can be specified up to 16 characters in a combination of letters (upper or lower case), numbers, "-" and ".". If specified, the tag number is inscribed on the product's name plate and tag plate (if optional code SCT is selected). For HART protocol, up to 8 characters can be specified.

## Cook, Duncan

**From:** Brian Shypitka [BShypitka@cbeng.com]
**Sent:** Thursday, August 11, 2005 3:24 PM
**To:** duncan.cook@earthtech.ca
**Subject:** Magmeter
**Attachments:** AXFA14GeneralSpecs.pdf

Duncan,

As per our conversation the remote transmitter modle is:

AXFA14C-E2-21/CF1/SCT

I have attached spec for this unit. If you have any questions or concerns feel free to contact us.
Regards,

**Brian Shypitka**
**Applications**
**CB ENGINEERING LTD**
Tel: 403-640-3132
Fax: 403-259-3377
Toll Free: 800-992-2364
Toll Free Fax: 888-259-1666
bshypitka@cbeng.com
***www.cbeng.com***
<<AXFA14GeneralSpecs.pdf>>

User's Manual

# AXFA14G/C
# Magnetic Flowmeter Remote Converter
# [Hardware Edition/Software Edition]

ADMAG AXF™

# AXF
# Magnetic Flowmeter
# Integral Flowmeter
# [Software Edition]

IM 01E20C02-01E

CITY OF IQUALUIT
C/O WASTE WATER TREAT.PLANT
C/O POTABLE WATER PLANT
P.O.BOX 460, IQUALUIT,
NUNAVUT, XOA OHO

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YOKOGAWA ◆
Yokogawa Electric Corporation

IM 01E20C02-01E
5th Edition

19.1.1

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# 1. INTRODUCTION

This instrument has been adjusted at the factory before shipment.

To ensure correct use of the instrument, please read this manual thoroughly and fully understand how to operate the instrument before operating it.

**NOTE**

This manual describes the hardware and software configurations of the AXFA14 converter and the software configuration of the AXF integral flowmeter.

The contents of "basic operating procedures", "parameter description", "operation via BRAIN terminal (BT200)", "operation via HART communicator", and "actual operation" for the AXF integral flowmeter are the same as the AXFA14, see Chapter 5 to 9 in this manual.
For the hardware configuration of the AXF integral flowmeter, see the user's manual of the AXF Integral Flowmeter/Remote Flowtube [Hardware Edition] (IM 01E20D01-01E).

## ■ Regarding This User's Manual

- This manual should be provided to the end user.
- Before use, read this manual thoroughly to comprehend its contents.
- The contents of this manual may be changed without prior notice.
- All rights are reserved. No part of this manual may be reproduced in any form without Yokogawa's written permission.
- Yokogawa makes no warranty of any kind with regard to this material, including, but not limited to, implied warranties of merchantability and suitability for a particular purpose.
- All reasonable effort has been made to ensure the accuracy of the contents of this manual. However, if any errors or omissions are found, please inform Yokogawa.
- Yokogawa assumes no responsibilities for this product except as stated in the warranty.
- Please note that this user's manual may not be revised for any specification changes, construction changes or operating part changes that are not considered to affect function or performance.
- If the customer or any third party is harmed by the use of this product, Yokogawa assumes no responsibility for any such harm owing to any defects in the product which were not predictable, or for any indirect damages.

**NOTE**

Please refer to manual IM 01E20D01-01E for information of the AXF Remote Flowtube.

## ■ Safety and Modification Precautions

- The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Yokogawa assumes no liability for the customer's failure to comply with these requirements. If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.
- Yokogawa will not be liable for malfunctions or damage resulting from any modification made to this instrument by the customer.
- The following safety symbol marks are used in this user's manual and instrument.

**WARNING**

A WARNING sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death of personnel.

**CAUTION**

A CAUTION sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

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# INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAME PROOF EQUIPMENT

Apparatus Certified Under Technical Criteria
(IEC-compatible Standards)

## 1. General

The following describes precautions on electrical apparatus of flameproof construction (hereinafter referred to as flameproof apparatus) in explosion-protected apparatus.

Following the Labour Safety and Health Laws of Japan, flameproof apparatus is subjected to type tests to meet either the technical criteria for explosionproof electrical machinery and equipment (standards notification no. 556 from the Japanese Ministry of Labour) (hereinafter referred to as technical criteria), in conformity with the IEC Standards, or the "Recommended Practice for Explosion-Protected Electrical Installations in General Industries," published in 1979. These certified apparatus can be used in hazardous locations where explosive or inflammable gases or vapours may be present.

Certified apparatus includes a certification label and an equipment nameplate with the specifications necessary for explosion requirements as well as precautions on explosion protection. Please confirm these precautionary items and use them to meet specification requirements.

For electrical wiring and maintenance servicing, please refer to "Internal Wiring Rules" in the Electrical Installation Technical Standards as well as "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.

To meet flameproof requirements, equipment that can be termed "flameproof" must:

(1) Be certified by a Japanese public authority in accordance with the Labour Safety and Health Laws of Japan and have a certification label in an appropriate location on its case, and
(2) Be used in compliance with the specifications marked on its certification label, equipment nameplate and precautionary information furnished.

## 2. Electrical Apparatus of Flameproof Type of Explosion-Protected Construction

Electrical apparatus which is of flameproof construction is subjected to a type test and certified by the Japanese Ministry of Labour aiming at preventing explosion caused by electrical apparatus in a factory or any location where inflammable gases or vapours may be present. The flameproof construction is of completely enclosed type and its enclosure shall endure explosive pressures in cases where explosive gases or vapours entering the enclosure cause explosion. In addition, the enclosure construction shall be such that flame caused by explosion does not ignite gases or vapours outside the enclosure.

In this manual, the word "flameproof" is applied to the flameproof equipment combined with the types of protection "e", "o", "i", and "d" as well as flameproof equipment.

## 3. Terminology

### (1) Enclosure

An outer shell of an electrical apparatus, which encloses live parts and thus is needed to configure explosion-protected construction.

### (2) Shroud

A component part which is so designed that the fastening of joint surfaces cannot be loosened unless a special tool is used.

### (3) Enclosure internal volume

This is indicated by:— the total internal volume of the flameproof enclosure minus the volume of the internal components essential to equipment functions.

### (4) Path length of joint surface

On a joint surface, the length of the shortest path through which flame flows from the inside to outside of the flameproof enclosure. This definition cannot be applied to threaded joints.

### (5) Gaps between joint surfaces

The physical distance between two mating surfaces, or differences in diameters if the mating surfaces are cylindrical.

Note: The permissible sizes of gaps between joint surfaces, the path length of a joint surface and the number of joint threads are determined by such factors as the enclosure's internal volume, joint and mating surface construction, and the explosion classification of the specified gases and vapours.

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# 4. Installation of Flameproof Apparatus

## (1) Installation Area

Flameproof apparatus may be installed, in accordance with applicable gases, in a hazardous area in Zone 1 or 2, where the specified gases are present. Those apparatus shall not be installed in a hazardous area in Zone 0.

Note: Hazardous areas are classified in zones based upon the frequency of the appearance and the duration of an explosive gas atmosphere as follows:
Zone 0: An area in which an explosive gas atmosphere is present continuously or is present for long periods.
Zone 1: An area in which an explosive gas atmosphere is likely to occur in normal operation.
Zone 2: An area in which an explosive gas atmosphere is not likely to occur in normal operation and if it does occur it will exist for a short period only.

## (2) Environmental Conditions

The standard environmental condition for the installation of flameproof apparatus is limited to an ambient temperature range from -20°C to +40°C (for products certified under Technical Criteria). However, some field-mounted instruments may be certified at an ambient temperature up to +60°C as indicated on the instrument nameplates. If the flameproof apparatus are exposed to direct sunshine or radiant heat from plant facilities, appropriate thermal protection measures shall be taken.

# 5. External Wiring for Flameproof Apparatus

Flameproof apparatus require cable wiring or flameproof metal conduits for their electrical connections. For cable wiring, cable glands (cable entry devices for flameproof type) to wiring connections shall be attached. For metal conduits, attach sealing fittings as close to wiring connections as possible and completely seal the apparatus. All non-live metal parts such as the enclosure shall be securely grounded. For details, see the "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.

## (1) Cable Wiring

- For cable wiring, cable glands (cable entry devices for flameproof type) specified or supplied with the apparatus shall be directly attached to the wiring connections to complete sealing of the apparatus.
- Screws that connect cable glands to the apparatus are those for G-type parallel pipe threads (JIS B 0202) with no sealing property. To protect the apparatus from corrosive gases or moisture, apply nonhardening sealant such as liquid gaskets to those threads for waterproofing.
- Specific cables shall be used as recommended by the "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.
- In necessary, appropriate protective pipes (conduit or flexible pipes), ducts or trays shall be used for preventing the cable run (outside the cable glands) from damage.
- To prevent explosive atmosphere from being propagated form Zone 1 or 2 hazardous location to any different location or non-hazardous location through the protective pipe or duct, apply sealing of the protective pipes in the vicinity of individual boundaries, or fill the ducts with sand appropriately.
- When branch connections of cables, or cable connections with insulated cables inside the conduit pipes are made, a flameproof or increased-safety connection box shall be used. In this case, flameproof or increased-safety cable glands meeting the type of connection box must be used for cable connections to the box.

## (2) Flameproof Metal Conduit Wiring

- For the flameproof metal conduit wiring or insulated wires shall be used as recommended by the USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry, published in 1994.
- For conduit pipes, heavy-gauge steel conduits conforming to JIS C 8305 Standard shall be used.
- Flameproof sealing fittings shall be used in the vicinity of the wiring connections, and those fittings shall be filled with sealing compounds to complete sealing of the apparatus. In addition, to prevent explosive gases, moisture, or flame caused by explosion form being propagated through the conduit, always provide sealing fittings to complete sealing of the conduit in the following locations:
  (a) In the boundaries between the hazardous and non-hazardous locations.
  (b) In the boundaries where there is a different classification of hazardous location.
- For the connections of the apparatus with a conduit pipe or its associated accessories, G-type parallel pipe threads (JIS B 0202) shall be used to provide a minimum of five-thread engagement to complete tightness. In addition, since these parallel threads do not have sealing property, nonhardening sealant such as liquid gaskets shall thus be applied to those threads for ensuring waterproofness.
- If metal conduits need flexibility, use flameproof flexible fittings.

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# 6. Maintenance of Flameproof Apparatus

To maintain the flameproof apparatus, do the following. (For details, see Chapter 10 "MAINTENANCE OF EXPLOSION-PROTECTED ELECTRICAL INSTALLATION" in the USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry.)

### (1) Maintenance servicing with the power on.

Flameproof apparatus shall not be maintenance-serviced with its power turned on. However, in cases where maintenance servicing is to be conducted with the power turned on, with the equipment cover removed, always use a gas detector to check that there is no explosive gas in that location. If it cannot be checked whether an explosive gas is present or not, maintenance servicing shall be limited to the following two items:

(a) Visual inspection
Visually inspect the flameproof apparatus, metal conduits, and cables for damage or corrosion, and other mechanical and structural defects.

(b) Zero and span adjustments
These adjustments should be made only to the extent that they can be conducted from the outside without opening the equipment cover. In doing this, great care must be taken not to cause mechanical sparks with tools.

### (2) Repair

If the flameproof apparatus requires repair, turn off the power and transport it to a safety (non-hazardous) location. Observe the following points before attempting to repair the apparatus.

(a) Make only such electrical and mechanical repairs as will restore the apparatus to its original condition. For the flameproof apparatus, the gaps and path lengths of joints and mating surfaces, and mechanical strength of enclosures are critical factors in explosion protection. Exercise great care not to damage the joints or shock the enclosure.

(b) If any damage occurs in threads, joints or mating surfaces, inspection windows, connections between the transmitter and terminal box, shrouds or clamps, or external wiring connections which are essential in flameproofness, contact Yokogawa Electric Corporation.

**⚠ CAUTION**

Do not attempt to re-process threaded connections or refinish joints or mating surfaces.

(c) Unless otherwise specified, the electrical circuitry and internal mechanisms may be repaired by component replacement, as this will not directly affect the requirements for flameproof apparatus (however, bear in mind that the apparatus must always be restored to its original condition). If you attempt to repair the flameproof apparatus, company-specified components shall be used.

(d) Before starting to service the apparatus, be sure to check all parts necessary for retaining the requirements for flameproof apparatus. For this, check that all screws, bolts, nuts, and threaded connections have properly been tightened.

### (3) Prohibition of specification changes and modifications

Do not attempt to change specifications or make modifications involving addition of or changes in external wiring connections.

# 7. Selection of Cable Entry Devices for Flameproof Type

**⚠ CAUTION**

The cable glands (cable entry devices for flameproof type) conforming to IEC Standards are certified in combination with the flameproof apparatus. So, Yokogawa-specified cable entry devices for flameproof type shall be used to meet this demand.

### References:

(1) Type Certificate Guide for Explosion-Protected Construction Electrical Machinery and Equipment (relating to Technical Standards Conforming to International Standards), issued by the Technical Institution of Industrial Safety, Japan

(2) USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry (1994), issued by the Japanese Ministry of Labour, the Research Institute of Industrial Safet

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**IMPORTANT**

An IMPORTANT sign denotes that attention is required to avoid damage to the instrument or system failure.

**NOTE**

A NOTE sign denotes information necessary for essential understanding of operation and features.

⏚ Protective grounding terminal

⏚ Functional grounding terminal
(This terminal should not be used as a protective grounding terminal.)

~ Alternating current

⎓ Direct current

# 1.1 Using the Magnetic Flowmeter Safely

**WARNING**

(1) Installation

- Installation of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to installation.
- The magnetic flowmeter is a heavy instrument. Be careful that no damage is caused to personnel through accidentally dropping it, or by exerting excessive force on the magnetic flowmeter. When moving the magnetic flowmeter, always use a trolley and have at least two people carry it.
- When the magnetic flowmeter is processing hot fluids, the instrument itself may become extremely hot. Take sufficient care not to get burnt.
- Where the fluid being processed is a toxic substance, avoid contact with the fluid and avoid inhaling any residual gas, even after the instrument has been taken off the piping line for maintenance and so forth.
- Do not apply excessive weight, for example, a person stepping on the magnetic flowmeter.
- All procedures relating to installation must comply with the electrical code of the country where it is used.

(2) Wiring

- The wiring of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.
- When connecting the wiring, check that the supply voltage is within the range of the voltage specified for this instrument before connecting the power cable. In addition, check that no voltage is applied to the power cable before connecting the wiring.
- The protective grounding must be connected securely at the terminal with the ⏚ mark to avoid danger to personnel.

(3) Operation

- Do not open the cover until the power has been off for at least 10 minutes. Only expert engineer or skilled personnel are permitted to open the cover.

(4) Maintenance

- Maintenance on the magnetic flowmeter should be performed by expert engineer or skilled personnel. No operator shall be permitted to perform any operations relating to maintenance.
- Always conform to maintenance procedures outlined in this manual. If necessary, contact Yokogawa.
- Care should be taken to prevent the build up of dirt, dust or other substances on the display panel glass or data plate. If these surfaces do get dirty, wipe them clean with a soft dry cloth.

(5) Explosion Protected Type Instrument

- Magnetic flowmeters with the model name AXFA14C are products which have been certified as explosion proof type instruments. Strict limitations are applied to the structures, installation locations, external wiring work, maintenance and repairs, etc. of these instruments. Sufficient care must be taken, as any violation of the limitations may cause dangerous situations.
  Be sure to read Chapter 12 "EXPLOSION PROTECTED TYPE INSTRUMENT" before handling the instruments. The description in Chapter 12 is prior to the other description in this user's manual.
  For TIIS flame proof type instruments, be sure to read "INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAME PROOF EQUIPMENT" at the end of this manual.



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- Only trained persons use this instrument in the industiral location.
- The protective grounding ⏚ must be connected to a suitable IS grounding system.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

## 1.2 Warranty

- The terms of this instrument that are guaranteed are described in the quotation. We will make any repairs that may become necessary during the guaranteed term free of charge.
- Please contact our sales office if this instrument requires repair.
- If the instrument is faulty, contact us with concrete details about the problem and the length of time it has been faulty, and state the model and serial number. We would appreciate the inclusion of drawings or additional information.
- The results of our examination will determine whether the meter will be repaired free of charge or on an at-cost basis.

**■ The guarantee will not apply in the following cases:**

- Damage due to negligence or insufficient maintenance on the part of the customer.
- Problems or damage resulting from handling, operation or storage that violates the intended use and specifications.
- Problems that result from using or performing maintenance on the instrument in a location that does not comply with the installation location specified by Yokogawa.
- Problems or damage resulting from repairs or modifications not performed by Yokogawa or someone authorized by Yokogawa.
- Problems or damage resulting from inappropriate reinstallation after delivery.
- Problems or damage resulting from disasters such as fires, earthquakes, storms, floods, or lightning strikes and external causes.

## 1.3 Combination Remote Flowtubes

**IMPORTANT**

- The AXFA14 Magnetic Flowmeter Converter should be used in combination with the following remote flowtubes:
  AXFA14□⇔AXF002□-P to AXF400□-P
  Other flowtubes (size 500 to 2600 mm) cannot be combined with the AXFA14 converter.
- If the converter combined with the AXF magnetic flowmeter remote flowtube is changed from the AXFA11 to AXFA14 or vice versa, the meter factor of the remote flowtube must be readjusted according to its flow calibration.

**CAUTION**

In case of combination with the explosion proof type remote flowtube (AXF□□□C-P) for CENELEC ATEX, FM, CSA, and TIIS certification, please see the manual IM 01E20D01-01E. The construction of the instrument, installation, external wiring, maintenance, and repair are strictly restricted, and non-observance or negligence of these restriction would result dangerous condition.

# 1.4 ATEX Documentation

This procedure is only applicable to the countries in European Union.

GB

All instruction manuals for ATEX Ex related products are available in English, German and French. Should you require Ex related instructions in your local language, you are to contact your nearest Yokogawa office or representative.

DK

Alle brugervejledninger for produkter relateret til ATEX Ex er tilgængelige på engelsk, tysk og fransk. Skulle De ønske yderligere oplysninger om håndtering af Ex produkter på eget sprog, kan De rette henvendelse herom til den nærmeste Yokogawa afdeling eller forhandler.

I

Tutti i manuali operativi di prodotti ATEX contrassegnati con Ex sono disponibili in inglese, tedesco e francese. Se si desidera ricevere i manuali operativi di prodotti Ex in lingua locale, mettersi in contatto con l'ufficio Yokogawa più vicino o con un rappresentante.

E

Todos los manuales de instrucciones para los productos antiexplosivos de ATEX están disponibles en inglés, alemán y francés. Si desea solicitar las instrucciones de estos artículos antiexplosivos en su idioma local, deberá ponerse en contacto con la oficina o el representante de Yokogawa más cercano.

NL

Alle handleidingen voor producten die te maken hebben met ATEX explosiebeveiliging (Ex) zijn verkrijgbaar in het Engels, Duits en Frans. Neem, indien u aanwijzingen op het gebied van explosiebeveiliging nodig hebt in uw eigen taal, contact op met de dichtstbijzijnde vestiging van Yokogawa of met een vertegenwoordiger.

SF

Kaikkien ATEX Ex -tyyppisten tuotteiden käyttöhjeet ovat saatavilla englannin-, saksan- ja ranskankielisinä. Mikäli tarvitsette Ex -tyyppisten tuotteiden ohjeita omalla paikallisella kielellännne, ottakaa yhteyttä lähimpään Yokogawa-toimistoon tai -edustajaan.

P

Todos os manuais de instruções referentes aos produtos Ex da ATEX estão disponíveis em Inglês, Alemão e Francês. Se necessitar de instruções na sua língua relacionadas com produtos Ex, deverá entrar em contacto com a delegação mais próxima ou com um representante da Yokogawa.

F

Tous les manuels d'instruction des produits ATEX Ex sont disponibles en langue anglaise, allemande et française. Si vous nécessitez des instructions relatives aux produits Ex dans votre langue, veuillez bien contacter votre représentant Yokogawa le plus proche.

D

Alle Betriebsanleitungen für ATEX Ex bezogene Produkte stehen in den Sprachen Englisch, Deutsch und Französisch zur Verfügung. Sollten Sie die Betriebsanleitungen für Ex-Produkte in Ihrer Landessprache benötigen, setzen Sie sich bitte mit Ihrem örtlichen Yokogawa-Vertreter in Verbindung.

S

Alla instruktionsböcker för ATEX Ex (explosionssäkra) produkter är tillgängliga på engelska, tyska och franska. Om Ni behöver instruktioner för dessa explosionssäkra produkter på annat språk, skall Ni kontakta närmaste Yokogawakontor eller representant.

GR

Όλα τα εγχειρίδια λειτουργίας των προϊόντων με ATEX Ex διατίθενται στα Αγγλικά, Γερμανικά και Γαλλικά. Σε περίπτωση που χρειάζεστε οδηγίες σχετικά με Ex στην τοπική γλώσσα παρακαλούμε επικοινωνήστε με το πλησιέστερο γραφείο της Yokogawa ή αντιπρόσωπο της.

# 2. HANDLING PRECAUTIONS

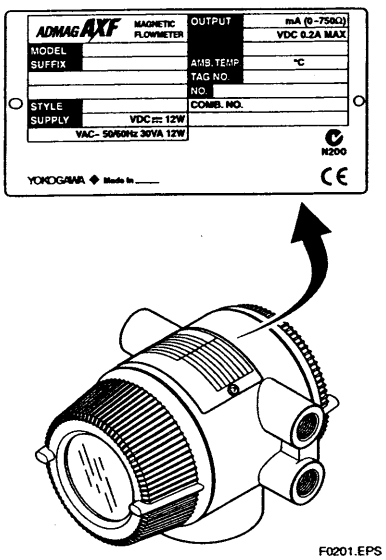
This instrument has been inspected carefully at the factory before shipment. When the instrument is delivered, visually check that no damage has occurred during transportation.

Read this section carefully as it contains important information on handling this instrument. Refer to the relevant sections for information not contained in this section. If you have any problems or questions, please contact Yokogawa sales office.

## 2.1 Checking Model and Specifications

The model code and specifications are found on the data plate located on the outside of the case. Check that the model code and specifications match what you have ordered.

Be sure you have your model number and serial number available when contacting Yokogawa.




F0201.EPS

**Figure 2.1.1 Data Plate**

## 2.2 Accessories

Check that the parts shown below are included in the package:

- Spare fuse: 1 piece (Use this spare fuse for this product only)
  (T2.0A, 250 V, T: time-lag fuse)
- Mounting hardware: 1 set
- Hexagonal wrench: 1 piece (nominal size 3 mm)

## 2.3 Storage Precautions

If the instrument is to be stored for a long period of time after delivery, observe the following points.

- The instrument should be stored in its original packing condition in the storage location.
- Select a storage location that fulfils the following conditions:
  - A place where it will not be exposed to rain or water
  - A place subject to minimal vibrations or shocks
  - Temperature and humidity levels should be as follows:
    Temperature: -30 to 70°C
    Humidity: 5 to 80% RH (no condensation)
    The preferred ambient temperature and humidity levels are 25°C and approximately 65% RH.
- If the AXFA14 converter is transferred to the installation site and stored without being installed, its performance may be impaired due to the infiltration of rainwater and so forth. Be sure to install and wire the AXFA14 as soon as possible after transferring it to the installation location.

## 2.4 Installation Location Precautions

Select the installation location with consideration to the following items to ensure long-term stable operation of the instrument.

- **Ambient Temperature:**
  Avoid installing the instrument in locations with constantly fluctuating temperatures. If the location is subject to radiant heat from the plant, provide heat insulation or improve ventilation.
- **Atmospheric Condition:**
  Avoid installing the instrument in a corrosive atmosphere. In situations where this is unavoidable, consider ways to improve ventilation and to prevent rainwater from entering and being retained in the conduit pipes.
- **Vibrations or Shocks:**
  Avoid installing the instrument in a place subject to shocks or vibrations.
- **Explosion protected type:**
  Explosion protect types can be installed in hazardous areas according to the types of gases for which they are certified. See the description in Chapter 12 "EXPLOSION PROTECTED TYPE INSTRUMENT" and "INSTALLATION AND OPERATING PRECAUTION FOR TIIS FLAME PROOF EQUIPMENT" in this user's manual.



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# 3. INSTALLATION

**WARNING**

Installation of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to installation.

## 3.1 Installation Location

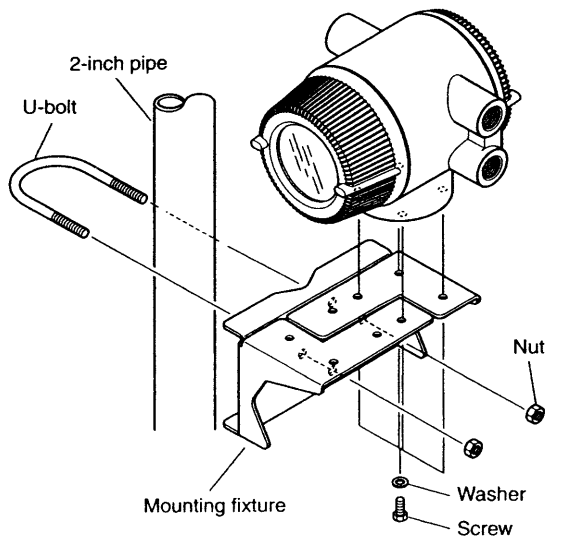
**IMPORTANT**

Install the instrument in a location where it is not exposed to direct sunlight. For ambient temperature, refer to Chapter 11 "OUTLINE".
The instrument may be used in an ambient humidity where the RH ranges from 0 to 100%. However, avoid long-term continuous operation at relative humidity above 95%.

## 3.2 Mounting

This instrument can be mounted on a 2-inch pipe in a vertical or horizontal position depending on the installation site.

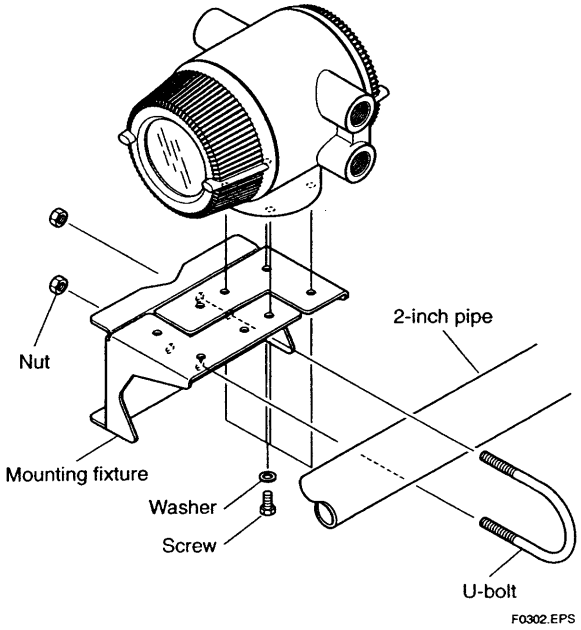
### ● Vertical Mounting




F0301.EPS

1. Fix the instrument on the mounting fixture using four screws.
2. Fix the mounting fixture with the instrument installed on a 2-inch pipe using a U-bolt.

### ● Horizontal Mounting




F0302.EPS

1. Fix the instrument casing on the mounting fixture using four screws.
2. Fix the mounting fixture with the instrument installed on a 2-inch pipe using a U-bolt.

**Figure 3.2.1 2-inch Pipe Mounting**

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# 4. WIRING

This chapter describes the wiring on the converter side only. For information relating to wiring on the flowtube side, refer to the user's manual of the AXF Remote Flowtube (IM 01E20D01-01E).

**⚠ WARNING**

The wiring of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.

**⚠ CAUTION**

Once all wiring is complete, check the connections before applying power to the instrument. Improper arrangements or wiring may cause a unit malfunction or damage.

## 4.1 Wiring Precautions

Be sure to observe the following precautions when wiring:

**⚠ CAUTION**

- In cases where the ambient temperature exceeds 50°C (122°F), use external heat-resistant wiring with a maximum allowable temperature of 70°C (158°F) or above.
- Do not connect cables outdoors in wet weather in order to prevent damage from condensation and to protect the insulation.
- Do not splice the cable between the flowtube terminal and the converter if it is too short. Replace the short cable with a cable that is the appropriate length.
- All the cable ends must be provided with round crimp-on terminals and be securely wired.
- The signal cables must be routed in separate steel conduit tubes 16 (JIS C 8305) or flexible conduit tubes 15 (JIS C 8309).
- Always route the power and output signal cables in separate steel conduit tubes, except when the power supply voltage is 24 V and four-core cables are used for wiring. Keep conduits or flexible tubes watertight using sealing tape.
- Ground the remote flowtube and the converter separately.
- Cover each shield of the signal cable with vinyl tube or vinyl tape to avoid contact between two shields or between a shield and a case.
- When waterproof glands or union equipped waterproof glands are used, avoid tightening the glands with an excessive torque.
- In case of 24V power supply version, it comes with a plug. Use this plug to cover the unused wiring port when wiring the instrument with only one, four-core cable.
- Be sure to turn power off before opening the cover.
- Before turning the power on, tighten the cover securely.
- The terminal box cover is locked by the special screw. In case of opening the terminal box cover, use the hexagonal wrench attached. For handling the locking screw, refer to Figure 4.4.1.
- Be sure to lock the cover by the special screw using the hexagonal wrench attached after installing the cover. For handling the locking screw, refer to Figure 4.4.12.
- Explosion protected types must be wired in accordance with specific requirement (and, in certain countries, legal regulations) in order to preserve the effectiveness of their explosion protected features.

## 4.2 Cables

### (1) Dedicated Signal Cable (AXFC)

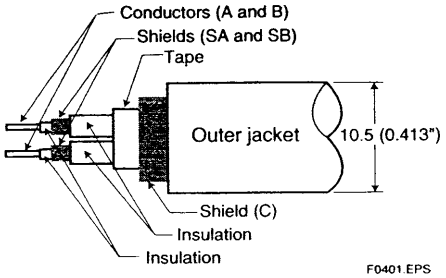


**Figure 4.2.1 Dedicated Signal Cable AXFC**

The flow signal is transmitted via this dedicated cable. The cable is constructed with double shielding over the two conductors, and heat-resistant vinyl is used for the outer jacket material.

Finished diameter: 10.5 mm (0.413")
Maximum length: 100 m (330 ft)
Maximum temperature: 80°C (176°F)

**IMPORTANT**

If the cable is longer than required, cut off any extra length rather than coiling it up, and terminate the conductors as shown in Figure 4.2.2. Avoid using junction terminal boards to extend the cable length, as this will interrupt the shielding.

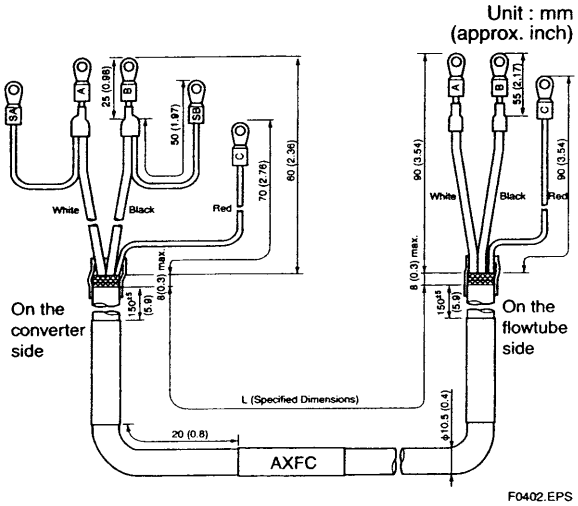


**Figure 4.2.2 Treatment of Dedicated Signal Cables**

**CAUTION**

- As crimp terminals A, B, SA, SB and C have their own electrical potentials, securely insulate them so as not to come in contact with one another.
- To prevent a shield from coming in contact with another shield or the case, cover each shield with a vinyl tube or wrap it in vinyl tape.

**NOTE**

Conductors A and B carry the signal from the electrodes, and C is at the potential of the liquid (signal common). Shields SA and SB are kept at the same potentials as the individual electrodes (these are actively driven shields.) This is done to reduce the effect of the distributed capacitance of the cable at long cable length. Note that, since the signals from the individual electrodes are impedance converted inside the converter, errors will result if they come in contact with any other component. Great care must be taken in the cable end treatment.

### (2) Excitation Cable/Power Cable/Output Cable

Use polyvinyl chloride insulated and sheathed control cables (JIS C 3401) or polyvinyl chloride insulated and sheathed portable power cables (JIS C 3312) or the equivalent.

Outer Diameter: 6.5 to 12 mm (0.26 to 0.47 in.)
10.5 or 11.5 mm (0.41 or 0.45 in.) for optional code EG, EU
6 to 12 mm (0.24 to 0.47 in.) for optional code EP
Nominal Cross Section (Single wire): 0.5 to 2.5 $mm^2$
Nominal Cross Section (Stranded wire): 0.5 to 1.5 $mm^2$

In case of power cable, Green/Yellow covered conductor shall be used only for connection to PROTECTIVE CONDUCTOR TERMINALS. Conform to IEC227, IEC245 or equivalent national authorization.

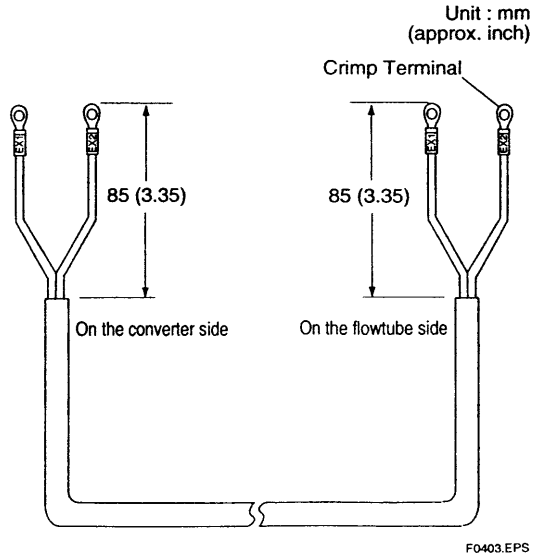


**Figure 4.2.3 End Treatment of Excitation Cable**

**NOTE**

- For excitation and power cables, always use a crimp terminal with an insulation cover.
- Use crimp tools from the manufacturer of the crimp terminal you want to use to connect the crimp terminal and cable.
- Use crimp tools that are appropriate for the diameter of the cable to be connected.

# 4.3 Wiring Ports

This instrument is of watertight construction as stipulated in JIS C0920-1982 (Tests to prove protection against ingress of water and degrees of protection against ingress of solid objects for electrical equipment.) It is shipped with a wiring bracket (waterproof gland or waterproof gland with union) or a plastic gland attached, only in cases where an optional specification is selected for the wiring port.
In case of the explosion proof type, refer to chapter 12.

### (1) When there are no particular optional specifications

The wiring port is sealed with a cap (not water-proof) that must be removed before wiring. At this time, handle the wiring port in accordance with the JIS C0920-1982 mentioned above.

### (2) Wiring using waterproof glands

**IMPORTANT**

To prevent water or condensation from entering the converter housing, waterproof glands are recommended. Do not over-tighten the glands or damage to the cables may result. Tightness of the gland can be checked by confirming that the cable is held firmly in place.

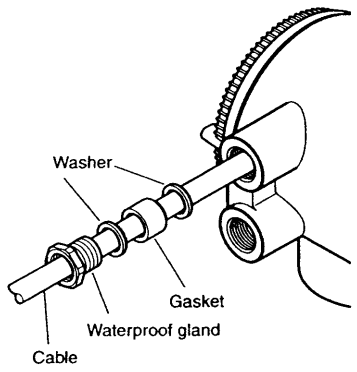


**Figure 4.3.1 Waterproof Gland (Optional code EG)**

For working on the electric wire tubes or the flexible tubes (PF1/2), remove the waterproof gland and attach them directly to the wiring port.

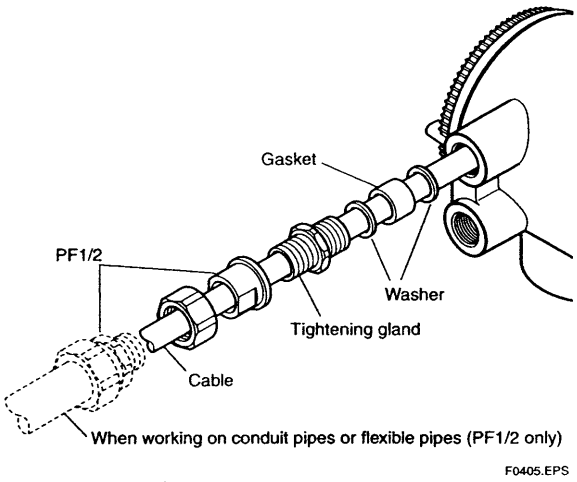


**Figure 4.3.2 Waterproof Gland with Union Joint (Optional code EU)**

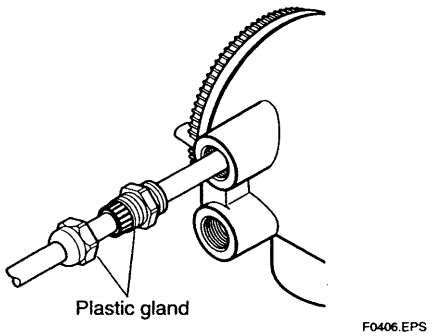


**Figure 4.3.3 Plastic Gland (Optional code EP)**

### (3) Conduit Wiring

When wiring the conduits, pass the conduit through the wiring connection port, and utilize the waterproof gland to prevent water from flowing in. Place the conduit pipe on an angle as shown in Figure 4.3.4. Install a drain valve at the low end of the vertical pipe, and open the valve regularly.



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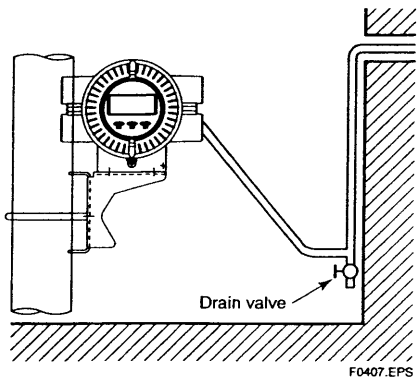


**Figure 4.3.4 Conduit Wiring**

# 4.4 Wiring Connections

## 4.4.1 Removing Cover

Loosen cover locking screw 2 clockwise using a hexagonal wrench (nominal size 3 mm) to unlock the cover. (Upon shipment from the manufacturing plant, the cover is unlocked.) Hold the flowmeter with your hand and remove the cover by turning it in the direction of the arrow as shown below.

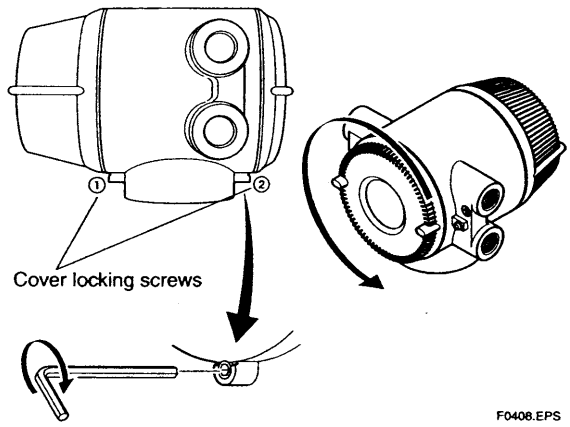


**Figure 4.4.1 Removing the Terminal Box Cover**

## 4.4.2 Terminal Configuration

When the cover is removed, the connection terminals will be visible. The terminal configuration labels are attached in the locations shown in Figure 4.4.2.

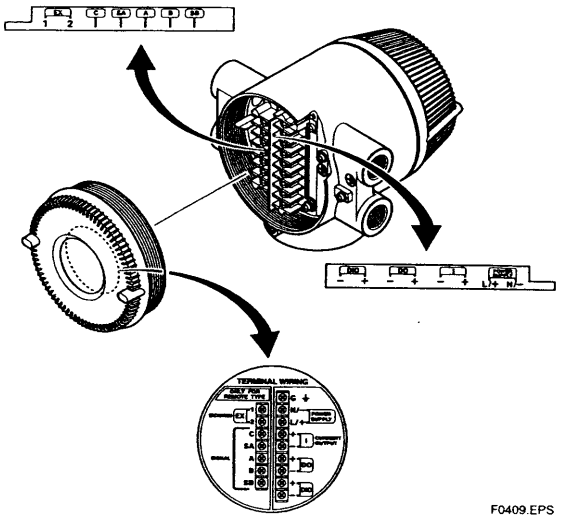


**Figure 4.4.2 Terminal Layout Labels Position**

The description of the terminal symbols is shown in Table 4.1.1.

**Table 4.1.1 Terminal Symbols**

| Terminal Symbols | Description |
|---|---|
| EX1<br>EX2 | Excitation current output |
| C<br>SA<br>A<br>B<br>SB | Flow singal input |

| Terminal Symbols | Description |
|---|---|
| ⏚ | Functional grounding |
| N/–<br>L/+ | Power supply |
| I+<br>I– | Current output 4 to 20mA DC |
| DO+<br>DO– | Pulse output/ Alarm output/ Status output |
| DIO+<br>DIO– | Alarm output/ Status output/ Status input |
| ⏚ | Protective grounding (Outside of the terminal) |

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## 4.4.3 Precautions for Wiring of Power Supply Cables

When connecting to the power supply, observe the points below. Failure to comply with these warnings may result in an electric shock or damage to the instrument.

**WARNING**

- Ensure that the power supply is OFF in order to prevent electric shocks.
- Ensure the protective grounding terminal is grounded before turning the power on.
- Use insulating sleeve crimp terminals (for 4-mm screws) for the power supply wiring and protective grounding wiring.
- Install an external switch or circuit breaker as a means to turn the powe off (capacitance; 15A, conforming to IEC947-1 and IEC947-3). Locate this switch either near the instrument or in other places facilitating easy operation. Affix a "Power Off Equipment" label to this external switch or circuit breaker.

### Wiring Procedure

1. Turn the instrument's power off.
2. Wire the power supply cable and the functional grounding cable to the power supply terminals.

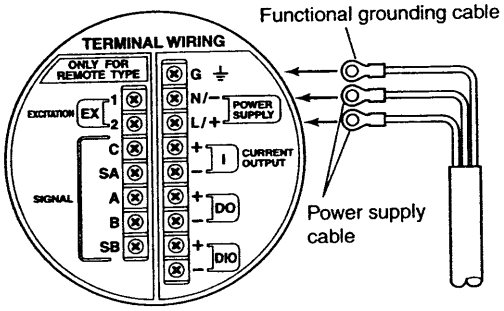



**Figure 4.4.3 Electric Cable Wiring**

## 4.4.4 DC Power Connection

When using DC power as the power supply for the converter, give attention to the following points.

### (1) Connecting Power Supply

**IMPORTANT**

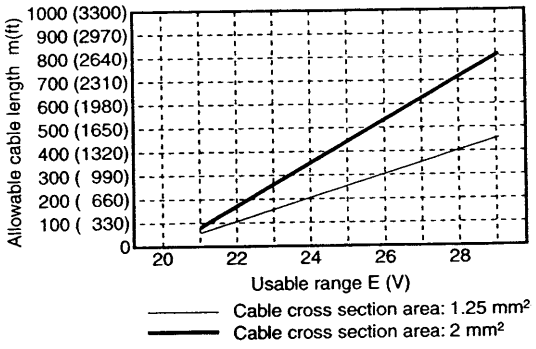
Do not connect power supply with reversed polarities.
L/+ terminal: connect +
N/− terminal: connect −

### (2) Required Power Supply Voltages

**IMPORTANT**

When using a 24 V power supply, the specification for the supply voltage is 24 V (−15% to +20%), but the input voltage of the converter drops due to cable resistance therefore it must be used within the following ranges.

**Supply Voltage and Cable Length**




### (3) Setting Power Supply Frequency

**IMPORTANT**

Set the local Commercial power frequency in order to eliminate the effect of induction noise from the Commercial power supply.
Refer to "Chapter 6: Parameter Description" in this manual.
Parameter No.: **J30** and **J31**



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## 4.4.5 Grounding

**CAUTION**

Be sure to connect the protective grounding of the AXFA14 with a cable of 2mm² or larger cross section in oder to avoid electrical shock to the operators and maintenance engineers and to prevent the influence of external noise.
Connect the grounding wire to the ⏚ mark.
The grounding should satisfy Class D requirements (ground resistance, 100 Ω or less).
In case of TIIS Flame proof type, the grounding should satisfy Class C requirements (ground resistance, 10 Ω or less) or class A requirements (ground resistance, 10 Ω or less).
For explosion proof type except TIIS, follow the domestic electrical requirements as regulated in each country.

**IMPORTANT**

When optional code A (lighting protector) is selected, the ground should satisfy Class C requirements (grounding resistance, 10 Ω or less).

- The protective grounding terminals ⏚ are located on the inside and outside of the terminal area. Either terminal may be used.
- Use 600V vinyl insulation wires as the grounding wires.

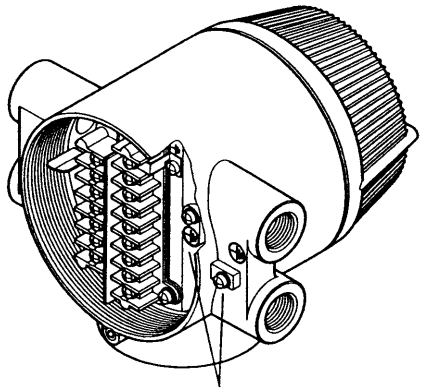



**Figure 4.4.4 Protective Grounding Terminal Location**

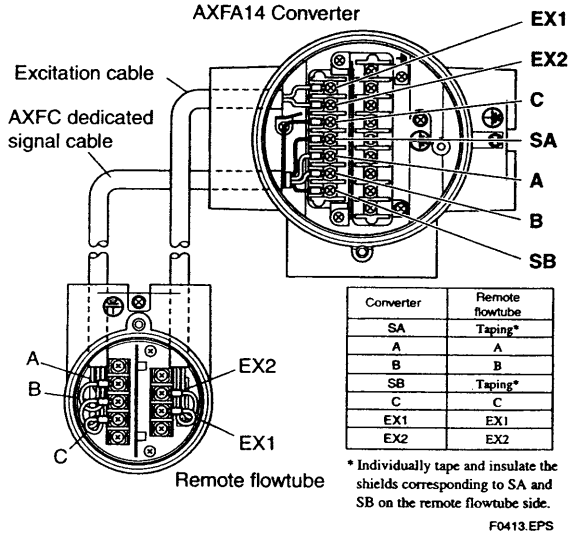
## 4.4.6 Wiring the Remote Flowtube with the AXFA14 Converter

**WARNING**

Before wiring, be sure that the power supply for AXFA14 converter has been turned off to prevent an electrical shock.

### (1) Connection with the Remote Flowtube (General-Purpose Use, Submersible Type, Sanitary Type, Size 2.5 to 400 mm (0.1 to 16 in.))

Connect wiring as shown in the figure below.




| Converter | Remote flowtube |
|---|---|
| SA | Taping* |
| A | A |
| B | B |
| SB | Taping* |
| C | C |
| EX1 | EX1 |
| EX2 | EX2 |

* Individually tape and insulate the shields corresponding to SA and SB on the remote flowtube side.

**Figure 4.4.5 Wiring Diagram**

### (2) Connection with the Remote Flowtube (Explosion proof Type, Size 2.5 to 400 mm (0.1 to 16 in.))

In case of explosion proof type for CENELEC ATEX, FM, CSA, and TIIS certification, connect wiring as shown in the figure below.

In case of the explosion proof type, the protective grounding ⏚ of remote flowtube must be connected to a suitable IS grounding system. In that case, ⏚ (functional grounding terminal) need not be connected.

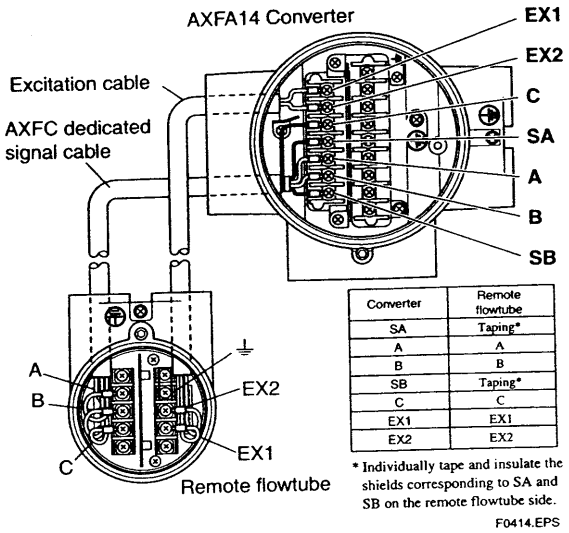



**Figure 4.4.6 Wiring Diagram**

## 4.4.7 Connecting to External Instruments

**WARNING**

Before wiring with external instruments, be sure to turn off the power supply for AXFA14 converter and any external instruments.

Connect the AXFA14 terminal to external instruments, giving attention to the following points.

### ● 4 to 20 mA DC Current Output

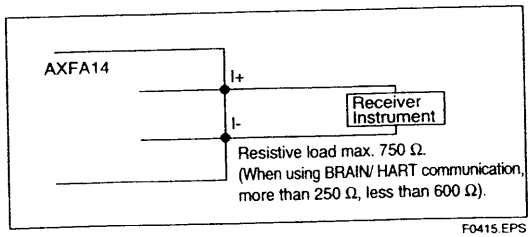



**Figure 4.4.7 4 to 20 mA DC Output Connection**

### ● Pulse Output

**IMPORTANT**

- As this is a transistor contact (insulated type), give attention to proper voltage and polarity when wiring.
- Do not apply a voltage larger than 30V DC or a current larger than 0.2A in order to prevent damage to the instrument.
- When input filter constant of the electronic counter is large in relation to the pulse width, the signal will decrease and the count will not be accurate.
- If the input impedance of the electronic counter is large, an induction noise from the power supply may result in inaccurate counts. Use a shield cable or sufficiently reduce the input impedance of the electronic counter within the electromagnetic flowmeter pulse output specification range.
- The active pulse output (Optional code EM) cannot be used in conjunction with the standard pulse output.
- When the active pulse output (Optional code EM) is selected, do not be short-circuit between the DO+ and DO– terminals to avoid damaging the instrument.
- To avoid communication (BRAIN/ HART) failure, it is recommended to use the shield cable.

**NOTE**

For pulse output from the DO terminals, parameters must be set. Refer to "Chapter 6: Parameter Description" in this manual.

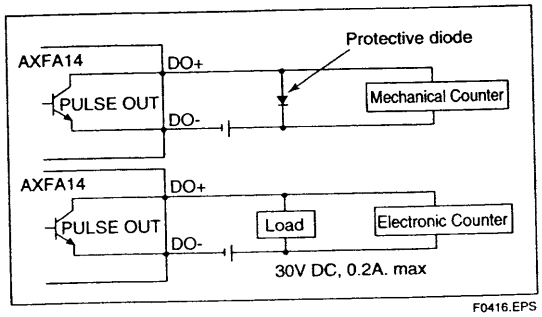



**Figure 4.4.8 Pulse Output Connection**



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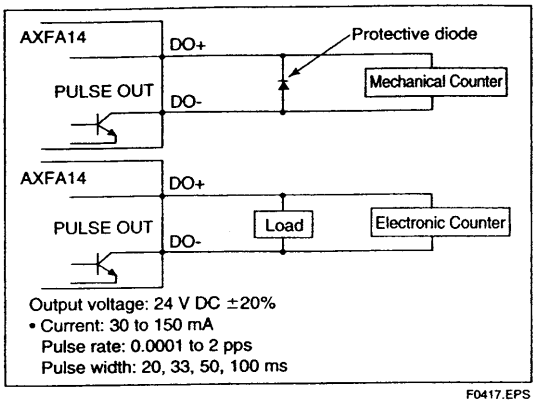



**Figure 4.4.9 Active Pulse Output (Optional code EM)**

## ● Status Input

**IMPORTANT**

Status inputs are designed for use with no-voltage (dry) contacts. Be careful not to connect the status to any signal source carrying voltage. Applying voltage may damage the input circuit.

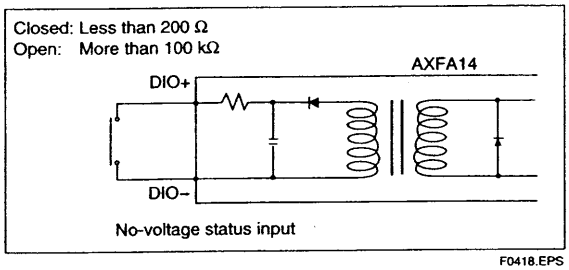



**Figure 4.4.10 Status Input Connection**

**NOTE**

For status input to the DIO terminals, parameters must be set. Refer to "Chapter 6: Parameter Description" in this manual.

## ● Status Output/ Alarm Output

**IMPORTANT**

Since this is an isolated transistor output, be careful of voltage and polarity when wiring. Do not apply a voltage larger than 30V DC or a current larger than 0.2A in order to prevent damage to the instrument.
This output cannot switch an AC load. To switch an AC load, an intermediate relay must be inserted as shown in Figure 4.4.11.
*The alarm output operates from open (normal) to closed (alarm occurrence) in the default value (as setup upon plant shipment). Changes can be made via the parameter settings.

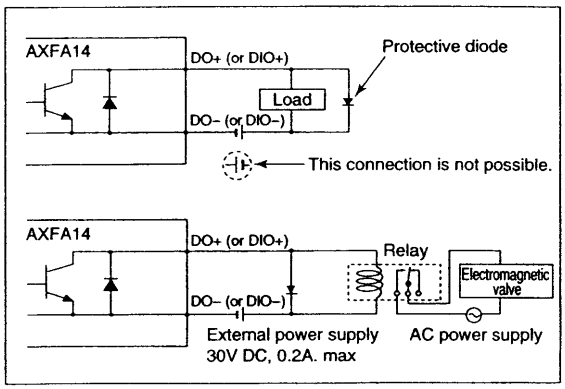



**Figure 4.4.11 Status Output/Alarm Output Connection**

**NOTE**

For status and alarm outputs from the DO or DIO terminals, parameters must be set. Refer to "Chapter 6: Parameter Description" in this manual.

## 4.4.8 Installing the Cover

Install the cover to the flowmeter by turning it in the direction of the arrow as shown below. Tighten cover locking screw 2 counterclockwise using a hexagonal wrench (nominal size 3 mm) to lock the cover.

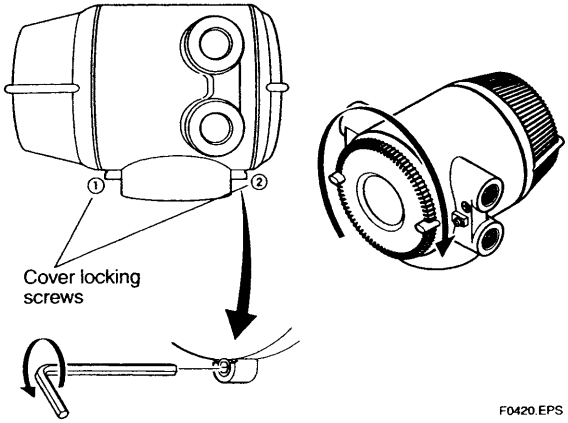



**Figure 4.4.12 Installing the Terminal Box Cover**

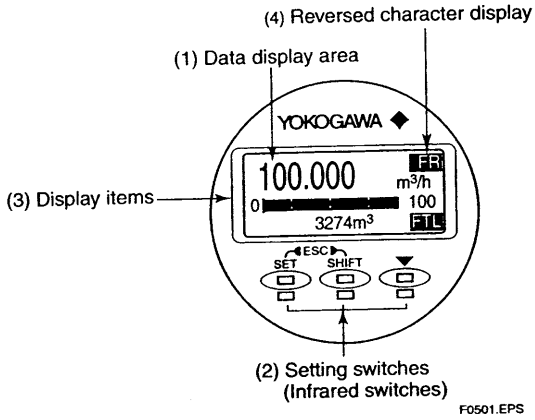
# 5. BASIC OPERATING PROCEDURES (USING THE DISPLAY UNIT)

The modification of data settings from the display unit can be carried out using the three setting switches (infrared switches) - namely, the SET, SHIFT, and ▼ switches. This chapter will provide a description of basic data configuration and the methods to be used with the three setting switches. The AXFA14 or the AXF integral flowmeter can also be operated using a handheld Brain Terminal (BT200) or a HART Communicator. (Please refer to Chapter 7 for operation via Brain Terminal and Chapter 8 for operation via HART Communicator.)

**NOTE**

(1) Always use the setting switches with the cover of the AXFA14 or the AXF integral flowmeter closed.
(2) Use these switches with them covered by the glass window.
(3) If dirt, dust or other substances surfaces on the display panel glass, wipe them clean with a soft dry cloth.
(4) The operation with dirty gloves may cause a switch response error.

## 5.1 Operating Panel Configuration and Functions




### (1) Data display area

1st line (Display Select1), 2nd line (Display Select2), and 3rd line (Display Select3) can be displayed using parameter settings. The content corresponding to selected item is shown with the reversed-character on the right of the line.

### (2) Setting switch operations

SET: Move the layer down, select, and confirm

SHIFT + SET: Move the layer up
(Press the SET switch while holding down the SHIFT switch)

▼: Move the cursor down (for selection-type parameters) or increase values (for numeric-type parameters)

SHIFT: Move the cursor to the right (for numeric-type parameters)

SHIFT + ▼: Move the cursor up (for selection-type parameters)

### (3) Display items

| Displayed items and reversed-character indication | | Content | Disp Select1 | Disp Select2 Disp Select3 |
|---|---|---|---|---|
| Instantaneous flow rate: % | FR | Displays the instantaneous flow rate for the span as a percentage. | ○ | ○ |
| Actual instantaneous flow rate | FR | Displays the actual reading for instantaneous flow rate. | ○ | ○ |
| Instantaneous flow rate: mA | FR | Displays the instantaneous flow rate for the span as a current output value. | ○ | ○ |
| Bar graph indicating instantaneous flow rate | None | Displays the instantaneous flow rate for the span as a percentage using bar graph. | × | ○ |
| Totalized forward-direction flow rate | FTL | Displays the totalized value for flow rate in the forward direction. | ○ | ○ |
| Totalized reverse-direction flow rate | RTL | Displays the totalized value for flow rate in the reverse direction. | ○ | ○ |
| Totalized differential flow rate | DTL | Displays the differential totalized value for flow rate between forward totalization and reverse totalization. | ○ | ○ |
| Tag number | TAG | Display the tag number (using up to 16 characters). | × | ○ |
| Diagnosis of electrode adhesion | ADH | Displays the adhesion condition in the form of a bar graph. (See the description for parameters K10 through K15 from Chapter 6: Parameter Description for more details.) | × | ○ |
| Communication | COM | Displays the communication type. | × | ○ |

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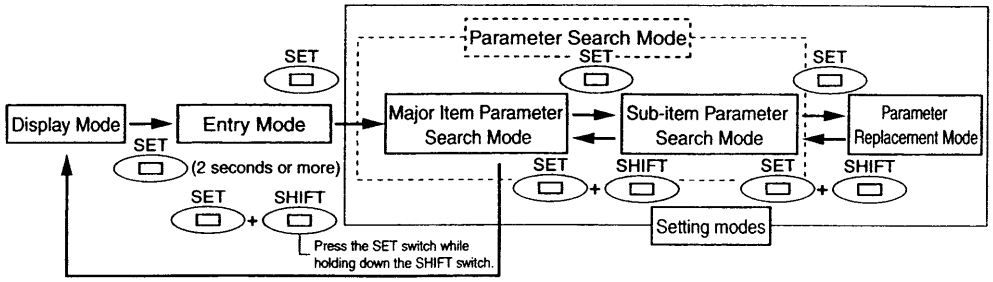
# 5.2 Display Unit Setting Methods

**NOTE**

Before changing any settings, be sure to check the corresponding setting details in Chapter 6: Parameter Description.

## 5.2.1 Display Mode → Setting Mode

Display Mode will be adopted when the power is turned on, and the Setting Mode can be activated using the following procedure.




* The term "mode" is used to refer to a situation where display and setting are possible.

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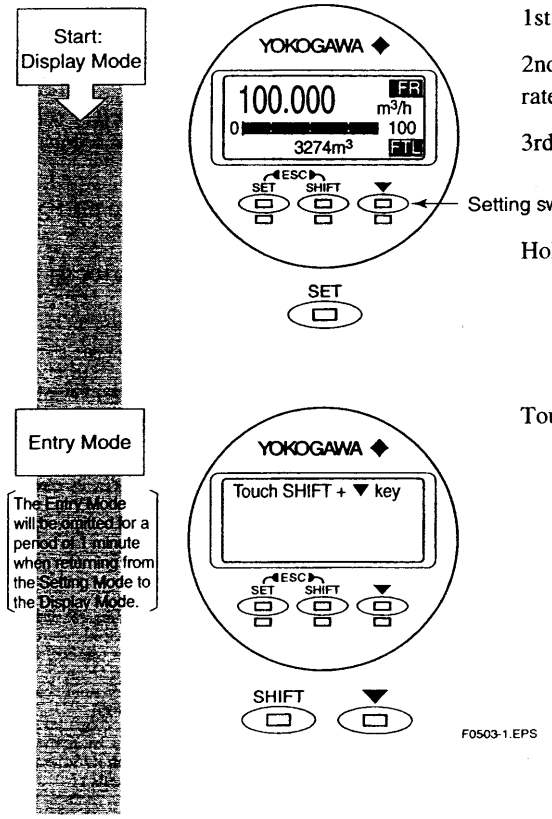
### Sample Display: Procedure for moving from Display Mode to Setting Mode

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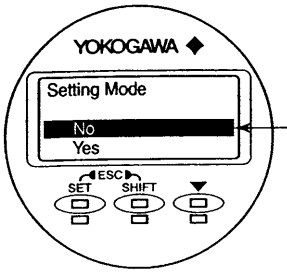
1st line: Actual instantaneous flow rate [FR]

2nd line: Bar graph indicating instantaneous flow rate

3rd line: Totalized forward flow rate [FTL]

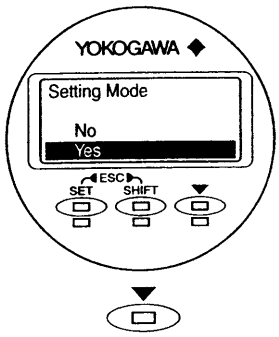
Hold the SET switch for 2 seconds.

Touch SHIFT and ▼ switches simultaneously.

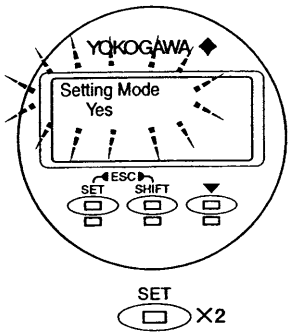



A screen is displayed to confirm whether or not the system is to enter Setting Mode.

The reversed-character (i.e. the cursor position) indicates the item that is currently selected.



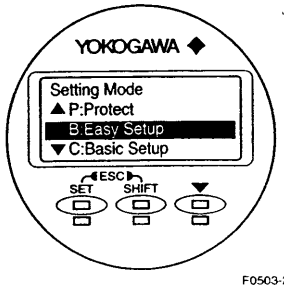

To enter Setting Mode, press the ▼ switch and select [Yes].




Touch the SET switch.

In order to request confirmation, the entire display flashes on and off.

Touch the SET switch once again at this time to fix your selection.

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The system enters Setting Mode.

Parameters to be set can be selected.

This completes the procedure for changing from the Display Mode to the Parameter Search Mode.

Setting Mode

To Parameter Search Mode

### 5.2.2 Setting Mode

When the Setting Mode has been activated using the procedure from Section 5.2.1, parameters can be selected for setting. If no operations are carried out for a period of 10 minutes in this mode, the system will automatically return to the Display Mode.

#### Format for Parameter Data

Depending on the type of parameter, data is formatted in one of the following three ways.

| Format | Typical display | Content |
|---|---|---|
| (i) Selection-type | B21:Base Flow Unit<br>$m^3$<br>▲$m^3$<br>▼kl(Kiloliter) | The desired data item is selected from a predefined list. |
| (ii) Numeric-type | B23:Flow Span<br>100 l/min<br>000100 l/min<br>Rng:0.00001 → 32000 | Data is set using the values in each digit and using the decimal point. |
| (iii) Alphanumeric-type | C10:Tag No<br>FI-1101<br>FI-1201 | Data is composed using alphanumeric characters (in the case of tag numbers, special units, and the like). With this format, setting can be carried out using up to 16 of the characters shown below. |

Regarding the alphanumeric-type format (iii), the following alphanumerics are displayed in the following sequence:

```
#%&*+-./0123456789:<>ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghij
klmnopqrstuvwxyz[space]
```

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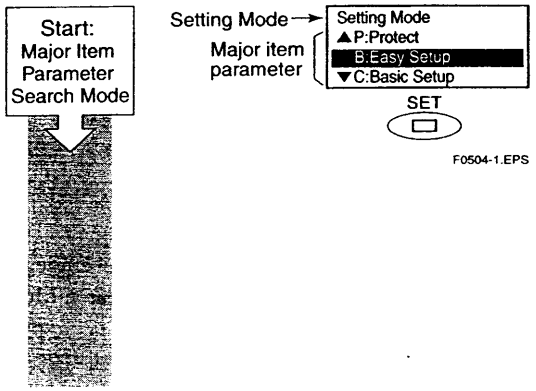
## 5.3 Parameter Setting Procedure

Once the system is in Setting Mode, the parameters for setting can be selected. Parameters that are frequently used have been grouped together in Easy Setup in Menu B. This section provides a description of the parameter setting procedure using **B: Easy Setup** and **C: Basic Setup**.

For more details regarding parameter content, please refer to Section 6: Parameter Description.

### 5.3.1 Setting Example for Selection-Type Data: Flow rate units

This example describes the setting of the flow rate units for the selection-type parameter **B21: Base Flow Unit** from $m^3$ to l (Liter).

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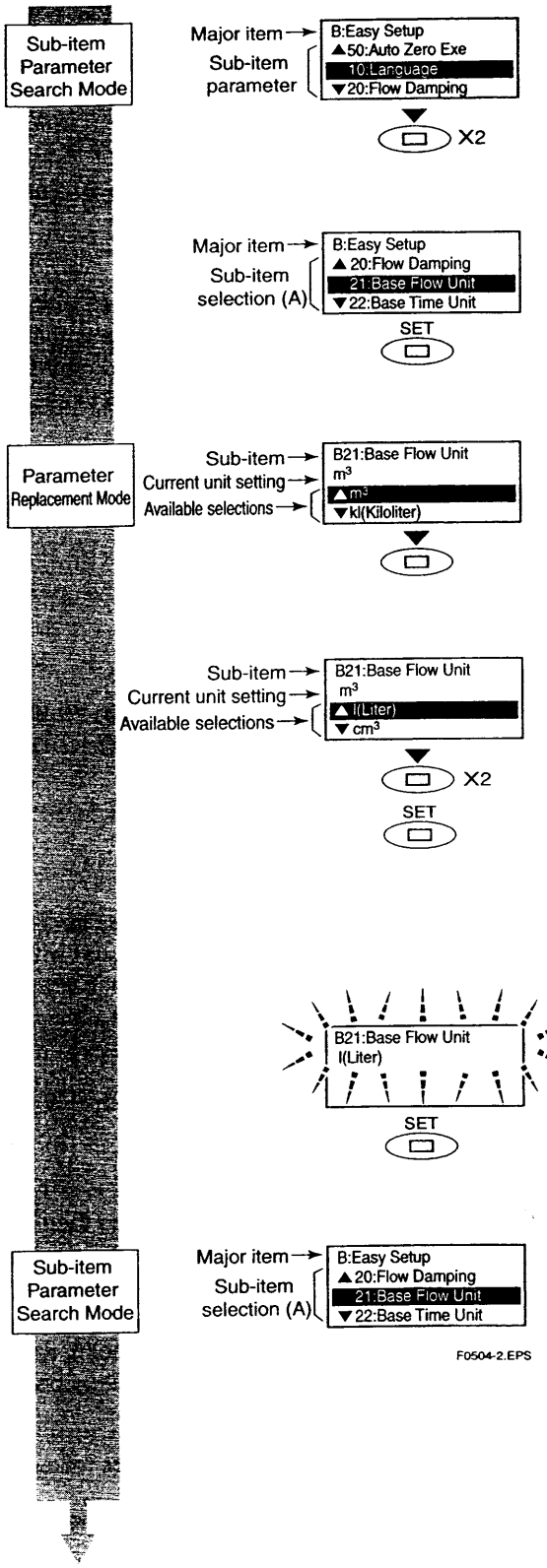
Major Item Parameter Search Mode has been accessed in this screen.

Touch the SET switch to access **B: Easy Setup**.

**NOTE**

The ▲ and ▼ symbols to the left of the parameters indicate that additional setting items to those being currently displayed may also be selected. Use the ▼ switch to cycle through these items.




Sub-item Parameter Search Mode has been accessed in this screen.

Touch the ▼ switch to move the cursor to **B21: Base Flow Unit**.

The cursor has been moved to **B21: Base Flow Unit** in this screen. (Sub-item selection screen (A))

In this screen, Parameter Replacement Mode has been called up using the SET switch.

Touch the ▼ switch to move the cursor to the unit item for selection. In this example, the ▼ switch is touched twice to select l (Liter)

When l (Liter) has been selected, touch the SET switch.

In order to request confirmation, the entire display flashes on and off. Touch the SET switch once again at this time to fix your selection.

The system returns automatically to sub-item selection screen (A).



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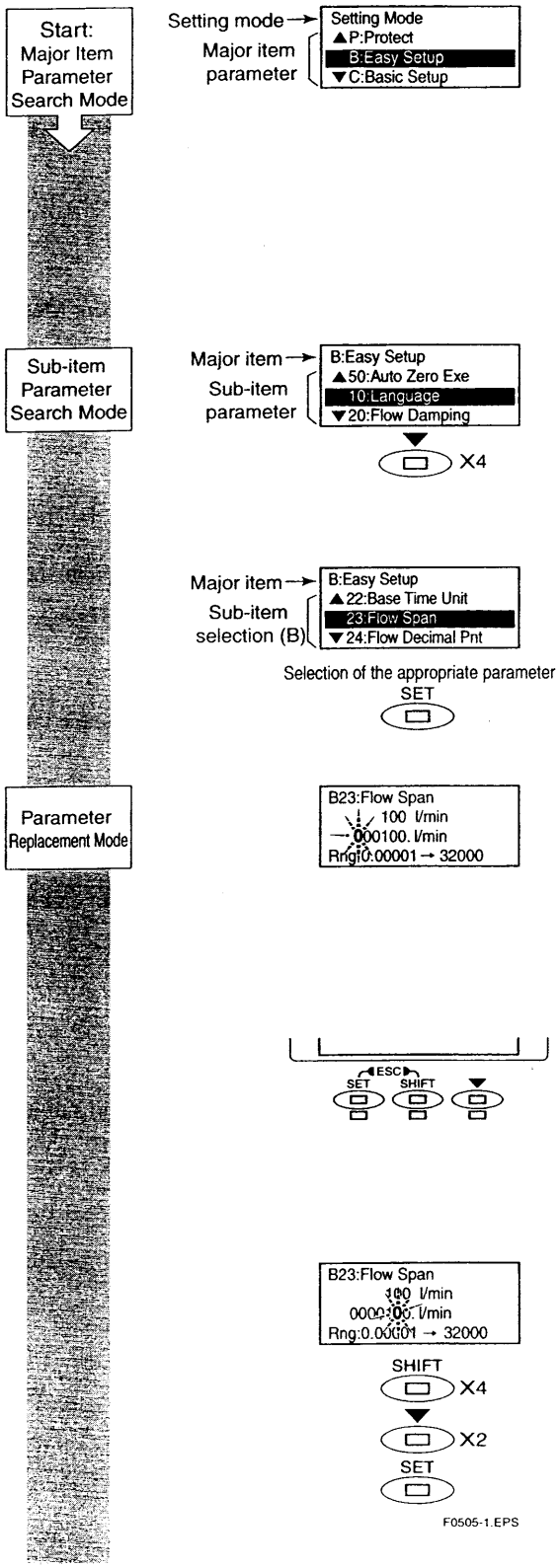
## 5.3.2 Setting Example for Numeric-Type Data: Flow rate span

This example describes the setting of the flow rate span for the numeric-type parameter **B23: Flow Span** from 100 l/min to 120 l/min.




### Setting Mode Condition

Touch the SET switch to access **B: Easy Setup**.

**NOTE**

The ▲ and ▼ symbols to the left of the parameters indicate that additional setting items to those being currently displayed may also be selected. Use the ▼ switch to cycle through these items.

Sub-Item Parameter Search Mode has been accessed in this screen.

Touch the ▼ switch to move the cursor to **B23: Flow Span**.

The cursor has been moved to **B23: Flow Span** in this screen. (Sub-item selection screen (B))

Touch the SET switch to access Parameter Replacement Mode.

Once Parameter Replacement Mode has been selected, the digit that can be replaced will be flashed on and off. When in this condition, confirm the relevant setting range as displayed at the bottom of the screen and then set the parameter as required.

In this example, the parameter will be set to "120 l/min".

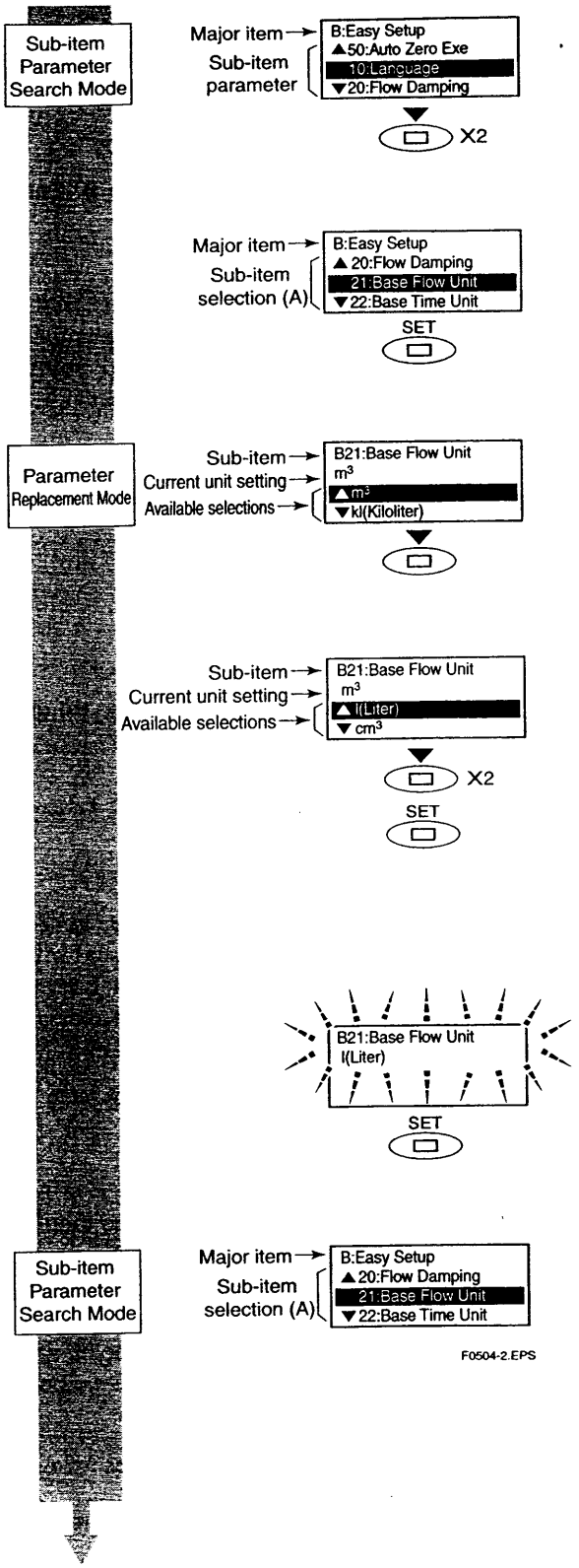
**NOTE**

When setting a new value, use the SHIFT switch to move from digit to digit, and use the ▼ switch to cycle through values for each individual digit. In addition to digit, it is also possible to select a decimal point, and this allows the position of the decimal point to be changed.

Modify the value to "120 l/min" as follows:

Touch the SHIFT switch to move the cursor to the position for multiples of 10. Then, touch the ▼ switch to change the value at this position from "0" to "2".

When the value of "120" has been setup, touch the SET switch.




Sub-item Parameter Search Mode has been accessed in this screen.

Touch the switch to move the cursor to **B21: Base Flow Unit**.

The cursor has been moved to **B21: Base Flow Unit** in this screen. (Sub-item selection screen (A))

In this screen, Parameter Replacement Mode has been called up using the SET switch.

Touch the switch to move the cursor to the unit item for selection. In this example, the switch is touched twice to select l (Liter)

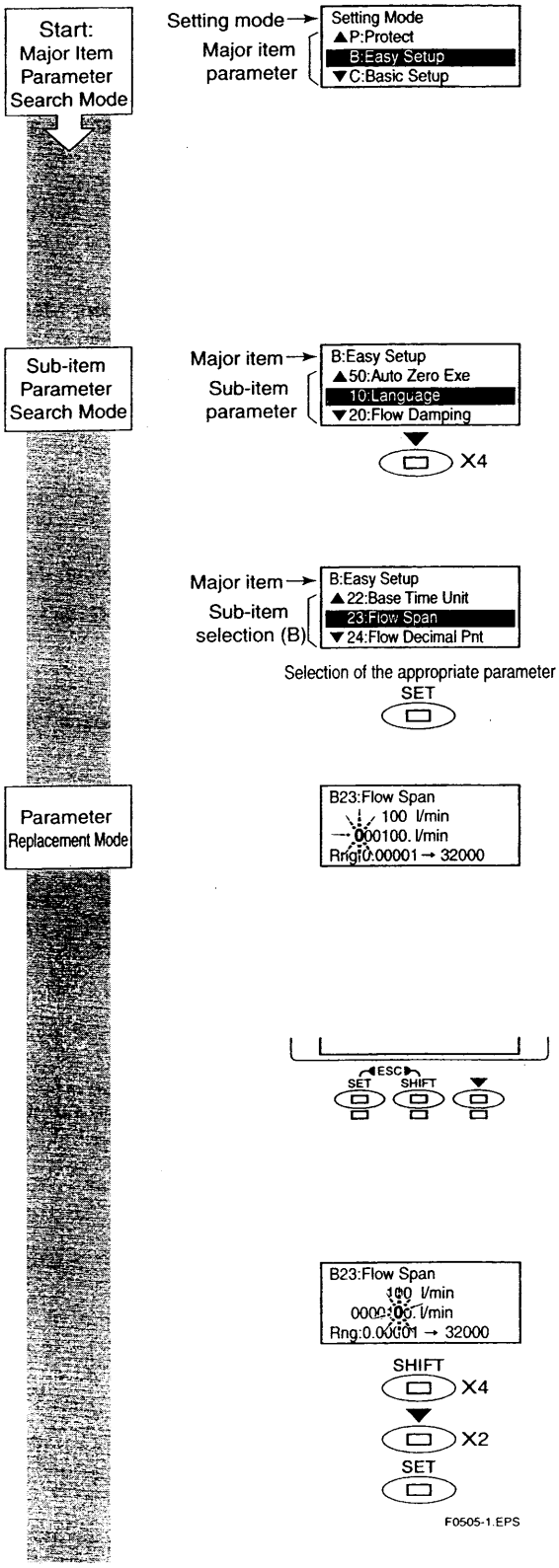
When l (Liter) has been selected, touch the SET switch.

In order to request confirmation, the entire display flashes on and off. Touch the SET switch once again at this time to fix your selection.

The system returns automatically to sub-item selection screen (A).

## 5.3.2 Setting Example for Numeric-Type Data: Flow rate span

This example describes the setting of the flow rate span for the numeric-type parameter **B23: Flow Span** from 100 l/min to 120 l/min.




### Setting Mode Condition

Touch the SET switch to access **B: Easy Setup**.

**NOTE**

The ▲ and ▼ symbols to the left of the parameters indicate that additional setting items to those being currently displayed may also be selected. Use the ▼ switch to cycle through these items.

Sub-Item Parameter Search Mode has been accessed in this screen.

Touch the ▼ switch to move the cursor to **B23: Flow Span**.

The cursor has been moved to **B23: Flow Span** in this screen. (Sub-item selection screen (B))

Touch the SET switch to access Parameter Replacement Mode.

Once Parameter Replacement Mode has been selected, the digit that can be replaced will be flashed on and off. When in this condition, confirm the relevant setting range as displayed at the bottom of the screen and then set the parameter as required.

In this example, the parameter will be set to "120 l/min".

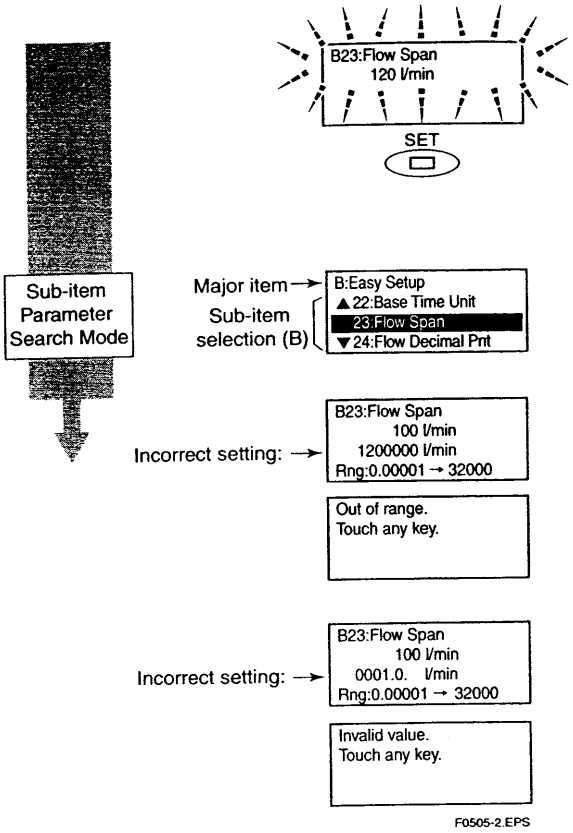
**NOTE**

When setting a new value, use the SHIFT switch to move from digit to digit, and use the ▼ switch to cycle through values for each individual digit. In addition to digit, it is also possible to select a decimal point, and this allows the position of the decimal point to be changed.

Modify the value to "120 l/min" as follows:

Touch the SHIFT switch to move the cursor to the position for multiples of 10. Then, touch the ▼ switch to change the value at this position from "0" to "2".

When the value of "120" has been setup, touch the SET switch.




When the SET switch is touched, the entire display flashes on and off. Confirm that the setting has been correctly changed to "120", and then fix this value by touching the SET switch once again.

The system returns automatically to sub-item selection screen (B).

**NOTE**

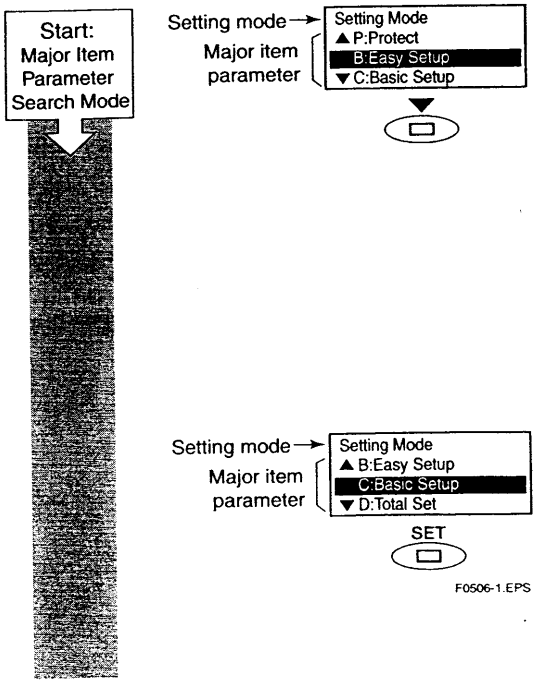
If the input value is outside the valid selection range, the message "Out of range. Touch any key." will be displayed. In such a case, touch any switch to return to Parameter Replacement Mode and redo the setting.

**NOTE**

If more than one decimal point has been input, the message "Invalid value. Touch any key." will be displayed. In such a case, touch any switch to return to Parameter Replacement Mode and redo the setting.

## 5.3.3 Setting Example for Alphanumeric-Type Data: Tag number

This example describes the setting of the tag number for the alphanumeric-type parameter **C10: Tag No.** from "FI-1101" to "FI-1201."




**Setting Mode Condition**

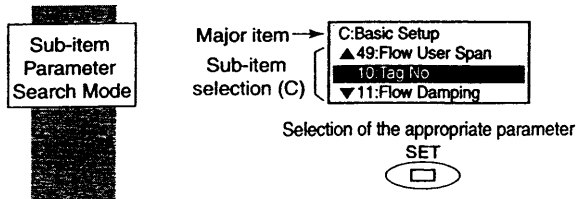
Touch the ▼ switch to access **C: Basic Setup**.

**NOTE**

The ▲ and ▼ symbols to the left of the parameters indicate that additional setting items to those being currently displayed may also be selected. Use the ▼ switch to cycle through these items.

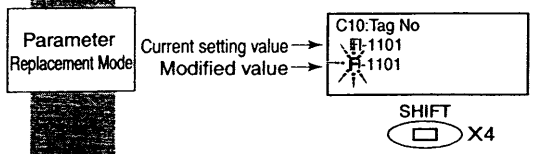
The cursor has been moved to **C: Basic Setup** in this screen.

Touch the SET switch to enter **C: Basic Setup**.

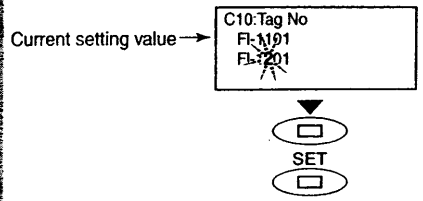



Upon selection of **C: Basic Setup**, the cursor will be positioned at **C10: Tag No**. (Sub-item selection screen (C))

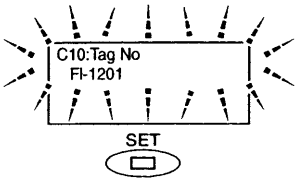
Touch the SET switch to access Parameter Replacement Mode.



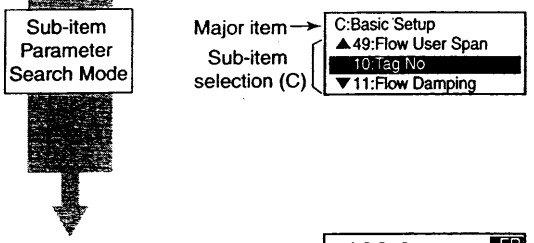

The cursor will flash on and off on the left of the tag number. As "FI-1201" is to be setup in this example, touch the SHIFT switch to move the cursor to the position for multiples of 100.



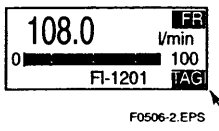

At the position for multiples of 100, touch the ▼ switch to change the "1" to "2". When the setting has been changed to "FI-1201", touch the SET switch.




When the SET switch is touched, the entire display flashes on and off. Confirm that the setting has been correctly changed to "FI-1201", and then fix this setting by touching the SET switch once again.




The system returns automatically to sub-item selection screen (C).




After returning to Display Mode by touching using the ( SET and SHIFT ) twice as escape switches, it will be possible to confirm the modified content (if Display Select has been setup to display the tag number.)

Indicates selection of Tag No display for B42: Display Select3.

# 6. PARAMETER DESCRIPTION

## 6.1 Parameters

With the exception of parameters that were specified by the customer upon ordering, all of the internal parameters will initially be set to default values. Actions such as the modification of display details can then be carried out whenever necessary.

**IMPORTANT**

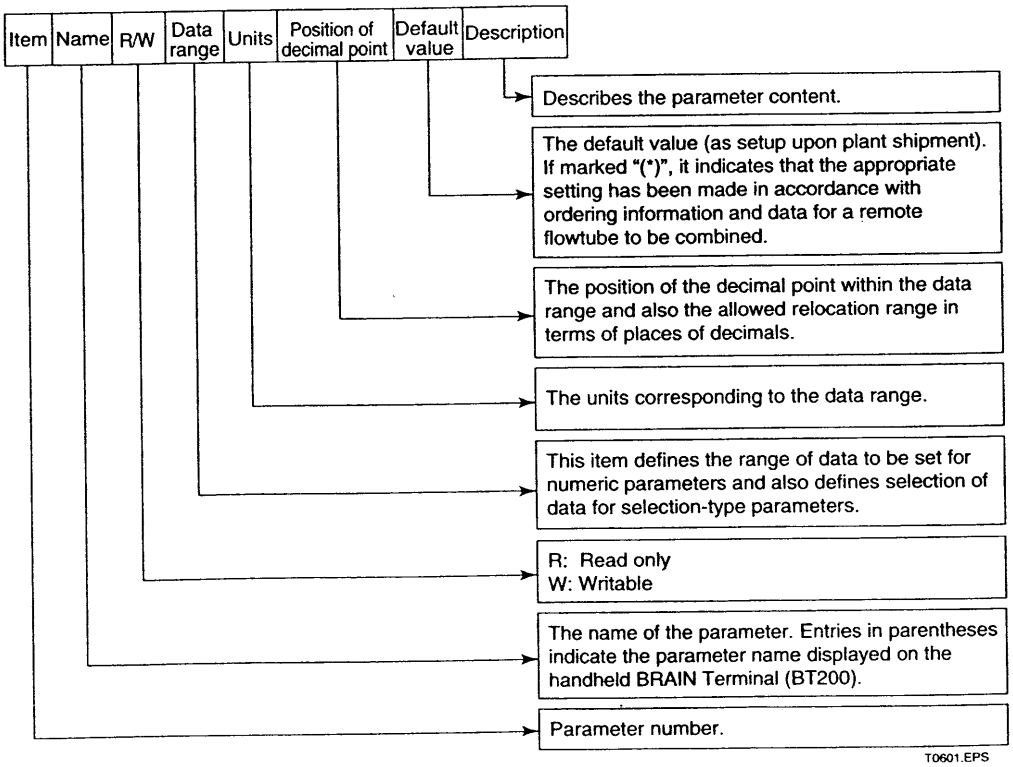
Make sure to keep the instrument's power on at least for 30 seconds after you set the parameters. If you turn the power off immediately after the parameters are set, the settings will be canceled.

**NOTE**

In order to ensure that correct flow rate data can be acquired, it is crucial that the nominal size, flow rate span, and meter factor of the combined remote flowtube are set. In cases where a remote flowtube is ordered at the same time as the AXFA14, or where the AXF integral flowmeter is ordered, the nominal size and meter factor will be set upon shipment from the manufacturing plant, and these will not require additional setting. If the AXFA14 is ordered separately, the default value will be set for the meter factor; accordingly, it will be necessary to change this setting to the meter factor indicated on your remote flowtube data plate.
If a flow rate span was specified upon ordering, this will be set before shipment. If this is not the case, however, it will be necessary for the appropriate value to be set by the user.

## 6.2 Parameter Lists

Parameter lists are comprised of the following items.



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# 6.3 Parameter List Overview

### (1) Item A (Menu A): Display items

Menu A contains the instantaneous flow rate, totalization values, and other items relevant to display.

| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| A00 | Display (DISPLAY) | | | | | | |
| A10 | FR (FLOW RATE (%)) | R | -110.0 to 110.0 | % | 1 | | For Display Mode only |
| A20 | FR (FLOW RATE) | R | -999999 to 999999 | B21/B22 (C40/C41) | 0 to 3 | | For Display Mode only |
| A21 | FR (FLW RATE (mA)) | R | 2.400 to 21.600 | mA | 3 | | For Display Mode only |
| A30 | FTL (TOTAL) | R | 0 to 99999999 | B30 (D10) | 0 to 7 | | For Display Mode only |
| A31 | RTL (REV TOTAL) | R | 0 to 99999999 | B30 (D10) | 0 to 7 | | For Display Mode only |
| A32 | DTL (DIF TOTAL) | R | -99999999 to 99999999 | B30 (D10) | 0 to 7 | | For Display Mode only |
| A60 | — (SELF CHECK) | R | Good<br>Error | | | | See "6.5 Alarm Functions". |

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### (2) Item B (Menu B): Easy Setup items

Those parameters with a high frequency of use have been grouped together in Menu B. All basic functions can be controlled using only the parameters from this block.

| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| B00 | Easy Setup (EASY SETUP) | | | | | | |
| B10 | Language (LANGUAGE) | W | English<br>Japanese<br>French<br>German<br>Italian<br>Spanish | | | English | Selects the language used for the display unit. Linked with H30. |
| B20 | Flow Damping (FLOW DAMPING) | W | 0.1 to 200.0 | s | 1 | 3.0 s | Sets damping time. Linked with C11. |
| B21 | Base Flow Unit (FLOW UNIT) | W | Ml(Megaliter)<br>$m^3$<br>kl (Kiloliter)<br>l (Liter)<br>$cm^3$<br>m<br>t<br>kg<br>g<br>kcf<br>cf<br>mcf<br>Mgal (US)<br>kgal (US)<br>gal (US)<br>mgal (US)<br>kbbl (US Oil)<br>bbl (US Oil)<br>mbbl (US Oil)<br>ubbl (US Oil)<br>kbbl (US Beer)<br>bbl (US Beer)<br>mbbl (US Beer)<br>ubbl (US Beer)<br>ft<br>klb (US)<br>lb (US) | | | m (*) | Selects flow units for the flow rate span. Linked with C40. |

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| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| B22 | Base Time Unit<br>(TIME UNIT) | W | /d<br>/h<br>/min<br>/s | | | /s (*) | Selects time units for the flow rate span. Linked with C41. |
| B23 | Flow Span<br>(FLOW SPAN) | W | 0.00001 to 32000 | B21/B22<br>(C40<br>/C41) | 0 to 5 | 1 m/s (*) | Sets flow rate span (with units from B21 and B22). Linked with C42. |
| B24 | Flow Decimal Pnt<br>(FLOW DECIMAL)<br>300 L/S<br>1000 m³/h | W | Auto<br>0<br>1<br>2<br>3 | | | Auto (*) | Selects decimal point position for the display unit's instantaneous flow rate. Linked with C43. |
| B30 | Total Unit<br>(TOTAL UNIT) | W | n Unit/P<br>u Unit/P<br>m Unit/P<br>Unit/P<br>k Unit/P<br>M Unit/P<br>Pulse/s | | | Pulse/s (*) | Selects the flow rate unit per one pulse as used for totalization display. Linked with D10. |
| B31 | Total Scale<br>(TOTAL SCALE) | W | 0 to 32000 | B30<br>(D10) | 0 to 5 | 0 (*) | Sets the flow rate per one pulse as used for the totalization display. Linked with D11. |
| B32 | Pulse Unit<br>(PULSE UNIT) | W | n Unit/P<br>u Unit/P<br>m Unit/P<br>Unit/P<br>k Unit/P<br>M Unit/<br>Pulse/s | | | Pulse/s (*) | Selects the flow rate unit per one pulse as used for pulse output. Linked with E10. |
| B33 | Pulse Scale<br>(PULSE SCALE) | W | 0 to 32000 | B32<br>(E10) | 0 to 5 | 0 (*) | Sets the flow rate per one pulse as used for pulse output. Linked with E11. |
| B40 | Display Select1<br>(DISP SELECT1) | W | Flow Rate(%)<br>Flow Rate<br>Flow Rate(mA)<br>Forward Total<br>Reverse Total<br>Dif Total | | | Flow Rate | Selects content of the first line for Display Mode. Linked with H10. |
| B41 | Display Select2<br>(DISP SELECT2) | W | Off<br>Flow Rate(%)<br>Flow Rate<br>Flow Rate(mA)<br>Flow Rate(Bar)<br>Forward Total<br>Reverse Total<br>Dif Total<br>Tag No<br>Adhesion Check<br>Communication | | | Off | Selects content of the second line for Display Mode. Linked with H11. |
| B42 | Display Select3<br>(DISP SELECT3) | W | Same as B41<br>(Display Select2) | | | Off | Selects content of the third line for Display Mode. Linked with H12. |
| B50 | Auto Zero Exe<br>(AUTOZERO EXE) | W | No Execution<br>Execution | | | No Execution | Selects whether or not automatic zero adjustment is carried out. Linked with M10. |
| B60 | —<br>(SELF CHECK) | R | Good<br>Error | | | | See "6.5 Alarm Functions". |

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### (3) Item C (Menu C): Basic Setting items

Menu C principally contains the basic setting items for the flowtube.

| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| C00 | Basic Setup (BASIC SETUP) | | | | | | |
| C10 | Tag No (TAG NO) | W | ASCII 16 characters | | | | Sets Tag number up to 16 characters. |
| C11 | Flow Damping (FLOW DAMPING) | W | 0.1 to 200.0 | s | 1 | 3.0 s | Sets damping time. Linked with B20. |
| C20 | Measure Mode (MEASURE MODE) | W | Standard DF<br>Enhanced DF | | | Standard DF | Selects measurement mode for dual frequency excitation |
| C21 | Low MF (LOW MF) | W | 0.0100 to 3.0000 | | 4 | 1.0000 (*) | Sets low-frequency meter factor for standard dual frequency excitation |
| C22 | High MF (HIGH MF) | W | 0.0100 to 3.0000 | | 4 | 1.0000 (*) | Sets high-frequency meter factor for standard dual frequency excitation |
| C23 | Low MF(EDF) (LOW MF(EDF)) | W | 0.0000 to 3.0000 | | 4 | 1.0000 (*) | Sets low-frequency meter factor for enhanced dual frequency excitation |
| C24 | High MF(EDF) (HIGH MF(EDF)) | W | 0.0000 to 3.0000 | | 4 | 1.0000 (*) | Sets high-frequency meter factor for enhanced dual frequency excitation |
| C31 | Nominal Size Unit (SIZE UNIT) | W | mm<br>inch | | | mm<br>inch | Selects the nominal size units for the flowtube. |
| C32 | Nominal Size (NOMINAL SIZE) | W | 0.99 to 3000.1<br>0.01 to 120.1 | mm<br>inch | 0 to 5 | 100 (*) | Sets flowtube nominal size in selected unit at C31. |
| C40 | Base Flow Unit (FLOW UNIT) | W | Ml(Megaliter)<br>$m^3$<br>kl(Kiloliter)<br>l(Liter)<br>$cm^3$<br>m<br>t<br>kg<br>g<br>kcf<br>cf<br>mcf<br>Mgal (US)<br>kgal (US)<br>gal (US)<br>mgal (US)<br>kbbl (US Oil)<br>bbl (US Oil)<br>mbbl (US Oil)<br>ubbl (US Oil)<br>kbbl (US Beer)<br>bbl (US Beer)<br>mbbl (US Beer)<br>ubbl (US Beer)<br>ft<br>klb (US)<br>lb (US) | | | m (*) | Selects flow units for the flow rate span. Linked with B21. |
| C41 | Base Time Unit (TIME UNIT) | W | /d<br>/h<br>/min<br>/s | | | /s (*) | Selects time units for the flow rate span. Linked with B22. |
| C42 | Flow Span (FLOW SPAN) | W | 0.00001 to 32000 | C40/C41 (B21 /B22) | 0 to 5 | 1 m/s (*) | Sets flow rate span (with units from C40 and C41). Linked with B23. |
| C43 | Flow Decimal Pnt (FLOW DECIMAL) | W | Auto<br>0<br>1<br>2<br>3 | | | Auto (*) | Selects decimal point position for the display unit's instantaneous flow rate. Linked with B24. |

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| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| C44 | Velocity Check (VELOCITY CHK) | R | 0.000 to 99.999 | m/s | 3 | | Display of the span setting using flow velocity (m/s). |
| C45 | Density Unit (DENSITY UNIT) | W | kg/m$^3$<br>lb/gal<br>lb/cf | | | kg/m$^3$ | Sets units for density when mass flow rate is selected. |
| C46 | Mass Flow Density (MASS DENSITY) | W | 0 to 32000 | C45 | 0 to 5 | 0 | Sets density when mass flow rate is selected (with units from C45). |
| C47 | User Span Select (USER SPN SEL) | W | No<br>Yes | | | No | Selects whether or not special units are used for flow rate units. |
| C48 | Flow User Unit (FL USER UNIT) | W | 8 alphanumeric characters | | | | Sets the special flow rate units. |
| C49 | Flow User Span (FL USER SPAN) | W | 0.00001 to 32000 | C48 | 0 to 5 | 100 | Sets span when using special flow rate units. |
| C60 | —<br>(SELF CHECK) | R | Good<br>Error | | | | See "6.5 Alarm Functions". |

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### (4) Item D (Menu D): Total Setting items

Menu D contains setting items such as the totalization scale and the forward/reverse totalized values.

| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| D00 | Total Set (TOTAL SET) | | | | | | |
| D10 | Total Unit (TOTAL UNIT) | W | n Unit/P<br>u Unit/P<br>m Unit/P<br>Unit/P<br>k Unit/P<br>M Unit/P<br>Pulse/s | | | Pulse/s (*) | Selects the flow rate unit per one pulse as used for totalization display. Linked with B30. |
| D11 | Total Scale (TOTAL SCALE) | W | 0 to 32000 | D10 (B30) | 0 to 5 | 0 (*) | Sets the flow rate per one pulse as used for totalization display. Linked with B31. |
| D12 | Total Decimal Pnt (TL DECIMAL) | W | 0<br>1<br>2<br>3<br>4<br>5<br>6<br>7 | | | 0 | Selects position of decimal point for totalization display |
| D13 | Total Low Cut (TOTAL LOWCUT) | W | 0 to 100 | % | 0 | 3 % | Sets the range in vicinity of 0% within which the totalization display will be halted. |
| D20 | Total Execution (TOTAL EXEC) | W | Start<br>Stop<br>Preset Total<br>Preset Rev Total | | | Start | Executes "Start" or "Stop" of the totalization function, or executes "Preset Total" or "Preset Rev Total". |
| D21 | Ttl Set Val Lower (TL SET VAL L) | W | 0 to 999999 | | 0 | 0 | Sets the totalization preset value in the lower 6 digits of the 8-digit totalized value. |
| D22 | Ttl Set Val Upper (TL SET VAL U) | W | 0 to 99 | | 0 | 0 | Sets the totalization preset value in the upper 2 digits of the 8-digit totalized value. |
| D23 | Ttl Switch Lower (TL SWITCH LO) | W | 0 to 999999 | | 0 | 0 | Sets the totalization switch value in the lower 6 digits of the 8-digit totalized value. |
| D24 | Ttl Switch Upper (TL SWITCH UP) | W | 0 to 99 | | 0 | 0 | Sets the totalization switch value in the upper 2 digits of the 8-digits totalized value. |
| D30 | Ttl User Select (TL USER SEL) | W | No<br>Yes | | | No | Selects whether or not special units are used as totalized units. |
| D31 | Ttl User Unit (TL USER UNIT) | W | 8 alphanumeric characters | | | | Sets the special totalized units. |
| D60 | —<br>(SELF CHECK) | R | Good<br>Error | | | | See "6.5 Alarm Functions". |

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### (5) Item E (Menu E): Pulse Setting items

Menu E contains items relevant to pulse output. This is used to set parameters such as the pulse scale and width.

| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| E00 | Pulse Set<br>(PULSE SET) | | | | | | |
| E10 | Pulse Unit<br>(PULSE UNIT) | W | n Unit/P<br>u Unit/P<br>m Unit/P<br>Unit/P<br>k Unit/P<br>M Unit/P<br>Pulse/s | | | Pulse/s (*) | Selects the flow rate unit per one pulse as used for pulse output. Linked with B32. |
| E11 | Pulse Scale<br>(PULSE SCALE) | W | 0 to 32000 | E10<br>(B32) | 0 to 5 | 0 (*) | Sets the flow rate per one pulse as used for pulse output. Linked with B33. |
| E12 | Pulse Width<br>(PULSE WIDTH) | W | 50% Duty<br>0.05 ms<br>0.1ms<br>0.5 ms<br>1 ms<br>20 ms<br>33 ms<br>50 ms<br>100 ms | | | 50% Duty | Selects the pulse width for pulse output. |
| E13 | Pulse Low Cut<br>(PULSE LOWCUT) | W | 0 to 100 | % | 0 | 3 % | Sets the range in vicinity of 0% within which pulse output will be halted. |
| E60 | —<br>(SELF CHECK) | R | Good<br>Error | | | | See "6.5 Alarm Function". |

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### (6) Item F (Menu F): Status Functions Setting items

Menu F contains items relevant to multiplex range output and other status Input/Output.

| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| F00 | Status Function<br>(STATUS FUNC) | | | | | | |
| F20 | DO Function<br>(DO FUNCTION) | W | No Function<br>Pulse Output<br>Alarm Output<br>Warning Output<br>Total Switch (O)<br>H/L Alarm (O)<br>HH/LL Alarm (O)<br>Fwd/Rev Rngs (O)<br>Auto 2 Rngs (O)<br>Auto 3 Rngs (O)<br>Auto 4 Rngs (O)<br>Ext 2 Answer (O) | | | Pulse Output | Selects function for the DO terminal |
| F21 | DIO Function<br>(DIO FUNCTION) | W | No Function<br>Alarm Output<br>Warning Output<br>Total Switch (O)<br>H/L Alarm (O)<br>HH/LL Alarm (O)<br>Fwd/Rev Rngs (O)<br>Auto 2 Rngs (O)<br>Auto 3 Rngs (O)<br>Auto 4 Rngs (O)<br>Ext 2 Answer (O)<br>0% Singal Lock (I)<br>Ext Auto Zero (I)<br>Ext Ttl Set (I)<br>Ext R Ttl Set (I)<br>Ext 2 Ttl Set (I) | | | No Function | Selects function for the DIO terminal |

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| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| F22 | DO Active Mode (DO ACT MODE) | W | Closed(On) Act<br>Open(Off) Act | | | Closed(On) Act | Selects whether DO terminal will be set to "On Active" or "Off Active". |
| F23 | DIO Active Mode (DIO ACT MODE) | W | Closed/Short Act<br>Open/Open Act | | | Closed/Short Act | Selects whether DIO terminal will be set to "Closed/Short Active" or"Open/Open Active". |
| F30 | Forward Span2 (FWD SPAN2) | W | 0.00001 to 32000 | C40 /C41 | 0 to 5 | 1 | Sets flow rate span for forward No. 2 range |
| F31 | Forward Span3 (FWD SPAN3) | W | 0.00001 to 32000 | C40 /C41 | 0 to 5 | 1 | Sets flow rate span for forward No. 3 range |
| F32 | Forward Span4 (FWD SPAN4) | W | 0.00001 to 32000 | C40 /C41 | 0 to 5 | 1 | Sets flow rate span for forward No. 4 range |
| F33 | Reverse Span1 (REV SPAN1) | W | 0.00001 to 32000 | C40 /C41 | 0 to 5 | 1 | Sets flow rate span for reverse No. 1 range |
| F34 | Reverse Span2 (REV SPAN2) | W | 0.00001 to 32000 | C40 /C41 | 0 to 5 | 1 | Sets flow rate span for reverse No. 2 range |
| F40 | Auto Range Hys (AUTO RNG HYS) | W | 0 to 15 | % | 0 | 10 % | Sets hysteresis width for automatic range switching |
| F41 | Bi Direction Hys (BI DIREC HYS) | W | 0 to 8 | % | 0 | 2 % | Sets hysteresis width for forward/reverse switching |
| F60 | —<br>(SELF CHECK) | R | Good<br>Error | | | | See "6.5 Alarm Function". |

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### (7) Item G (Menu G): Alarm Setting items

Menu G contains setting items relevant to alarm output, burnout, alarm record, etc.

| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| G00 | Alarm (ALARM) | | | | | | |
| G10 | Low Alarm (LOW ALARM) | W | -110 to 110 | % | 0 | -110 | Sets level setting value for low flow rate limit (L) |
| G11 | High Alarm (HIGH ALARM) | W | -110 to 110 | % | 0 | 110 | Sets level setting value for high flow rate limit (H) |
| G12 | Low Low Alarm (LO LO ALARM) | W | -110 to 110 | % | 0 | -110 | Sets level setting value for low-low flow rate limit (LL) |
| G13 | High High Alarm (HI HI ALARM) | W | -110 to 110 | % | 0 | 110 | Sets level setting value for high-high flow rate limit (HH) |
| G14 | H/L Alarm Hys (H/L ALM HYS) | W | 0 to 10 | % | 0 | 5 % | Sets hysteresis width for high-low flow rate limit alarm |
| G21 | 4-20mA Alarm Out (4-20 ALM OUT) | W | 2.4mA or Less<br>4.0mA<br>Hold<br>21.6mA or More | | | 21.6mA or More | Selects the current output during alarm occurrence. |
| G22 | 4-20mA Burn Out (4-20 BURNOUT) | R | High<br>Low | | | — | Displays the current output during a CPU failure. |
| G30 | Alm-Setting (ALM-SETTING) | W | No<br>Yes | | | Yes | Selects whether a setting alarm is to be specified as an alarm. |
| G31 | Alm-Sig Over (ALM-SIG OVER) | W | No<br>Yes | | | Yes | Selects whether a signal overflow alarm is to be specified as an alarm. |
| G32 | Alm-Emp Pipe (ALM-EMP PIPE) | W | No<br>Yes | | | Yes | Selects whether an empty pipe alarm is to be specified as an alarm. |
| G33 | Alm-HH/LL (ALM-HH/LL) | W | No<br>Yes | | | No | Selects whether a flow rate high-high or low-low alarm is to be specified as an alarm. |
| G34 | Alm-Adhesion (ALM-ADHESION) | W | No<br>Yes | | | No | Selects whether an electrode adhesion alarm is to be specified as an alarm. |

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| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| G40 | Operation Time<br>(OPERATE TIME) | R | 0D 00:00 to<br>99999D 23:59 | | | | Operation time |
| G41 | Alm Record1<br>(ALM RECORD1) | R | 10:uP Fault<br>11:EEPROM Fault<br>12:A/D(H) Fault<br>13:A/D(L) Fault<br>14:A/D(Z) Fault<br>15:Coil Open<br>16:EEPROM Dflt<br>18:Power Off<br>19:Inst Pwr Fail<br>28:WDT<br>30:Sig Overflow<br>31:Empty Pipe<br>33:Adhesion Alm | | | | Displays the content of the most recent alarm. |
| G42 | Alm Record Time1<br>(ALM TIME 1) | R | 0D 00:00 to<br>99999D 23:59 | | | | Displays the operation time at the occurrence of the most recent alarm. |
| G43 | Alm Record2<br>(ALM RECORD2) | R | See G41 | | | | Displays the content of the second most recent alarm. |
| G44 | Alm Record Time2<br>(ALM TIME 2) | R | 0D 00:00 to<br>99999D 23:59 | | | | Displays the operation time at occurrence of the second most recent alarm. |
| G45 | Alm Record3<br>(ALM RECORD3) | R | See G41 | | | | Displays the content of the third most recent alarm. |
| G46 | Alm Record Time3<br>(ALM TIME 3) | R | 0D 00:00 to<br>99999D 23:59 | | | | Displays the operation time at the occurrence of the third most recent alarm. |
| G47 | Alm Record4<br>(ALM RECORD4) | R | See G41 | | | | Displays the content of the fourth most recent alarm. |
| G48 | Alm Record Time4<br>(ALM TIME 4) | R | 0D 00:00 to<br>99999D 23:59 | | | | Displays the operation time at the occurrence of the fourth most recent alarm. |
| G60 | —<br>(SELF CHECK) | R | Good<br>Error | | | | See "6.5 Alarm Functions". |

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### (8) Item H (Menu H): Display Setting items

Menu H contains setting items that are relevant to display on the display unit.

| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| H00 | Display Set<br>(DISP SET) | | | | | | |
| H10 | Display Select1<br>(DISP SELECT1) | W | Flow Rate(%)<br>Flow Rate<br>Flow Rate(mA)<br>Forward Total<br>Reverse Total<br>Dif Total | | | Flow Rate(%) | Selects content of the first line for Display Mode. Linked with B40. |
| H11 | Display Select2<br>(DISP SELECT2) | W | Off<br>Flow Rate(%)<br>Flow Rate<br>Flow Rate(mA)<br>Flow Rate(Bar)<br>Forward Total<br>Reverse Total<br>Dif Total<br>Tag No<br>Adhesion Check<br>Communication | | | Off | Selects content of the second line for Display Mode. Linked with B41. |
| H12 | Display Select3<br>(DISP SELECT3) | W | Same as H11<br>(Display Select2) | | | Off | Selects content of the third line for Display Mode. Linked with B42. |
| H20 | Display Cycle<br>(DISP CYCLE) | W | 200ms<br>400ms<br>1s<br>2s<br>4s<br>8s | | | 400ms | Selects the display cycle. |
| H30 | Language<br>(LANGUAGE) | W | English<br>Japanese<br>French<br>German<br>Italian<br>Spanish | | | English | Selects the language used by the display unit. Linked with B10. |
| H60 | —<br>(SELF CHECK) | R | Good<br>Error | | | | See "6.5 Alarm Functions". |

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### (9) Item J (Menu J): Auxiliary Function Setting items

Menu J contains setting items such as the flow direction, rate limits, and low cut.

| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| J00 | Aux<br>(AUX) | | | | | | |
| J10 | 4-20mA Low Cut<br>(4-20 LOW CUT) | W | 0 to 10 | % | 0 | 0% | Sets the range in vicinity of 0% within which the current output will be 4 mA. |
| J11 | 4-20mA Low Lmt<br>(4-20 LOW LMT) | W | -20.0 to 100.0 | % | 1 | -20.0% | Sets the low limit for current output |
| J12 | 4-20mA High Lmt<br>(4-20 HI LMT) | W | 0.0 to 120.0 | % | 1 | 120.0% | Sets the high limit for current output |
| J20 | Flow Direction<br>(FLOW DIRECT) | W | Forward<br>Reverse | | | Forward | Selects the flow direction. |
| J21 | Rate Limit<br>(RATE LIMIT) | W | 0 to10 | % | 0 | 5% | Sets the level to reduce output fluctuation. |
| J22 | Dead Time<br>(DEAD TIME) | W | 0 to 15 | s | 0 | 0s | Sets the dead time to reduce output fluctuation. When "0" is set, rate limit function is not available. |
| J23 | Pulsing Flow<br>(PULSING FLOW) | W | No<br>Yes | | | No | Selects whether pulsing flow is to be supported. |
| J24 | T/P Damp Select<br>(T/P DAMP SEL) | W | Damping<br>No Damping | | | Damping | Selects whether the flow rate value obtained through damping calculation for total/pulse or the instantaneous flow rate value (no damping) for total/pulse is to be used. |

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| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| J30 | Power Synch (POWER SYNCH) | W | No<br>Yes | | | Yes | Selects whether or not the internal frequency is to be synchronized with the power supply frequency. |
| J31 | Power Frequency (POWER FREQ) | R/W | 47.00 to 63.00 | Hz | 2 | 50.00 | Displays the power-supply frequency (for Power Synch = "Yes"), or sets the power-supply frequency (for Power Synch="No"). |
| J40 | Memo 1 (MEMO 1) | W | ASCII 16 characters | | | | Memo field |
| J41 | Memo 2 (MEMO 2) | W | ASCII 16 characters | | | | Memo field |
| J42 | Memo 3 (MEMO 3) | W | ASCII 16 characters | | | | Memo field |
| J50 | Software Rev No (SOFTWARE REV) | R | — | | | | Software revision number |
| J60 | —<br>(SELF CHECK) | R | Good<br>Error | | | | See "6.5 Alarm Functions". |

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### (10) Item K (Menu K): Diagnostic Function Setting items

Menu K contains items that are relevant to the diagnosis of insulation adhesion to the electrode.

| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| K00 | Diagnosis (DIAGNOSIS) | | | | | | |
| K10 | Adhesion Check (ADHESION CHK) | W | No<br>Yes | | | No | Selects whether or not to perform diagnosis of adhesion to the electrode. |
| K11 | Adhesion Level1 (ADH LEVEL1) | W | 0.00 to 100.00 | M ohm | 2 | 0.10 | Sets the resistance value for adhesion Level 1 to the electorode. |
| K12 | Adhesion Level2 (ADH LEVEL2) | W | 0.00 to 100.00 | M ohm | 2 | 0.50 | Sets the resistance value for adhesion Level 2 to the electorode. |
| K13 | Adhesion Level3 (ADH LEVEL3) | W | 0.00 to 100.00 | M ohm | 2 | 1.00 | Sets the resistance value for adhesion Level 3 to the electorode. |
| K14 | Adhesion Level4 (ADH LEVEL4) | W | 0.00 to 100.00 | M ohm | 2 | 3.00 | Sets the resistance value for adhesion Level 4 to the electorode. |
| K15 | Adh Measure Value (ADH MEAS VAL) | R | — | M ohm | 2 | | Displays the resistance value for adhesion to the electrode. |
| K60 | —<br>(SELF CHECK) | R | Good<br>Error | | | | See "6.5 Alarm Functions". |

T0611.EPS

### (11) Item M (Menu M): Automatic Zero-Adjustment Function Setting items

Menu M contains items that are relevant to automatic zero adjustment.

| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| M00 | Adjustment (ADJUSTMENT) | | | | | | |
| M10 | Auto Zero Exe (AUTOZERO EXE) | W | No Execution<br>Execution | | | No Execution | Selects whether or not automatic zero adjustment is carried out. Linked with B50. |
| M11 | Magflow Zero (MAGFLOW | R/W | -99.999 to 99.999 | | 3 | 0.000 | Displays the result of the automatic zero adjustment, or sets the zero point. |
| M60 | —<br>(SELF CHECK) | R | Good<br>Error | | | | See "6.5 Alarm Functions". |

T0612.EPS

### (12) Item N (Menu N): Loop Test Setting items

Menu N contains items that are relevant to the execution of loop testing.

| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| N00 | Test<br>(TEST) | | | | | | |
| N10 | Test Mode<br>(TEST MODE) | W | Normal<br>Test | | | Normal | Selects whether mode will be set to "Normal" or "Test". |
| N11 | Test Output Value<br>(TEST OUT VAL) | W | -10 to 110 | % | 0 | 0% | Sets the test output value. |
| N30 | Test DO<br>(TEST DO) | W | Open(Off)<br>Closed(On)<br>Pulse | | | Open(Off) | Selects the test condition for DO terminal. |
| N31 | Test DIO (O)<br>(TEST DIO (O)) | W | Input Mode<br>Open(Off)<br>Closed(On) | | | Input Mode | Selects the test condition for DIO terminal used for output. |
| N32 | Test DIO (I)<br>(TEST DIO (I)) | R | Open<br>Short | | | | Displays the test condition for DIO terminal used for input. |
| N60 | —<br>(SELF CHECK) | R | Good<br>Error | | | | See "6.5 Alarm Functions". |

T0613.EPS

### (13) Item P (Menu P): Parameter Protection items

Menu P contains items that are relevant to write protection and passwords.

| Item | Name<br>Display unit (BRAIN) | R/W | Data range<br>Display unit /BRAIN | Units | Position of decimal point | Default value (*): Indicated item | Description |
|---|---|---|---|---|---|---|---|
| P00 | Protect<br>(PROTECT) | | | | | | |
| P10 | Key Code<br>(KEY CODE) | W | 0 to 9999 | | | 0 | Parameter of the display restriction |
| P20 | Write Protect<br>(W PROTECT) | R | No<br>Yes | | | No | Displays whether or not overwriting of parameter data is prohibited. |
| P21 | Enable Wrt Passwd<br>(ENABLE WRITE) | W | ASCII 8 characters | | | | Sets the correct password so that write protection function will be released. |
| P22 | New Password<br>(NEW PASSWORD) | W | ASCII 8 characters | | | | Sets the password for write protection funcion |
| P23 | Software Seal<br>(SOFT SEAL) | R | Break<br>Keep | | | | Displays whether or not a Joker password was used (Break). |
| P60 | —<br>(SELF CHECK) | R | Good<br>Error | | | | See "6.5 Alarm Functions". |

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# 6.4 Parameter Description

### (1) Menu B: Easy Setup items

Those parameters with a high frequency of use have been grouped together in Easy Setup. All basic functions can be controlled using only the parameters from this block. Parameters from Menu B share identical names with those from other menus; however, modification of one such parameter will result in the other being automatically modified.

**[B10: Language]** Selection of language used for the display unit
→ This setting is linked with that of parameter **H30**.
One of the following languages can be selected for the display unit.

**Data Range**

| Setting item | Description |
|---|---|
| English | All parameters, alarm messages, etc. displayed in English. |
| Japanese | All parameters, alarm messages, etc. displayed in Japanese katakana. |
| French | All parameters, alarm messages, etc. displayed in French. |
| German | All parameters, alarm messages, etc. displayed in German. |
| Italian | All parameters, alarm messages, etc. displayed in Italian. |
| Spanish | All parameters, alarm messages, etc. displayed in Spanish. |

T0614.EPS

**[B20: Flow Damping]** Setting of the damping time constant
→ This setting is linked with that of parameter **C11**.
The damping time constant should be modified to suppress an output fluctuation or to change the response time. This time constant has an effect on analog output and on the flow rate display (i.e., actual instantaneous flow rate, %, current value), and in addition, it also affects pulse output and totalization. However, when "No Damping" has been set for **J24: T/P Damp Select**, there will be no effect on pulse output or totalization.

* Time constant: The time required for the output to reach 63.2% from 0%.

**[B21: Base Flow Unit]** Selection of flow units for the flow rate span
→ This setting is linked with that of parameter **C40**.
This parameter selects the flow units for the flow rate span. (In case of mass flow, the setting of density is also required. Refer to **C46: Mass Flow Density** for more details.)

**[B22: Base Time Unit]** Selection of time units for the flow rate span
→ This setting is linked with that of parameter **C41**.
This parameter selects the time units for the flow rate span; however, if "m" has been selected for the flow rate units, "/s" is automatically set for this parameter.

**[B23: Flow Span]** Setting of the flow rate span
→ This setting is linked with that of parameter **C42**.
The span can be set for the forward flow rate in the range 0 to 32,000 (although this does not include 0). The units set using **B21/C40: Base Flow Unit** and **B22/C41: Base Time Unit** will be displayed at this time.

**NOTE**

If the flow rate units, time units, and flow rate span are specified upon ordering, these parameters will be setup before shipment; however, if this is not the case, it will be necessary for the appropriate values to be set up by the user.

**NOTE**

Flow rate span is the value for instantaneous flow rate that corresponds to a current output of 20 mA. The following factors should be taken into consideration when deciding on the flow rate span.

- In the case of applications with large variations in flow rate, the maximum flow rate should be set. If a flow rate in excess of the flow rate span was to occur, output would be possible up to an upper limit of 108%, and beyond this, error would occur. Note that the same applies to pulse output and totalization.
- In the case of applications that have a relatively stable flow rate, a flow rate span of 1.5 to 2.0 times larger than the normal flow rate may be considered suitable.
- The flow rate to be adopted should - upon conversion to flow velocity - correspond to a value within the range of 0.1 to 10 m/s. The flow velocity can be confirmed using sizing data or with parameter **C44: Velocity Check**, and in the latter case, the value obtained when span is converted to flow velocity will be displayed.
- Regardless of the position of the decimal point, the largest value that can be set on the display unit is 32,000. Furthermore, it is not possible to set a number of 4 or greater for the highest-order digit. Similarly, if 3 is set for this highest-order digit, it will not be possible to set a

number of 2 or greater for the next digit to the right, regardless of the position of the decimal point.
Example: A value of 333.33 is represented by the character string 33333, and since this exceeds 32000, it cannot be set. In such a case, the value 333.3 should be set instead.

**[B24: Flow Decimal Pnt]** Setting of the decimal point position for the instantaneous flow rate
→ This setting is linked with that of parameter **C43**.
This parameter sets the position of the decimal point for instantaneous flow rate values in terms of the number of digits. When set using "Auto", the decimal point position will be automatically determined in accordance with the setting value for **B23/C42: Flow Span** as shown below.

| | |
|---|---|
| Flow Span ≤ 9 | Decimal point position: 3 digits |
| 9 < Flow Span ≤ 90 | Decimal point position: 2 digits |
| 90 < Flow Span ≤ 900 | Decimal point position: 1 digit |
| 900 < Flow Span | Decimal point position: no digits (i.e., no decimal point) |

When an item other than "Auto" is set, the selected number of digits for the decimal point position is used.

With the decimal point removed, 6 digits are available for the instantaneous flow rate value, and display is possible up to 999,999. If an overflow occurs as a result of the setting adopted for decimal point position, the warning **84: Disp Over Wng** will be displayed to provide notification of this condition.

**Example: When 1000 m³/h is set for B23/C42: Flow Span**

| Item | Display content for instantaneous flow rate value |
|---|---|
| Auto | 1000 m³/h |
| 0 | 1000 m³/h |
| 1 | 1000.0 m³/h |
| 2 | 1000.00 m³/h |
| 3 | With the decimal point removed, 7 digits are not available for the instantaneous flow rate value; therefore, a warning is displayed. |

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**[B30: Total Unit]** Setting of units for totalization scale
→ This setting is linked with that of parameter **D10**.
This parameter selects the flow rate units for use in totalization.

| Item | Description |
|---|---|
| n Unit/P | $10^{-9}$×FU |
| u Unit/P | $10^{-6}$×FU |
| m Unit/P | $10^{-3}$×FU |
| Unit/P | FU |
| k Unit/P | $10^{3}$×FU |
| M Unit/P | $10^{6}$×FU |
| Pulse/s | Number of pulses to be counted for one second at 100% output. |

FU: Flow rate unit selected in B21/C40: Base Flow Unit.

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**[B31: Total Scale]** Setting of the totalization scale
→ This setting is linked with that of parameter **D11**.
The flow rate is totalized in individual counts in accordance with this parameter's setting. If 0 is selected, it indicates that the totalization function is not to be used.

**NOTE**

If a totalization scale is specified upon ordering, this parameter is set up before shipment; however, if this is not the case, it will be necessary for the appropriate value to be set up by the user.

**NOTE**

- By setting the totalization scale, the totalized value is displayed on the display unit. The totalization scale is determined in accordance with the settings of **B30/D10: Total Unit** and **B31/D11: Total Scale**.
- The maximum value that can be displayed is 99999999, and if this is exceeded, the value 0 is counted once again. However, counting stops at 99999999 when the totalization switch function is used.
- If multiple ranges are being used, the flow rate span for the smallest range becomes the standard for the **D13: Total Low Cut** setting value.
- Totalization for the reverse flow rate and for the differential flow rate is carried out only when "Fwd/Rev Ranges" is selected for **F20: DO Function** or **F21: DIO Function**.
- The totalized units are indicated on the display unit when **B31/D11** is 0.001, 0.01, 0.1, 1, 10, 100, or 1000. In the case of other setting values, the totalized units are not indicated.

Example 1: To count in 1 Ml (mega-liter) steps with flow rate span = 100 $m^3/h$
Since 1 Ml = $10^3$ x $m^3$, k Unit/P is set for **B30/D10**, and 1 is set for **B31/D11**. "x$10^3$ $m^3$" is indicated for the totalized units in the Display Mode.

Example 2: To count in 10 l (liter) steps with flow rate span = 100 $m^3/h$
Since 1 l = $10^{-3}$ x $m^3$, m Unit/P is set for **B30/D10**, and 10 is set for **B31/D11**. "x$10^{-2}$ $m^3$" is indicated for the totalized units in the Display Mode.

Example 3: To count in 5 l (liter) steps with flow rate span = 100 $m^3/h$
Since 1 l = $10^{-3}$ x $m^3$, m Unit/P is set for **B30/D10**, and 5 is set for **B31/D11**. Since **B31/D11** is not 0.001, 0.01, 0.1, 1, 10, 100, or 1000, there is no indication of totalized units in the Display Mode.

- Setting of totalization scale is not possible when specific selections have been made for **B30/D10: Total Unit**, **B31/D11: Total Scale**, and **B23/C42: Flow Span**. In such a case, a setting alarm will be displayed, and parameters should be changed in accordance with the instructions given.

**[B32: Pulse Unit]** Setting of the pulse units
→ This setting is linked with that of parameter **E10**.
This parameter selects the flow rate units to be used for pulse output.

| Item | Description |
|---|---|
| n Unit/P | $10^{-9}$×FU |
| u Unit/P | $10^{-6}$×FU |
| m Unit/P | $10^{-3}$×FU |
| Unit/P | FU |
| k Unit/P | $10^{3}$×FU |
| M Unit/P | $10^{6}$×FU |
| Pulse/s | Number of pulses to be output for one second at 100% output. |

FU: Flow rate unit selected in B21/C40: Base Flow Unit.

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**[B33: Pulse Scale]** Setting of pulse scale
→ This setting is linked with that of parameter **E11**.
Pulse output is performed in individual counts in accordance with this parameter's setting. If 0 is selected, it indicates that the pulse output function is not to be used.

**NOTE**

If a pulse scale is specified upon ordering, this parameter is setup before shipment; however, if this is not the case, it will be necessary for the appropriate value to be setup by the user.

**NOTE**

- By setting the pulse scale, pulse output performs. The pulse scale is determined in accordance with the settings of **B32/E10: Pulse Unit** and **B33/E11: Pulse Scale**.
- If multiple ranges are being used, the flow rate span for the smallest range becomes the standard for the **E13: Pulse Low Cut** setting value.
- Pulse output for the reverse flow rate is carried out only when "Fwd/Rev Ranges" is selected for **F20: DO Function** or **F21: DIO Function**.
- Setting of pulse scale is not possible when specific selections have been made for **B32/E10: Pulse Unit**, **B33/E11: Pulse Scale**, **E12: Pulse Width** and **B23/C42: Flow Span**. In such a case, a setting alarm will be displayed, and parameters should be changed in accordance with the instructions given.

Example 1: To perform pulse output in 1 Ml (mega-liter) steps with flow rate span = 100 $m^3/h$
Since 1 Ml = $10^3$ x $m^3$, M Unit/P is set for **B32/E10**, and 1 is set for **B33/E11**.

Example 2: To perform pulse output in 10 l (liter) steps with flow rate span = 100 $m^3/h$
Since 1 l = $10^{-3}$ x $m^3$, m Unit/P is set for **B32/E10**, and 10 is set for **B33/E11**.

Example 3: To perform pulse output in 5 l (liter) steps with flow rate span = 100 $m^3/h$
Since 1 l = $10^{-3}$ x $m^3$, m Unit/P is set for **B32/E10**, and 5 is set for **B33/E11**.

**[B40: Display Select1]** Setting of the first line for display unit
→ This setting is linked with that of parameter **H10**.
This parameter selects the display content of the first line for display unit. The size of the characters which are displayed will depend on the selections made for

**B41/H11: Display Select2** and **B42/H12: Display Select3** as described below. (For more details, refer to Chapter 5: Basic Operating Procedures.)

**CAUTION**

It is not possible to set Display Select1 to "Off".

**[B41: Display Select2]** Setting of the second line for display unit
→ This setting is linked with that of parameter **H11**. This parameter selects the display content of the second line for display unit. When "Off" is selected, one-line display will be adopted regardless of the setting made for **B42/H12: Display Select 3**.

**[B42: Display Select3]** Setting of the third line for display unit
→ This setting is linked with that of parameter **H12**. This parameter selects the display content of the third line for display unit. When "Off" is selected for this parameter, two-line display is adopted.

**[B50: Auto Zero Exe]** Execution of the automatic zero adjustment function
→ This setting is linked with that of parameter **M10**. This parameter executes the automatic zero adjustment function: If "Execution" is selected, this function will be started. "Now Auto Zero Executing..." is indicated while the Auto Zero function is being carried out. The result of the automatic zero adjustment is confirmed using **M11: Magflow Zero**, and if the result exceeds the rated value, the warning **82: Auto Zero Wng** will be displayed. (For more details, refer to Chapter 9: Operation.)

| Setting | Function |
|---|---|
| No Execution | No execution |
| Execution | Automatic zero adjustment is started. |

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### (2) Menu C: Basic Setting items

Menu C principally contains the basic setting items for the flowtube.

**NOTE**

In order to ensure that correct flow rate data can be acquired, it is crucial that the nominal size, flow rate span, and meter factor of the combined remote flowtube are set. In cases where a remote flowtube is ordered at the same time as the AXFA14, or where the AXF integral flowmeter is ordered, the nominal size and meter factor will be set upon shipment from the manufacturing plant, and these will not require additional setting. If the AXFA14 is ordered separately, the default value will be set for the meter factor; accordingly, it will be necessary to set the meter factor indicated on your remote flowtube data plate.
If a flow rate span was specified upon ordering, this will be set before shipment. If this is not the case, however, it will be necessary for the appropriate value to be set by the user.

**[C10: Tag No]** Setting of the tag number
→ The setting for this parameter corresponds to one of the ordered items.
Up to a maximum of 16 characters can be entered for the display unit. For more details regarding the actual characters that can be used, refer to Section 5.2.2: Setting Mode.

**NOTE**

If a tag number is specified upon ordering, this parameter is set up before shipment; however, if this is not the case, it will be necessary for the appropriate value to be set up by the user.

**[C11: Flow Damping]** Setting of the damping time
→ Refer to the description of parameter **B20**.

**[C20: Measure Mode]** Selection of dual frequency excitation mode

| Item | Description |
|---|---|
| Standard DF | Standard dual frequency excitation |
| Enhanced DF | Enhanced dual frequency excitation |

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Enhanced DF (i.e., enhanced dual frequency excitation) is set to stabilize measurement for difficult applications, such as for high concentration slurries or low conductivity fluid. Note that this parameter is only valid when this product is used in combination with an AXF flowtube, as only supports enhanced dual frequency excitation. (Optional code HF1 or HF2)

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**NOTE**

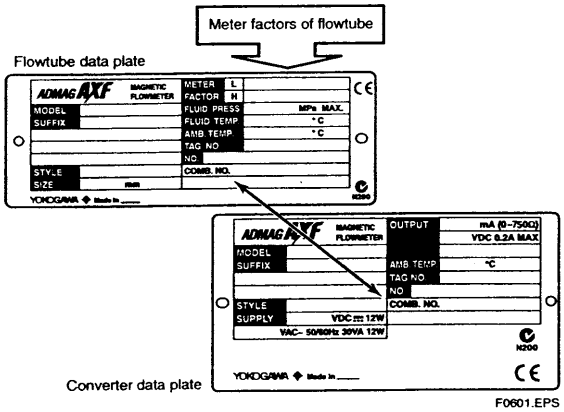
- When this product is used in combination with any flowtube that does not support enhanced dual frequency excitation and "Enhanced DF" is selected, a setting alarm will be displayed. The setting should be returned to "Standard DF" in such a case.
- When dual frequency excitation mode is changed, perform zero adjustment. For details on zero adjustment, refer to chapter 9.

**[C21: Low MF]** Setting of the low-frequency meter factor
This parameter sets the low-frequency meter factor for standard dual frequency excitation.

**[C22: High MF]** Setting of the high-frequency meter factor
This parameter sets the high-frequency meter factor for standard dual frequency excitation.

**NOTE**

**Meter Factor Settings**




(1) Confirm that the serial number indicated by COMB. NO. on the AXFA14 converter's data plate corresponds with the AXF remote flowtube's serial number.
(2) Set the values that are marked in the METER FACTOR fields on the data plate for the Remote Flowtube.
(3) The meter factors are crucial in ensuring that the electromotive force is correctly in proportion to the flow velocity and are determined at the manufacturing plant by actual-flow calibration.

**[C23: Low MF (EDF)]** Setting of the low-frequency meter factor for EDF
This parameter sets the low-frequency meter factor as required when Enhanced DF (i.e., enhanced dual frequency excitation) is selected. If "Standard DF" has been selected for **C20: Measure Mode**, neither **C23: Low MF (EDF)** nor **C24: High MF (EDF)** is displayed, and if "Enhanced DF" is selected, the four parameters from **C21** to **C24** will be displayed.

**NOTE**

For the AXF integral flowmeter, refer to "Section 6.6: Precautions for the AXF integral flowmeter."

**[C24: High MF (EDF)]** Setting of the high-frequency meter factor for EDF
This parameter sets the high-frequency meter factor as required when Enhanced DF (i.e., enhanced dual frequency excitation) is selected.

**[C31: Nominal Size Unit]** Setting of the nominal size units
This parameter selects the units used for setting of the nominal size.

**[C32: Nominal Size]** Setting of the nominal size
This parameter sets the nominal size of flowtube.

**[C40: Base Flow Unit]** Selection of flow units for the flow rate span
→ Refer to the description of parameter **B21**.

**[C41: Base Time Unit]** Selection of time units for the flow rate span
→ Refer to the description of parameter **B22**.

**[C42: Flow Span]** Setting of the flow rate span
→ Refer to the description of parameter **B23**.

**[C43: Flow Decimal Pnt]** Setting of the decimal point position for the instantaneous flow rate
→ Refer to the description of parameter **B24**.

**[C44: Velocity Check]** Display of the flow rate span velocity
This parameter displays the flow rate span for the maximum range in m/s units.

**[C45: Density Unit]** Setting of the density units for mass flow rate
This parameter selects the units for density as required when making settings using **C46: Mass Density**.

**[C46: Mass Density]** Setting of the density for mass flow rate
This parameter is necessary in situations where t, kg, g, klb or lb has been selected as the mass unit in **B21/C40: Base Flow Unit**. If a mass unit is selected in **B21/C40: Base Flow Unit** and a value of 0 is set for this parameter, the setting alarm "**57: Dens Set Err**" will be displayed. In such a case, ensure that the density is set correctly.

**[C47: User Span Select]** Selection of the use of special flow rate units
This parameter selects whether or not special units are used for instantaneous flow rate. Actual setting of these units is carried out using **C48: Flow User Unit** and **C49: Flow User Span**.

**[C48: Flow User Unit]** Setting of the special flow rate units
This parameter is used to select the special units (up to maximum 8 characters in length). These units are displayed when instantaneous flow rate is selected in the Display Mode, and they are displayed for **A20: FLOW RATE** when BRAIN communication is being carried out.

**[C49: Flow User Span]** Setting of the special flow rate span
This parameter sets the special span to be displayed for 100% output in the maximum range.

**NOTE**

Example : To set the special flow rate span to 100 dl/s
Since 100 dl (deci-liter)=10 l (liter),
"l (Liter)" is set for **B21/C40: Base Flow Unit**,
"/s" is set for **B22/C41: Base Time Unit**,
"10" is set for **B23/C42: Flow Span**,
"Yes" is set for **C47: User Span Select**,
"dl/s" is set for **C48: Flow User Unit**,
"100" is set for **C49: Flow User Span**.
"100 dl/s" is indicated for 100% output in the Display Mode.

### (3) Menu D: Total Setting items

Menu D contains parameters that are relevant to totalization function settings.

**[D10: Total Unit]** Setting of units for totalization scale
→ Refer to the description of parameter **B30**.

**[D11: Total Scale]** Setting of the totalization scale
→ Refer to the description of parameter **B31**.

**[D12: Total Decimal Pnt]** Setting of the decimal point position for the totalization display
This parameter sets the position of the decimal point for totalization display in terms of the number of digits. Except in cases where 0 is selected, the totalized units are not displayed.

Example: When totalized value is 12345678 $m^3$

| Item | Totalization display |
|---|---|
| 0 | 12345678 $m^3$ |
| 1 | 1234567.8 |
| 2 | 123456.78 |
| 3 | 12345.678 |
| 4 | 1234.5678 |
| 5 | 123.45678 |
| 6 | 12.345678 |
| 7 | 1.2345678 |

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**[D13: Total Low Cut]** Setting of the totalization stop range
This parameter allows the settings to be made that prevent totalization when the flow rate is at or below the low-cut setting value. In cases where there are multiple ranges or forward/reverse ranges, low cut is carried out at the setting value for the smallest span (i.e., an integer between 0 and 10%).
Example: When the first range = 10 $m^3/h$, the second range = 100 $m^3/h$, and the Total Low Cut = 3%, no totalization is carried out at flow rates of 0.3 $m^3/h$ or lower.

**[D20: Total Execution]** Operation setting for the totalization function
This parameter sets "Start" and "Stop" of the totalization function, in addition to performing the preset function for the forward totalized value and the reverse totalized value.
*: The preset function starts the count for totalization from the set value.

| Item | Description |
|---|---|
| Start (initial value) | Starts totalization |
| Stop | Stops totalization |
| Preset Total | Sets the preset value for totalization display that has been specified as the forward totalized value. Preset value are determined using **D21: Ttl Set Val Lower** and **D22: Ttl Set Val Upper**. In case that "Start" is sellected, the count for totalization starts from the preset value. Setting of zero as the preset value allows the zero-reset function to be implemented. |
| Preset Rev Total | Sets the preset value for totalization display that has been specified as the reverse totalized value. Preset value are determined using **D21: Ttl Set Val Lower** and **D22: Ttl Set Val Upper**. In case that "Start" is sellected, the count for totalization starts from the preset value. Setting of zero as the preset value allows the zero-reset function to be implemented. |

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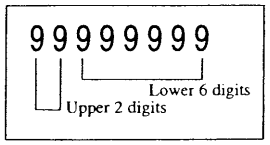
**NOTE**

Totalization presets can also be set up by using status input. For details regarding the setting method, refer to the descriptions of **F21**.

**[D21: Ttl Set Val Lower]** Setting of the totalization preset value (lower 6 digits)
This parameter sets a totalization preset value in the lower 6 digits of the 8-digit totalized value. If zero is to be set as the preset value, "000000" should be set here.

**[D22: Ttl Set Val Upper]** Setting of the totalization preset value (upper 2 digits)
This parameter sets a totalization preset value in the upper 2 digits of the 8-digit totalized value. If zero is to be set as the preset value, "00" should be set here.

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**[D23: Ttl Switch Lower]** Setting of the totalization switch value (lower 6 digits)
The totalization switch function operates to set the status output terminal (i.e., DO or DIO) to "Closed (On)" when the forward internal totalized value reaches or exceeds the totalization switch value. (For details regarding the setting method for the status output, refer to the descriptions of parameters **F20** and **F21**.)

If this function is set up, the totalization count will stop at 99999999.
**D23** sets the lower 6 digits of the 8-digit totalization switch value.

**[D24: Ttl Switch Upper]** Setting of the totalization switch value (upper 2 digits)
This parameter sets the upper 2 digits of the 8-digit totalization switch value.

**[D30: Ttl User Select]** Selection of the use of special totalization unit
This parameter specifies whether or not special units are used for totalization unit. Actual setting of these units is carried out using **D31: Ttl User Unit**.

**[D31: Ttl User Unit]** Setting of special totalization units
Units of up to maximum 8 characters in length can be specified using this parameter. The units set with this parameter are displayed whenever totalization (i.e., FTL, RTL, DTL) is selected in the Display Mode, and they are displayed for **A30: TOTAL, A31: REV TOTAL**, and **A32: DIF TOTAL** when BRAIN communication is being carried out.

**NOTE**

Example: To count in 1 dl (deci-liter) steps with flow rate span=10 l/s.
Since 1 dl (deci-liter) = 0.1 l (liter),
"l (Liter)" is set for **B21/C40: Base Flow Unit**,
"/s" is set for **B22/C41: Base Time Unit**,
"10" is set for **B23/C42: Flow Span**,
"Unit/P" is set for **B30/D10: Total Unit**,
"0.1" is set for **B31/D11: Total Scale**,
"Yes" is set for **D30: Ttl User Select**,
"dl" is set for **D31: Ttl User Unit**.
"dl" is indicated for the totalized units in the Display Mode and is counted in 1 dl steps.

### (4) Menu E: Pulse Setting items

Menu E contains items relevant to pulse output.

**NOTE**

For pulse output from the DO terminal, set **F20: DO Function** to "Pulse Output."

**[E10: Pulse Unit]** Setting of the pulse units
→ Refer to the description of parameter **B32: Pulse Unit**

**[E11: Pulse Scale]** Setting of the pulse scale
→ Refer to the description of parameter **B33: Pulse Scale**

**[E12: Pulse Width]** Setting of the pulse width
This parameter selects the pulse width (i.e., m/s : millisecond) that is output.

**Data Range**

| Setting | Pulse Rate (pps) | |
|---|---|---|
| | Maximum Value | Minimum Value |
| (0) 50% Duty | 11000 | 0.0001 |
| (1) 0.05ms | 10000 | (pps: pulses per second) |
| (2) 0.1ms | 5000 | |
| (3) 0.5ms | 1000 | |
| (4) 1ms | 500 | |
| (5) 20ms | 25 | |
| (6) 33ms | 15 | |
| (7) 50ms | 10 | |
| (8) 100ms | 5 | |

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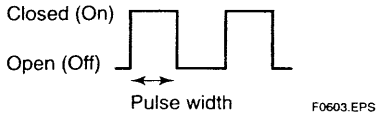
**NOTE**

*:The pulse width with the exception of "50% Duty" is the "Closed (On)" time for each pulse in case that "Closed (On) Act" is selected for **F22: DO Active Mode**

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A limit applies to the maximum pulse scale that can be set with respect to the pulse width. If a value in excess of this limit is set, a setting alarm will be displayed.

**[E13: Pulse Low Cut]** Setting of the pulse output stop range
This parameter allows the settings to be made which prevent pulse output when the flow rate is at or below the low-cut setting value. In cases where there are multiple ranges or forward/reverse ranges, low cut is carried out at the setting value for the smallest span (i.e., an integer between 0 and 10%).
Example: When the first range = 10 $m^3/h$, the second range = 100 $m^3/h$, and the Pulse Low Cut = 3%, no pulse output is carried out at flow rates of 0.3 $m^3/h$ or lower.

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### (5) Menu F: Status Functions Setting items

Menu F contains setting items relevant to status Input/Output functions.

**[F20: DO Function]** Setting of the function for the DO status output terminal

This parameter sets the function for the DO (status output) terminal.

| Setting | Function | Description |
|---|---|---|
| No Function | Stops output (i.e., inactive condition) | As no function is set, there is no output. |
| Pulse Output | Pulse output | Pulse output is carried out. |
| Alarm Output | Output upon alarm | Refer to Alarms (Section 6.5). |
| Warning Output | Output upon warning | |
| Total Switch(O) | Totalization switch output | Status output is carried out when the forward internal totalized value reaches or exceeds the totalization switch value. The totalization switch value is determined using **D23: Ttl Switch Lower** and **D24: Ttl Switch Upper**. |
| H/L Alarm(O) | H/L alarm output | Status output is carried out when the instantaneous flow rate equals or falls below the low flow rate limit (L), or when it equals or exceeds the high flow rate limit (H). These limit values are determined using **G10: Low Alarm** and **G11: High Alarm**. |
| HH/LL Alarm(O) | HH/LL alarm output | Status output is carried out when the instantaneous flow rate equals or falls below the low-low flow rate limit (LL), or when it equals or exceeds the high-high flow rate limit (HH). These limit values are determined using **G12: Low Low Alarm** and **G13: High High Alarm**.To output "HH/LL Alarm" as an alarm, set **G33: Alm-HH/LL** to "Yes." |
| Fwd/Rev Rngs(O) | Forward/reverse flow rate measurement | When flow is in the reverse direction, switching to the reverse range is carried out automatically, measurement is performed, and status output is carried out. |
| Auto 2 Rngs(O) | Automatic 2 ranges switching | This function ensures that when the instantaneous flow rate exceeds 100% of the range, transition to the next range is carried out automatically. Status output is carried out upon range switching. |
| Auto 3 Rngs(O) | Automatic 3 ranges switching (Note 1) | |
| Auto 4 Rngs(O) | Automatic 4 ranges switching (Note 1) | |
| Ext 2 Answer(O) | Answerback: 2 ranges switching via external status input | When range switching is carried out in response to external status input, status output is performed in the form of an answerback to indicate the range currently being used. |

Note 1: When these functions are selected, two terminals become necessary for status output, the DO and DIO terminals which cannot be used for other functions. Accordingly, the setting for **F20: DO Function** is automatically adopted as the setting for **F21: DIO Function**. (Setting of these two functions is not possible using **F21: DIO Function**.)

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**[F21: DIO Function]** Setting of the function for the DIO status input/output terminal
This parameter sets the function for the DIO (status input/output) terminal.

| Setting | Function | Description |
|---|---|---|
| No Function | No function | As no function is set, there is no input and output. |
| Alarm Output | Output upon alarm | Refer to Alarms (Section 6.5). |
| Warning Output | Output upon warning | |
| Total Switch(O) | Totalization switch output | Status output is carried out when the forward internal totalized value reaches or exceeds the totalization switch value. The totalization switch value is determined using **D23: Ttl Switch Lower** and **D24: Ttl Switch Upper**. |
| H/L Alarm(O) | H/L alarm output | Status output is carried out when the instantaneous flow rate equals or falls below the low flow rate limit (L), or when it equals or exceeds the high flow rate limit (H). These limit values are determined using **G10: Low Alarm** and **G11: High Alarm**. |
| HH/LL Alarm(O) | HH/LL alarm output | Status output is carried out when the instantaneous flow rate equals or falls below the low-low flow rate limit (LL), or when it equals or exceeds the high-high flow rate limit (HH). These limit values are determined using **G12: Low Low Alarm** and **G13: High High Alarm**. To output "HH/LL Alarm" as an alarm, set **G33: Alm-HH/LL** to "Yes." |
| Fwd/Rev Rngs(O) | Forward/reverse flow rate measurement | When flow is in the reverse direction, switching to the reverse range is carried out automatically, measurement is performed, and status output is carried out. |
| Auto 2 Rngs(O) | Automatic 2 ranges switching | This function ensures that when the instantaneous flow rate exceeds 100% of the range, transition to the next range is carried out automatically. Status output is carried out upon range switching. |
| Auto 3 Rngs(O) | Automatic 3 ranges switchings (Note 1) | |
| Auto 4 Rngs(O) | Automatic 4 ranges switchings (Note 1) | |
| Ext 2 Answer(O) | Answerback: 2 ranges switching via external status input | When range switching is carried out in response to external status input, status output is performed in the form of an answerback to indicate the range currently being used. |
| 0% Signal Lock(I) | 0% signal lock via external status input | Based on the external status input, the instantaneous flow rate indication is forcibly set to 0% (i.e., 4 mA), and both totalization and pulse outputs are halted. This setting has precedence over the output signal whenever an alarm occurs. When the 0% signal lock is canceled, the instantaneous flow rate is restored in accordance with the time constant originally set using **B20/C11: Flow Damping**. |
| Ext Auto Zero(I) | Automatic zero adjustment via external status input | Automatic zero adjustment is carried out in response to external status input. For more details regarding automatic zero adjustment, refer to Chapter 9: Operation. |
| Ext Ttl Set(I) | Forward totalization preset via external status input | The totalization display value is preset or reset to zero in accordance with the external status input. The preset value is determined using **D21: Ttl Set Val Lower** and **D22: Ttl Set Val Upper**. In case that "Start" is selected for **D20: Total Execution**, the count for totalization starts from the preset value. |
| Ext R Ttl Set(I) | Reverse totalization preset via external status input | |
| Ext 2 Ranges(I) | 2 ranges switching via external status input | This function allows the switching of 2 ranges in response to status input for a single direction only. |

Note 1: When these functions are selected, two terminals become necessary for status output, the DO and DIO terminals which cannot be used for other functions.

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**[F22: DO Active Mode]** Setting of the active mode for DO terminal

Operations are performed in accordance with the following table when the active mode has been set to "Closed (On) Act" using this parameter. Operating patterns are reversed when the active mode has been set to "Open (Off) Act."

| Selected function | Condition of DO terminal | |
|---|---|---|
| | Open (Off) | Closed (On) |
| Pulse Output (see Example 1) | Open (Off) when pulses are output. | Closed (On) when pulses are output. |
| Alarm Output (see Example 2) | Good (normal) | Alarm status |
| Warning Output | Good (normal) | Warning status |
| Total Switch(O) (see Example 3) | Below setting value | Equal or above setting value |
| H/L Alarm(O) | Normal | H/L alarm status |
| HH/LL Alarm(O) | Normal | HH/LL alarm status |
| Fwd/Rev Rngs(O) | Forward direction | Reverse direction |

Note: For "Auto 2 Rngs(O)," "Auto 3 Rngs(O)", "Auto 4 Rngs(O)", and "Ext 2 Answer(O)", see the **Multiple ranges setting** section.

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**[F23: DIO Active Mode]** Setting of the active mode for DIO terminal

Operations are performed in accordance with the following table when the active mode has been set to "Closed/Short Act" using this parameter. Operating patterns are reversed when the active mode has been set to "Open/Open Act."

| Selected function | Condition of DIO (O) terminal | |
|---|---|---|
| | Open (Off) | Closed (On) |
| Alarm Output (see Example 2) | Good (normal) | Alarm status |
| Warning Output | Good (normal) | Warning status |
| Total Switch(O) (see Example 3) | Below setting value | Equal or above setting value |
| H/L Alarm(O) | Normal | H/L alarm status |
| HH/LL Alarm(O) | Normal | HH/LL alarm status |
| Fwd/Rev Rngs(O) | Forward direction | Reverse direction |

Note: For "Auto 2 Rngs(O)," "Auto 3 Rngs(O)", "Auto 4 Rngs(O)", and "Ext 2 Answer(O)", see the **Multiple ranges setting** section.

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| Selected function | Condition of DIO (I) terminal | |
|---|---|---|
| | Open | Short |
| 0% Signal Lock (I) (see Example 4) | Normal | Signal locked status |
| Ext Auto Zero (I) | Normal | Start of automatic zero adjustment |
| Ext Ttl Set (I) | Normal | Forward totalization preset |
| Ext R Ttl Set (I) | Normal | Reverse totalization preset |

Note: For "Ext 2 Ranges(I)," see the **Multiple ranges setting** section.

*: "DIO (O)" indicates DIO function is used for output. "DIO (I)" indicates DIO function is used for input.

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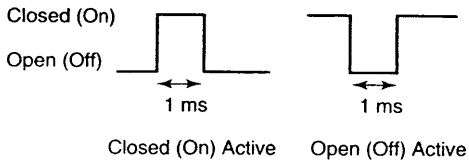
Example 1: When the "Pulse Output" function is selected for the DO terminal and the **E12: Pulse Width** is "1 ms", the following signals are output from the terminal.

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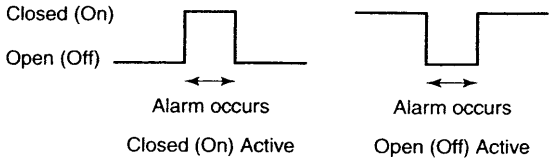
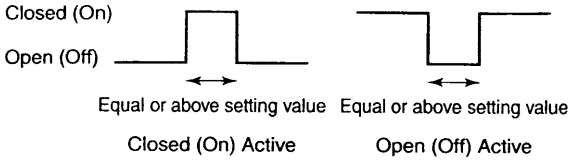
Example 2: When the "Alarm Output" function is selected for the DO or DIO (O) terminal, the following signals are output from the terminal.



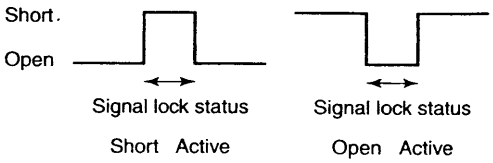

F0604-2.EPS

Example 3: When the "Total Switch (O)" function is selected for the DO or DIO (O) terminal, the following signals are output from the terminal.




F0604-3.EPS

Example 4: When the "0% Signal Lock (I)" function is selected for the DIO (I) terminal, the following signals are input to the terminal.




F0604-4.EPS

**NOTE**

**Multiple ranges setting**

Parameters from **F30** to **F41** are used with the automatic multiple ranges and the multiple ranges switching via an external status input. The followings will describe the setting method for each range.

The multiple ranges use the following parameters:

**[B23: Flow Span]** Setting of the flow rate span (Setting of the forward No.1 range)

**[F30: Forward Span 2]** Setting of the forward No.2 range

**[F31: Forward Span 3]** Setting of the forward No.3 range

**[F32: Forward Span 4]** Setting of the forward No.4 range

**[F33: Reverse Span 1]** Setting of the reverse No.1 range

**[F34: Reverse Span 2]** Setting of the reverse No.2 range

**[F40: Auto Range Hys]** Setting of the automatic multiple ranges hysteresis width.

**[F41: Bi Direction Hys]** Setting of the forward/ reverse flow measurement hysteresis width

### Multiple Ranges Setting 1: Automatic multiple ranges switching

- When the instantaneous flow rate exceeds 100% of the range, transition to the next range (up to four ranges) is carried out automatically. Furthermore, when the flow is in reverse, the reverse range is automatically selected.
- Range switching can be confirmed according to the status of the DO and DIO status output terminals. Refer to Table 6.4.1: Status Output for Automatic Multiple Ranges Switching for details of status output conditions for each range.

### Status Output for Automatic Multiple Ranges Switching

Operations are performed in accordance with the following table when the active mode has been set to "Closed (On) Act" using **F22: DO Active Mode** or "Closed/Short Act" using **F23: DIO Active Mode**. Operating patterns are reversed when the active mode has been set to "Open (Off) Act" using **F22: DO Active Mode** or "Open/Open Act" using **F23: DIO Active Mode**.

**Table 6.4.1 Status Output for Automatic Multiple Ranges Switching**

| Parameter setting | | Function | | Status output | | |
|---|---|---|---|---|---|---|
| | | | | DO | DIO | |
| F20 | F21 | | | | DIO (O) | DIO (I) |
| No Function | No Function | Forward single range | | – | – | – |
| Fwd/Rev Rngs (O) | No Function | Auto forward/ reverse 1 range | Forward | Open | – | – |
| | | | Reverse | Closed | – | – |
| No Function | Fwd/Rev Rngs (O) | | Forward | – | Open | – |
| | | | Reverse | – | Closed | – |
| Auto 2 Rngs (O) | No Function | Auto forward 2 ranges | Forward 1 range | Open | – | – |
| | | | Forward 2 range | Closed | – | – |
| No Function | Auto 2 Rngs (O) | | Forward 1 range | – | Open | – |
| | | | Forward 2 range | – | Closed | – |
| Auto 3 Rngs (O) | Auto 3 Rngs (O) | Auto forward 3 ranges | Forward 1 range | Open | Open | – |
| | | | Forward 2 range | Closed | Open | – |
| | | | Forward 3 range | Open | Closed | – |
| Auto 4 Rngs (O) | Auto 4 Rngs (O) | Auto forward 4 ranges | Forward 1 range | Open | Open | – |
| | | | Forward 2 range | Closed | Open | – |
| | | | Forward 3 range | Open | Closed | – |
| | | | Forward 4 range | Closed | Closed | – |
| Fwd/Rev Rngs (O) | Auto 2 Rngs (O) | Auto forward/ reverse 2 ranges | Forward 1 range | Open | Open | – |
| | | | Forward 2 range | Open | Closed | – |
| | | | Reverse 1 range | Closed | Open | – |
| | | | Reverse 2 range | Closed | Closed | – |
| Auto 2 Rngs (O) | Fwd/Rev Rngs (O) | | Forward 1 range | Open | Open | – |
| | | | Forward 2 range | Closed | Open | – |
| | | | Reverse 1 range | Open | Closed | – |
| | | | Reverse 2 range | Closed | Closed | – |

*: "No Function" is the default value. Only DO or DIO terminals are used for single or dual ranges; accordingly, the unused terminal remains at the default value (i.e., No Function) and can therefore be used for other functions.

*: "DIO (O)" indicates DIO function is used for output.

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## Parameter setting sequence (for automatic multiple ranges switching)

**F20: DO Function**
Select a function.

**F21: DIO Function**
Select a function.

**F22: DO Active Mode**
Select whether DO output is to be "Closed (On) Act" or "Open (Off) Act".

**F23: DIO Active Mode**
Select whether DIO output is to be "Closed/Short Act" or "Open/Open Act".

Select a function (Note 1)
No Function: Output is stopped (other functions may be selected)
Fwd/Rev Rngs(O): Forward/reverse flow rate measurement
Auto 2 Rngs(O): Automatic 2-ranges switching
Auto 3 Rngs(O): Automatic 3-ranges switching
Auto 4 Rngs(O): Automatic 4-ranges switching

Refer to Table 6.4.1 and set **F20** or **F21**.
Note 1: "DIO (O)" indicates DIO function is used for output.

| | | |
|---|---|---|
| **B23: Flow Span** Forward No.1 range | **F30: Forward Span 2** Forward No.2 range | **F31:Forward Span 3** Forward No.3 range |
| **F32:Forward Span 4** Forward No.4 range | **F33:Reverse Span 1** Reverse No.1 range | **F34:Reverse Span 2** Reverse No.2 range |

Set the spans for the ranges to be used.
No.1 range≦No.2 range≦No.3 range≦No.4 range

If "instantaneous flow rate % (FR)" is selected for Display Mode and **A10: FLOW RATE (%)** is selected for BRAIN communication, the instantaneous flow rate % and following symbols will be displayed only for multiple ranges and forward/reverse flow measurement.
Forward No.1 range: [F1] Reverse No.1 range: [R1]
Forward No.2 range: [F2] Reverse No.2 range: [R2]
Forward No.3 range: [F3]
Forward No.4 range: [F4]

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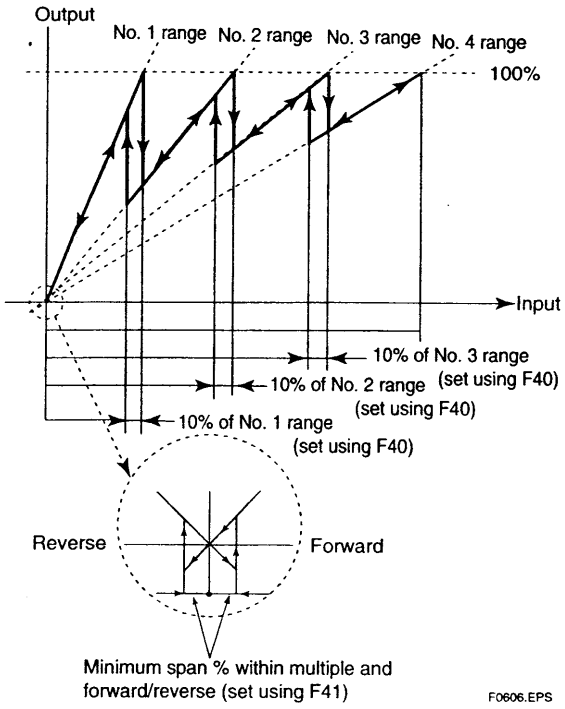



**Figure 6.4.1 Multiple Ranges and Hysteresis Widths**

### NOTE

For more details regarding the setting of hysteresis width, refer to the description of setting parameter for **F40: Auto Range Hys** and **F41: Bi Direction Hys**.

### Multiple Ranges Setting 2: Multiple ranges switching via external status input

- For both the forward and reverse directions, switching of up to two ranges can be carried out based on a status input; however, switching between directions is not possible. Switching between forward and reverse ranges is carried out automatically only when the flow direction reverses.
- DIO terminal is used for multiple ranges switching. For more details, refer to Table 6.4.2: Multiple Ranges Switching via External Status Input.

### Multiple Ranges Switching via External Status Input

Operations are performed in accordance with the following table when the active mode has been set to "Closed (On) Act" using **F22: DO Active Mode** or "Closed/Short Act" using **F23: DIO Active Mode**. Operating patterns are reversed when the active mode has been set to "Open (Off) Act" using **F22: DO Active Mode** or "Open/Open Act" using **F23: DIO Active Mode**.

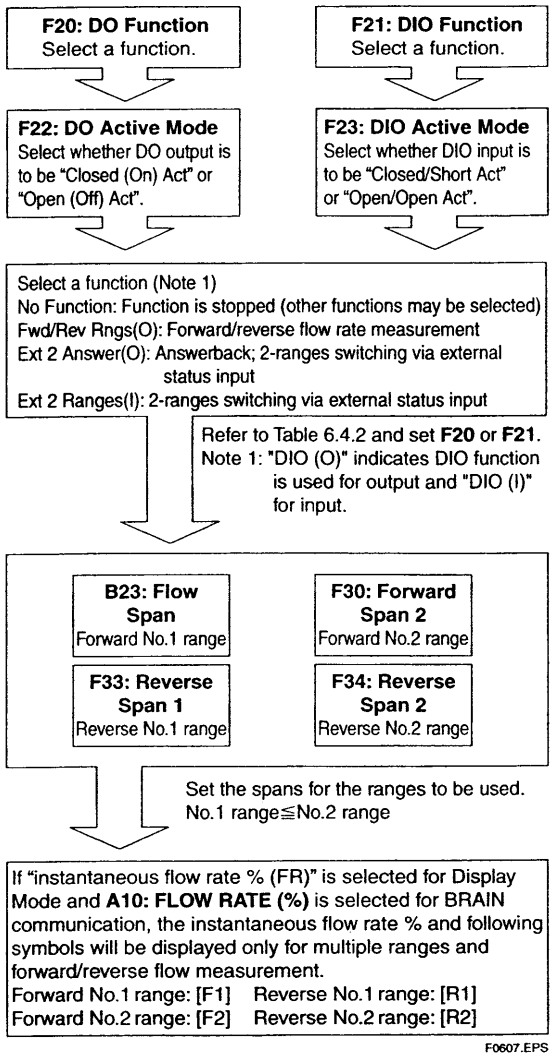
**Table 6.4.2 Multiple Ranges Switching via External Status Input**

| Parameter setting | | Function | | Status output | | |
|---|---|---|---|---|---|---|
| | | | | DO | DIO | |
| F20 | F21 | | | | DIO (O) | DIO (I) |
| No Function | Ext 2 Ranges(I) | External forward 2 ranges | Forward 1 range | – | – | Open |
| | | | Forward 2 range | – | – | Short |
| Fwd/Rev Rngs(O) | Ext 2 Ranges(I) | External forward/ reverse 2 ranges | Forward 1 range | Open | – | Open |
| | | | Forward 2 range | Open | – | Short |
| | | | Reverse 1 range | Closed | – | Open |
| | | | Reverse 2 range | Closed | – | Short |
| Ext 2 Answer(O) | Ext 2 Ranges(I) | External forward 2 ranges, with answerback | Forward 1 range | Open | – | Open |
| | | | Forward 2 range | Closed | – | Short |

*: "No Function" is the default value. Only DIO terminal is used for dual ranges; accordingly, the unused DO terminal remains at the default value (i.e., No Function) and can therefore be used for other functions.

*: "DIO (I)" indicates DIO function is used for input. T0628.EPS

### Parameter setting sequence (for multiple ranges switching via external status input)



F0607.EPS

**[F40: Auto Range Hys]** Setting of automatic range-switching hysteresis width

Automatic switching takes place for multiple range switching when 100% of the range is exceeded, and this parameter allows a hysteresis width to be set for this switching.

Refer to Figure 6.4.1: Multiple Ranges and Hysteresis Widths.

**[F41: Bi Direction Hys]** Setting of forward/reverse flow measurement hysteresis width

This parameter sets the hysteresis for forward/reverse flow rate measurement as a % value of the minimum flow span.

Refer to Figure 6.4.1: Multiple Ranges and Hysteresis Widths.

### (6) Menu G: Alarm Setting items

(Refer to Section 6.5: Alarm Functions for more details.)

Menu G principally contains setting items relevant to alarms.

**[G10: Low Alarm]** Low alarm setting

This parameter sets the low limit (L) alarm value, and this is done using a % value of the maximum span.

- A setting value of -110% indicates that the alarm is disabled.

**[G11: High Alarm]** High alarm setting

This parameter sets the high limit (H) alarm value, and this is done using a % value of the maximum span.

- A setting value of 110% indicates that the alarm is disabled.

**[G12: Low Low Alarm]** Low-low alarm setting

This parameter sets the low-low limit (LL) alarm value, and this is done using a % value of the maximum span.

- A setting value of -110% indicates that the alarm is disabled.

**[G13: High High Alarm]** High-high alarm setting

This parameter sets the high-high limit (HH) alarm value, and this is done using a % value of the maximum span.

- A setting value of 110% indicates that the alarm is disabled.

**NOTE**

Setting of -110% or 110% results in the corresponding function being disabled; accordingly, settings can be combined to implement only high alarms or low alarms, etc.

**Output Example 1**

The high-high alarm (HH) is set to 90% or more of the flow rate span; the low-low alarm (LL), to 20% or less; the high alarm (H), to 80% or more; and the low alarm (L), to 30% or less.

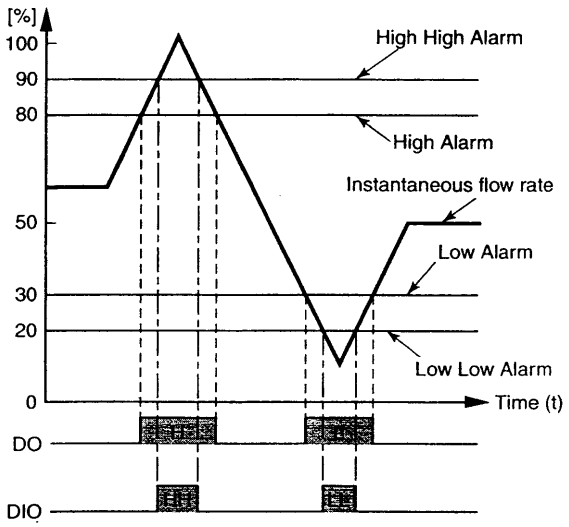
Settings are:

**G10: Low Alarm** = 30%

**G11: High Alarm** = 80%

**G12: Low Low Alarm** = 20%

**G13: High High Alarm** = 90%




Select "H/L Alarm(O)" for **F20: DO Function**
Select "HH/LL Alarm(O)" for **F21: DIO Function**
Select "Closed (On) Act" for **F22: DO Active Mode**
Select "Closed/Short Act" for **F23: DIO Active Mode**

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### Output Example 2

The high alarm (H) is set to 80% or more of the flow rate span; the low-low alarm (LL), to 20% or less.

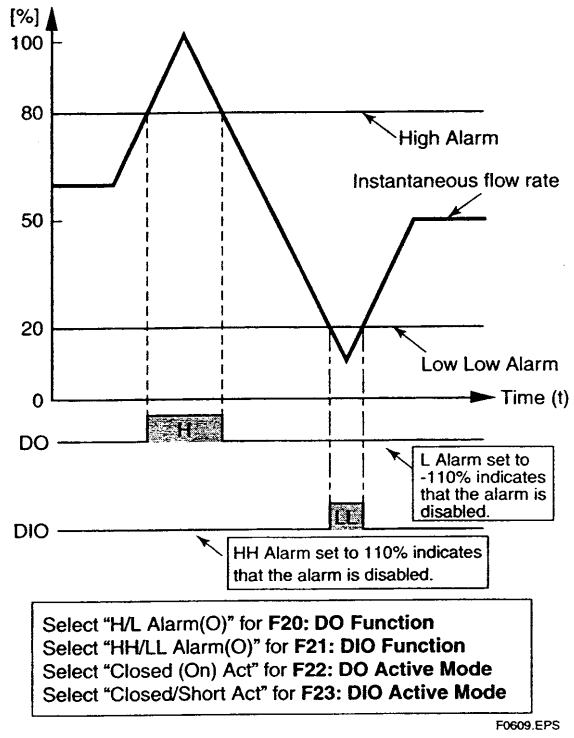
Settings are:

**G10: Low Alarm** = -110%

**G11: High Alarm** = 80%

**G12: Low Low Alarm** = 20%

**G13: High High Alarm** = 110%




### Output Example 3

The high alarm (H) is set to 80% or more of the flow rate span; the high-high alarm (HH), to 90% or more.

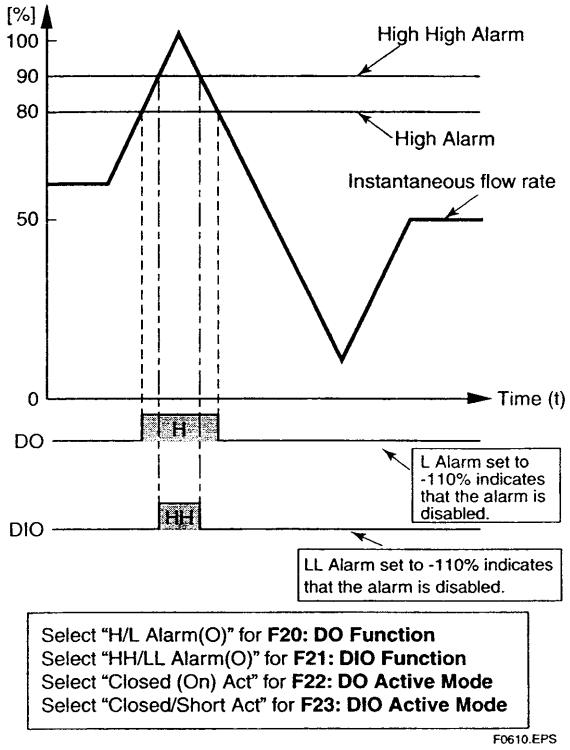
Settings are:

**G10: Low Alarm** = -110%

**G11: High Alarm** = 80%

**G12: Low Low Alarm** = -110%

**G13: High High Alarm** = 90%




**NOTE**

- Although the same items can be selected using the DO terminal (selected for **F20**) and the DIO terminal (selected for **F21**), output is identical for both.
- Setting values of -110% and 110% are used to disable corresponding functions; and accordingly, status output can be customized for specific purposes.



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**[G14: H/L Alarm Hys]** Setting of upper/lower alarm value hysteresis width
This parameter sets the hysteresis width for upper and lower alarm value, using a % value of the maximum span.

### Output Example

The hysteresis width is set to 5%.

Settings are:

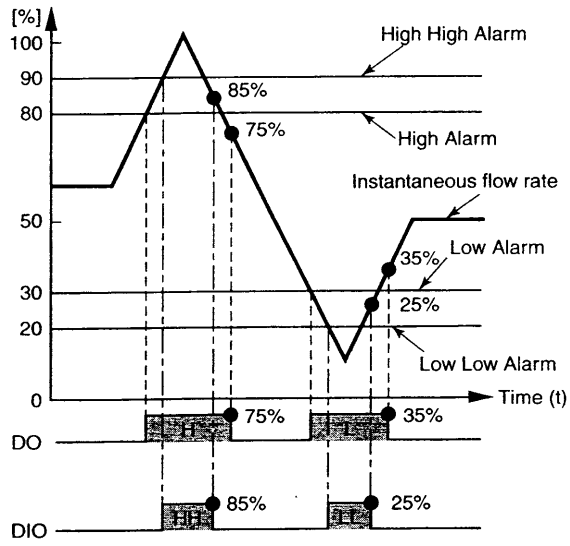
**G10: Low Alarm** = 30%

**G11: High Alarm** = 80%

**G12: Low Low Alarm** = 20%

**G13: High High Alarm** = 90%

**G14: H/L Alarm Hys** = 5%




F0611.EPS

**[G21: 4-20mA Alarm Out]** Setting of the current output during an alarm occurrence
This parameter can be used to set up the current output during alarm occurrence in advance.

| Setting | Function |
|---|---|
| 2.4mA or Less | Fixed at 2.4 mA or less |
| 4.0mA | Fixed at 4 mA |
| Hold | Fixed current value when an alarm occured. |
| 21.6mA or More | Fixed at 21.6 mA or more |

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**[G22: 4-20mA Burn Out]** Display of the current output during a CPU failure
This parameter displays the current output direction for a CPU failure (i.e., burnout). Note that communication will not be possible if such a failure occurs.
With the standard specification, this is set to High and 25mA is output when a failure occurs. Low is setup for optional code C1, and in such a case, 0mA is output when a failure occurs.

**NOTE**

The current output direction for a CPU failure (i.e., burnout) can be changed. Refer to selection 10.2.1: Setting of Burnout Switch.

**[G30: Alm-Setting]** Alarm recognition of "Setting Alarm"
This parameter specifies whether the setting alarm will be recognized as an alarm.

| Setting | Function |
|---|---|
| No | Not recognized as an alarm |
| Yes | Recognized as an alarm |

T0630.EPS

**[G31: Alm-Sig Over]** Alarm recognition of "Signal Overflow Alarm"
This parameter specifies whether the signal overflow in process alarms will be recognized as an alarm. A signal overflow occurs when there is an error in the input signal.

| Setting | Function |
|---|---|
| No | Not recognized as an alarm |
| Yes | Recognized as an alarm |

T0631.EPS

**[G32: Alm-Emp Pipe]** Alarm recognition of "Empty Pipe Alarm"
This parameter specifies whether the empty pipe (flowtube is not filled with fluid) in process alarms will be recognized as an alarm.

| Setting | Function |
|---|---|
| No | Not recognized as an alarm |
| Yes | Recognized as an alarm |

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**[G33: Alm-HH/LL]** Alarm recognition of "HH/LL Alarm"
(Refer to the descriptions of **G12** and **G13** for more details regarding HH and LL alarms.)
This parameter specifies whether HH/LL alarm in process alarms will be recognized as an alarm.

| Setting | Function |
|---|---|
| No | Not recognized as an alarm |
| Yes | Recognized as an alarm |

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**NOTE**

To set "HH/LL Alarm" as an alarm, it is necessary to set "HH/LL Alarm(O)" according to **F20: DO Function** or **F21: DIO Function**, and set **G12: Low Low Alarm** or **G13: High High Alarm** as well.

**[G34: Alm-Adhesion]** Alarm recognition of "Adhesion Alarm"
This parameter specifies whether the electrode adhesion alarm in process alarms will be recognized as an alarm.

| Setting | Function |
|---|---|
| No | Not recognized as an alarm |
| Yes | Recognized as an alarm |

T0634.EPS

**NOTE**

The AXFA14 or the AXF integral flowmeter has three different type of alarm (i.e., system alarms, process alarms, and setting alarms). For setting alarms and process alarms, settings are made with **G30**, **G31**, **G32**, **G33** and **G34** to specify whether these will be recognized as an alarm. Refer to Section 6.5: Alarm Functions for more details regarding the content of each alarm and the effect of alarm recognition on output.

**[G40: Operation Time]** Display of operation time
This parameter is used to display the operation time. The operation time is the total time that is counted while the device works actually.
When the power supply is off, the operation time is not counted.
For example, "1D23:45" indicates an operation time of 1 day, 23 hours, and 45 minutes.

**[G41: Alm Record1]** Alarm record1
This parameter is used to display the most-recent alarm, and the alarms that can be displayed are as follows.

**Alarm Items**

| Item | Description |
|---|---|
| : 16 space characters (i.e., no display) | No issuing of alarms |
| 10 : uP Fault | Microprocessor (CPU) failure |
| 11 : EEPROM Fault | EEPROM failure |
| 12 : A/D(H) Fault | A/D converter failure (at high frequency |
| 13 : A/D(L) Fault | A/D converter failure (at low frequency side) |
| 14 : A/D(Z) Fault | A/D converter failure (detection of adhesion) |
| 15 : Coil Open | Flowtube coil is open-circuit |
| 16 : EEPROM Dflt | EEPROM returns to default values |
| 18 : Power off | Power supply is off. |
| 19 : Inst Pwr Fail | Instantaneous power fail for tens of milliseconds. After this fail is released, outputs reach the previous value immediately. |
| 28 : WDT | The return from excessive instantaneous noise. After the noise is released, output return the normal condition. |
| 30 : Sig Overflow | Input signal error |
| 31 : Empty Pipe | Flowtube is not filled with fluid |
| 33 : Adhesion Alm | Insulation adhered to electrode |

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**NOTE**

Records for "30: Sig Overflow" are kept only when **G31** specifies that this condition is to be recognized as an alarm (i.e., "Yes" is selected). Records for "31: Empty Pipe" are kept only when **G32** specifies that this condition is to be recognized as an alarm (i.e., "Yes" is selected). Records for "33: Adhesion Alm" are kept only when **G34** specifies that this condition is to be recognized as an alarm (i.e., "Yes" is selected).

**[G42: Alm Record Time1]** Display the operation time of alarm record1
This parameter is used to display the operation time at which the alarm indicated by **G41: Alm Record1** was occurred. For example, "1D23:45" indicates that an alarm was occured at the operation time of 1 day, 23 hours, and 45 minutes.

**[G43: Alm Record2]** Alarm record2
This parameter is used to display the second most-recent alarm, and the alarms that can be displayed are the same as those for **G41: Alm Record1**.

**[G44: Alm Record Time2]** Display the operation time of alarm record2
This parameter is used to display the operation time at which the alarm indicated by **G43: Alm Record2** was occurred. For example, "1D23:45" indicates that an alarm was occured at the operation time of 1 day, 23 hours, and 45 minutes.

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**[G45: Alm Record3]** Alarm record3
This parameter is used to display the third most-recent alarm, and the alarms that can be displayed are the same as those for **G41: Alm Record1**.

**[G46: Alm Record Time3]** Display the operation time of alarm record3
This parameter is used to display the operation time at which the alarm indicated by **G45: Alm Record3** was occurred. For example, "1D23:45" indicates that an alarm was occured at the operation time of 1 day, 23 hours, and 45 minutes.

**[G47: Alm Record4]** Alarm record4
This parameter is used to display the fourth most-recent alarm, and the alarms that can be displayed are the same as those for **G41: Alm Record1**.

**[G48: Alm Record Time4]** Display the operation time of alarm record4
This parameter is used to display the operation time at which the alarm indicated by **G47: Alm Record4** was occurred. For example, "1D23:45" indicates that an alarm was occured at the operation time of 1 day, 23 hours, and 45 minutes.

### (7) Menu H: Display Setting items

Menu H contains setting items relevant to the display unit.

**[H10: Display Select1]** Setting of the first line for display unit
→ Refer to the description for parameter **B40**
This parameter selects the display content of the first line for display unit.

**[H11: Display Select2]** Setting of the second line for display unit
→ Refer to the description for parameter **B41**
This parameter selects the display content of the second line for display unit.

**[H12: Display Select3]** Setting of the third line for display unit
→ Refer to the description for parameter **B42**
This parameter selects the display content of the third line for display unit.

**[H20: Display Cycle]** Setting of the display cycle
This parameter sets the cycle for the display-response speed of display unit. Settings should be made in accordance with the measurement environment by, for example, setting a longer display cycle when using the equipment in low temperatures.

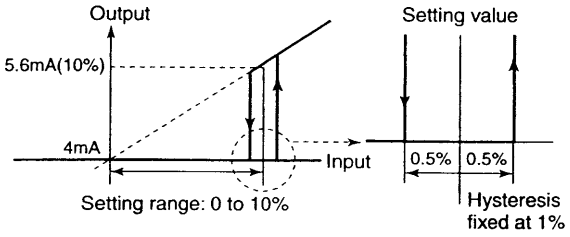
**[H30: Language]** Selection of language used for the display unit
→ Refer to the description for parameter **B10**
This parameter can be used to select the language for the display unit.

### (8) Menu J: Auxiliary Function Setting items

Menu J contains setting items such as the flow direction, rate limits, and current output limits.

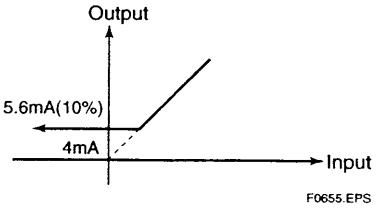
**[J10: 4-20mA Low Cut]** Setting of the low-cut range for current output
This parameter is used to force current output to 0% (i.e., 4mA) in the vicinity of 0% output, and setting for the current (4 to 20 mA) output low cut is made using a percentage of the smallest flow rate span. However, the low cut function will be terminated if this parameter is set to 0%.

Example: Situation where low cut is set to 10%




**[J11: 4-20mA Low Lmt]** Setting of the low limit for current output
This parameter is used to restrict low current portions of current (4 to 20mA) output, and it is initially set to -20%. Setting should be performed when a higher value is required for the lower limit.

Example: Situation where low limit is set to 10%




**NOTE**

If "2.4mA or less" has been set for **G21:4-20mA Alarm Out**, 2.4mA or less will be output upon an alarm occurrence, regardless of the low limit setting.

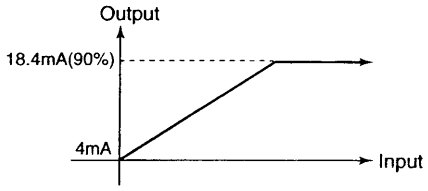
**NOTE**

- If the setting value for the low limit is not less than the high limit value (as set using **J12: 4-20mA High Lmt**), the setting alarm "4-20 Lmt Err" will be displayed.
- This parameter has no effect on pulse output or the totalization function.

**[J12: 4-20mA High Lmt]** Setting of the high limit for current output

This parameter is used to restrict high current portions of current (4 to 20mA) output, and it is initially set to 120%. Setting should be performed when a lower value is required for the higher limit.

Example: Situation where high limit is set to 90%



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**NOTE**

If "21.6mA or more" has been set for **G21:4-20 mA Alarm Out**, 21.6mA or more will be output upon an alarm occurrence, regardless of the high limit setting.

**[J20: Flow Direction]** Setting of the flow direction

Upon shipment from the manufacturing plant, the system is setup such that flow in the same direction, as shown by the direction of the arrow mark on the flowtube, will be measured as forward flow; however, this parameter can be used to set "Reverse" so that flow in the opposite direction to the arrow mark will be treated as forward.

Note: This function does not apply to measurement in both the forward and reverse directions, although this can be setup using by selecting "Fwd/Rev Rngs(O)" from either **F20: DO Function** or **F21: DIO Function**.

| Setting | Function |
|---|---|
| Forward | Forward direction corresponds with arrow mark. |
| Reverse | Forward direction is opposite to arrow mark. |

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**[J21: Rate Limit]** Setting of the rate limit value

- This parameter is used in situations where sudden noise cannot be eliminated by increasing the damping time constant.
- In situations where step signals or sudden noise signals caused by slurries or the like are entered, this parameter is used to set the standard for determining whether an input corresponds to a flow measurement or noise. Specifically, this determination is made using upper and lower rate limits and using the dead time.
- Rate limit values are set using a percentage of the smallest range. The range of deviation per one calculation cycle should be input.

**[J22: Dead Time]** Setting of dead time

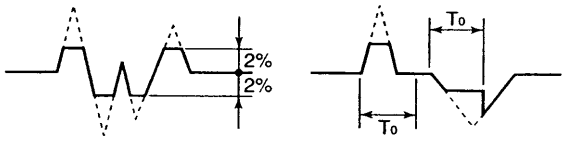
This parameter sets the time for application of the rate limit, and if a value of 0 is set, the rate limit function will be terminated.

**NOTE**

**Determining rate limit value and dead time**

Rate limit value:
Determines the level for output fluctuation cutoff. For example, if this is set to 2%, noise above 2% will be eliminated as shown in the diagram.

Dead time ($T_0$):
This is to be determined using the output fluctuation width. If noise exceeds the dead time as shown in the diagram below, the dead time should be made longer.



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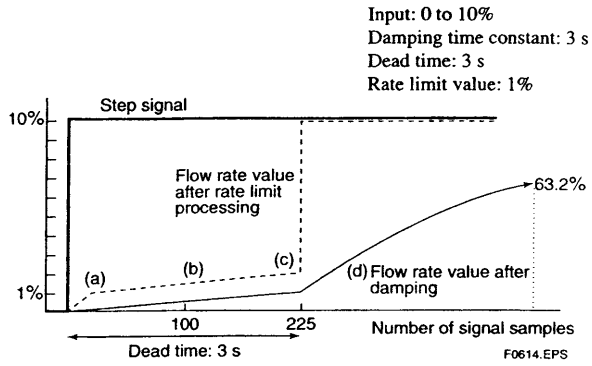
- Signal processing method:
  A fixed upper and lower limit value is setup with respect to the primary delay response value for the flow rate value obtained during the previous sampling, and if the currently sampled flow rate is outside these limits, then the corresponding limit is adopted as the current flow rate value. In addition, if signals which breach the limits in the same direction occur over multiple samples (i.e., within the dead time), it is concluded that the corresponding signal is a flow rate signal.

### Example 1: Step input




(1) In comparison with the previous value at (a), it is determined that the signal is in excess of the rate limit value and the response becomes 1%. However, the actual output applies damping, and therefore the output turns out to be as indicated by the solid line.

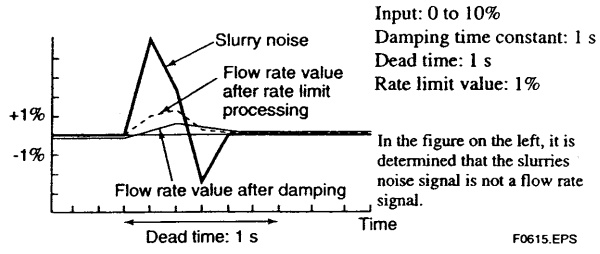
(2) Subsequent flow values within the dead time zone correspond to signals of post-damping flow value + rate limit value (1%).

(3) Since input signals do not return to within the rate limit value during the dead time, it is determined at (c) that this signal is a flow rate signal.

(4) The output signal becomes a damped curve and compliance with the step signal begins.

Three seconds after determination of a flow rate signal in the above figure, a level of 63.2% is reached.

### Example 2: Slurry noise




**[J23: Pulsing Flow]** Selection of pulsing flow support

In a situation where pulsating flow causes error in the average flow value, due to the application of a plunger pump, this parameter provides functionality whereby calculation is controlled and variations in flow rate are followed.

| Setting | Function |
|---|---|
| No | Normal |
| Yes | Support for pulsing flow |

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**[J24: T/P Damp Select]** Setting of damping operation

This parameter is used to select that the flow rate value obtained through damping calculation for totalization and pulse output or the instantaneous flow rate value (no damping) for totalization and pulse output.

| Setting | Function |
|---|---|
| Damp | Damping |
| No Damp | No damping |

T0653.EPS

**[J30: Power Synch]** Setting of power synchronization

This parameter sellects whether or not the internal frequency is to be synchronized with that of the power supply.

| Setting | Function |
|---|---|
| No | Not synchronized |
| Yes | Synchronized |

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**[J31: Power Frequency]** Setting of power frequency

When "Yes" (i.e., in synchrony) has been selected for **J30: Power Synch**, this parameter is used to display the power supply frequency. If "No" (i.e., not synchronized) has been selected, the power supply frequency is to be specified.

**IMPORTANT**

In situations where a DC power supply is used for converters, set the local commercial power frequency in area where the converter is installed.
Set "No" for **J30: Power Synch** and the local commercial power frequency for **J31: Power Frequency**.

| | | Size 2.5 mm (0.1 in.) to 400 mm (16 in.) |
|---|---|---|
| AC power supply | J30 | Power synchronous (Yes) |
| | J31 | No setting |
| DC power supply | J30 | Power asynchronous (No) |
| | J31 | Local commercial power frequency |

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**[J40: Memo 1]** Setting of memo 1

**[J41: Memo 2]** Setting of memo 2

**[J42: Memo 3]** Setting of memo 3

These parameters are used with the memo function, and up to 16 characters can be set for each.

**[J50: Software Rev No]** Display of software revision
This parameter is used to display the software's revision number.

### (9) Menu K: Diagnostic Function Setting items

Menu K contains items that are relevant to the diagnosis of insulation adhesion to the electrode.

**[K10: Adhesion Check]** Setting of adhesion diagnostic function
This parameter selects whether or not the adhesion diagnostic function will be carried out.

| Setting | Function |
|---|---|
| No | Halt the adhesion diagnostic function |
| Yes | Carry out the adhesion diagnostic function |

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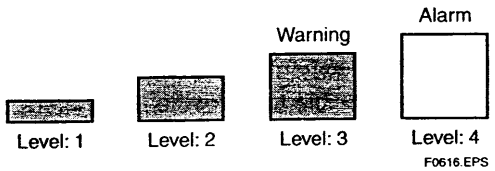
**NOTE**

**Adhesion Diagnostic Function**

- This function diagnose adhesion using electrode resistance values.
- When "Adhesion check" has been set for **B41/H11: Display Select 2** or **B42/H12: Display Select 3**, the diagnose adhesion is indicated on the display unit using four different levels.
- If the judgment value for Level 3 is exceeded, a warning is displayed; and if the value for Level 4 is exceeded, an alarm is displayed.
- Available conductivity for this function is limited to:
  Nominal size 10 mm or smaller: 30 μS/cm
  Nominal size 15 mm or larger: 10 μS/cm
  Make sure to use the adhesion diagnostic function with the greater conductivity than the above mentioned value.

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**[K11: Adhesion Level1]** Setting the resistance value for adhesion diagnostic level1
This parameter sets the resistance value (in M ohm) for judgment of Level 1.

**[K12: Adhesion Level2]** Setting the resistance value for adhesion diagnostic level2
This parameter sets the resistance value (in M ohm) for judgment of Level 2.

**[K13: Adhesion Level3]** Setting the resistance value for adhesion diagnostic level3
This parameter sets the resistance value (in M ohm) for judgment of Level 3.
*: The warning **80: Adhesion Wng** is displayed when the adhension level reaches Level 3.
*: If "Warning Output" has been selected for **F20: DO Function** or **F21: DIO Function**, then status output will be performed when the adhesion level reaches Level 3.

**[K14: Adhesion Level4]** Setting the resistance value for adhesion diagnostic level4
This parameter sets the resistance value (in M ohm) for judgment of Level 4.
*: The process alarm **33: Adhesion Alm** is displayed when the adhension level reaches Level 4.
*: Alarm output will be preformed if "Alarm Output" has been selected for **F20: DO Function** or **F21: DIO Function**, and "Yes" for **G34: Alm-Adhesion**.

**[K15: Adh Measure Value]** Displays the resistance value for adhesion diagnose
This parameter displays the value measured using the adhesion diagnostic function (in M ohm).
When "No" is selected for **K10: Adhesion Check**, this parameter displays the indetermination value.

### (10) Menu M: Automatic Zero Adjustment Function Setting items

Menu M contains items that are relevant to automatic adjustment of the zero point.

**[M10: Auto Zero Exe]** Execution of automatic zero adjustment function
→ Refer to the description of parameter **B50**.

**[M11: Magflow Zero]** Results of automatic zero adjustment
This parameter is used to display the results obtained from **B50/M10: Auto Zero Exe**. Specifically, the correction value displayed, and it is also possible to directly enter correction value.

### (11) Menu N: Loop Test Setting items

Menu N contains items that are relevant to loop testing.

**[N10: Test Mode]** Setting for loop test execution

| Setting | Function |
|---|---|
| Normal | No execution of loop testing. |
| Test | Loop testing is started |

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**IMPORTANT**

(1) Test output has priority over flow rate measurement signals. When carrying out flow rate measurements, be sure to always return to "Normal".
(2) Upon entry to the Test Mode, all output terminals will simultaneously adopt test condition.
(3) "Normal" will be restored when the power is turned off or when 30 minutes have elapsed since entry to Test Mode.
(4) In Test Mode, the warning **83: Fix Cur Wng** will be displayed as a warning message. (For more details, refer to Section 6.5 Alarm Functions.)

**[N11: Test Output Value]** Setting for test output values

During loop testing, current output (4 to 20mA), totalization, and pulse will be output in accordance with this parameter's setting, and values can be set when "Test" has been selected for **N10: Test Mode**. With multiple ranges or when performing forward/reverse flow measurements, setting should be done using a percentage of the maximum range.

**[N30: Test DO]** Setting for DO terminal condition during testing

This parameter sets the condition of the DO terminal during loop testing. Setting is possible when "Test" has been selected for **N10: Test Mode**.

| Setting | Function |
|---|---|
| Open (Off) | DO terminal in Open (Off) condition |
| Closed (On) | DO terminal in Closed (On) condition |
| Pulse | Outputs pulses as were specified with Menu E.* |

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*: If the pulse scale is 0 pps or there is a pulse setting error, the DO terminal is "Open (Off)."

**[N31: Test DIO (O)]** Setting for the DIO terminal condition during testing

This parameter sets the condition of the DIO terminal during loop testing. Setting is possible when "Test" has been selected for **N10: Test Mode**.

| Setting | Function |
|---|---|
| Input mode | Must be set when **N32: Test DIO (I)** is used to display the condition of the DIO terminal. |
| Open (Off) | DIO terminal in Open (Off) condition |
| Closed (On) | DIO terminal in Closed (On) condition |

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**[N32: Test DIO (I)]** Display for DIO terminal condition during testing

This parameter is used to display the condition of the DIO terminal. Setting is possible when "Test" has been selected for **N10: Test Mode**.

| Setting | Function |
|---|---|
| Open | DIO terminal in Open condition |
| Short | DIO terminal in Short condition |

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### (12) Menu P: Parameter Protection items

Menu P contains items that are relevant to write protection and passwords.

**[P10: Key Code]** Parameter of the display restriction

This parameter restricts access to the Service Mode.

**NOTE**

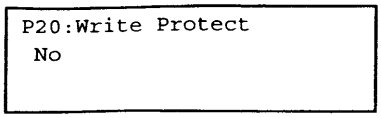
**Write Protect function**

- The parameters **P20** through **P23** are set when using the write protect function. Specifically, this function responds to a hardware switch or the setting of a software password, and it protects parameters from being overwritten.
- If the hardware switch is set to "Protect", it will not be possible to overwrite parameters; furthermore, this condition will be maintained until the switch is set to "Enable".
- For more details regarding hardware switch settings, refer to Section 10.2.2: Setting of Write Protect Switch.

**[P20: Write Protect]** Setting of password to release the write protection function

This parameter is used to indicate whether or not write protection is currently on.

Default setting (Enable)

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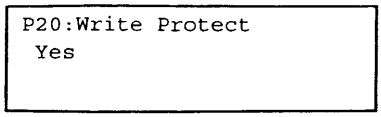
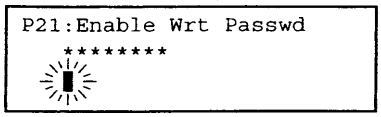
Write protection (Protect)




F0618.EPS

**[P21: Enable Wrt Passwd]** Setting of password to release the write protection function
When the correct password is input, write protection will be released for a period of 10 minutes; furthermore, this period will be extended by a further 10 minutes each time a parameter is overwritten.

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The cursor will flash when entering Parameter Replacement Mode, and the password set with **P22: New Password** should be input at this time.

**[P22: New Password]** Setting of a new password
This parameter sets the password required for the release of write protection. When set, it will be possible to make write protect settings on the software side.

Default setting

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The default setting for this parameter is a string of 8 spaces (i.e., Enable), and thus, the password field will be empty. When the cursor is flashing, the password should be input. Press the SET key twice to confirm the password. The display will then change to "********".

After password setting

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To change a password, first of all use the password originally set with **P21: Enable Wrt Passwd** to release the write protect function, and then set the new password. Alternatively, if it is desired to return to the condition where no password is set, enter a string of 8 spaces.

**[P23: Software Seal]** Display the software seal
When the joker password has been used to release write protection, this parameter displays "Break", and when protection is cancelled using the password set using **P22: New Password**, it returns to "Keep".

**NOTE**

If you should forget your password, the joker password can be used to temporarily release write protection function. To obtain the joker password, please contact your nearest YOKOGAWA sales office.

# 6.5 Alarm Functions

## 6.5.1 Alarm Levels

Alarms are classified into the following four different types based on level.

| Alarm | Level | Description |
|---|---|---|
| System alarm | Major breakdown | Device breakdown or inability to obtain correct measurements. Replacement will be required. |
| Process alarm | Intermediate level break down | Device is normal but process-related errors make correct measurement impossible. Maintenance or the like will be required. |
| Setting alarm | Minor breakdown | Device is normal but errors have been made in the setting of parameters. Functions not related to the incorrect settings are operating normally. The incorrect settings must be corrected. |
| Warning | Warning | Device and measurements are normal but a warning is occurred. |

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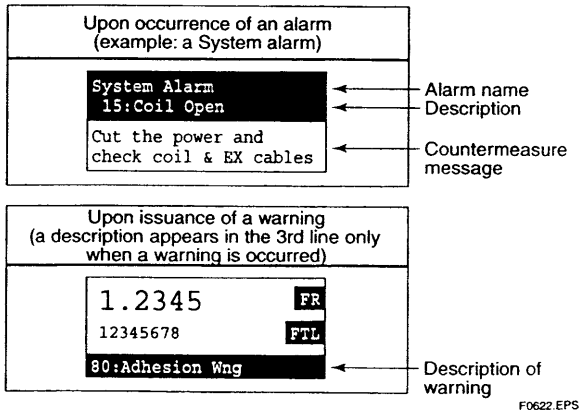
When an alarm has been occurred, the corresponding alarm name, description, and suitable countermeasure will be displayed on the display unit. The normal Display Mode and Alarm Mode may be displayed alternatively. When a warning has been issued, the corresponding content will be shown in the third line in the Display Mode.

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## 6.5.2 Alarm Selection

The display and output differs depending on the alarm levels. Certain types of alarm may or may not be recognized as alarms, according to the settings of certain parameters. The parameters that are relevant to this function as follows.

**[F20: DO Function]** Setting of the function for the DO status output terminal

**[F21: DIO Function]** Setting of the function for the DIO status input/output terminal

**[F22: DO Active Mode]** Setting of the active mode for DO terminal

**[F23: DIO Active Mode]** Setting of the active mode for DIO terminal

**[G21: 4-20mA Alarm Out]** Setting of the current output during an alarm occurring.

**[G30: Alm-Setting]** Alarm recognition of "Setting Alarm"

**[G31: Alm-Sig Over]** Alarm recognition of "Signal Overflow Alarm"

**[G32: Alm-Emp Pipe]** Alarm recognition of "Empty Pipe alarm"

**[G33: Alm-HH/LL]** Alarm recognition of "HH/LL Alarm" (Refer to the descriptions of **G12** and **G13** for more details regarding HH and LL alarms.)

**[G34: Alm-Adhesion]** Alarm recognition of "Adhesion Alarm"

**[G41: Alm Record1]** Alarm record1

**[G43: Alm Record2]** Alarm record2

**[G45: Alm Record3]** Alarm record3

**[G47: Alm Record4]** Alarm record4

### (1) Display and output condition for system alarms

| | | Alarm description | Alarm output | 4-20 mA output | Totalization | Pulse | Display unit | Alarm record |
|---|---|---|---|---|---|---|---|---|
| | Normal | | Closed (On) | Normal | Normal | Normal | Display Mode | No |
| 10 | μP Fault | Microprocessor(CPU)failure | Open (Off) | 0mA or 25mA (*) | Indetermination | Stopped | Indetermination | Indetermination |
| 11 | EEPROM Fault | EEPROM failure | | | | | | |
| 12 | A/D(H) Fault | A/D converter failure | Open (Off) | Fixed (G21 selection) | Stopped | Stopped | Alarm Mode (display of system alarm message) | Recorded |
| 13 | A/D(L) Fault | | | | | | | |
| 14 | A/D(Z) Fault | | | | | | | |
| 15 | Coil Open | Flowtube coil is open-circuit | | | | | | |
| 16 | EEPROM Dflt | EEPROM default values | | | | | | |

Note: • Alarm is output only when **F20: DO Function** or **F21: DIO Function** is set to "Alarm Output."
• The operation when "Open (Off) Act" is set for **F22: DO Active Mode**, or "Open/Open Act" is set for **F23: DIO Active Mode** is shown in above table.
• 4-20mA output upon the occurrence of an alarm will be fixed at the value selected with **G21: 4-20mA Alarm Out**.
*The output value is performed in accordance with the setting of the burnout switch. For information about this switch, see Section 10.2.1.

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### (2) Display and output condition for process alarms

| | | Alarm description | Selection (parameter number) | Alarm output | 4-20 mA output | Totalization | Pulse output | Display unit | Alarm record |
|---|---|---|---|---|---|---|---|---|---|
| 30 | Sig Overflow | Input signal error | YES (G31) | Open (Off) | Fixed | Stopped | Stopped | Alarm Mode (Message) | Recorded |
| | | | NO (G31) | Closed (On) | Continuous (*) | Continuous (*) | Continuous (*) | Display Mode | No |
| 31 | Empty Pipe | Flowtube is not filled with fluid | YES (G32) | Open (Off) | Fixed | Stopped | Stopped | Alarm Mode (Message) | Recorded |
| | | | NO (G32) | Closed (On) | Continuous (*) | Continuous (*) | Continuous (*) | Display Mode | No |
| 32 | HH/LL Alm | HH/LL Alarm | YES (G33) | Open (Off) | Normal operation | Normal operation | Normal operation | Alarm Mode (Message) | No |
| | | | NO (G33) | Closed (On) | | | | Display Mode | |
| 33 | Adhesion Alm | Electrode adhesion alarm | YES (G34) | Open (Off) | Fixed | Stopped | Stopped | Alarm Mode (Message) | Recorded |
| | | | NO (G34) | Closed (On) | Continuous (*) | Continuous (*) | Continuous (*) | Display Mode | No |

Note: • Alarm is output only when **F20: DO Function** or **F21: DIO Function** is set to "Alarm Output."
• The operation when "Open (Off) Act" is set for **F22: DO Active Mode** or "Open/Open Act" is set for **F23: DIO Active Mode** is shown in above table.
• 4-20mA output upon the occurrence of an alarm will be fixed at the value selected with **G21: 4-20mA Alarm Out**.
*: Although outputs are continuous, output values are not guaranteed.

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## (3) Display and output condition for setting alarm occurrences

| | | Alarm description | Selection (parameter number) | Alarm output | 4-20 mA output | Totali-zation | Pulse output | Display unit | Alarm record |
|---|---|---|---|---|---|---|---|---|---|
| 50 | Span > 10m/s | Span flow velocity setting is 11 m/s or more | NO (G30) | Closed (On) | Fixed | Stopped | Stopped | Alarm Mode (message) | No |
| 51 | Span < 0.1m/s | Span flow velocity setting is 0.05 m/s or less | | | | | | | |
| 52 | TTL>10000p/s | Totalization rate is 11000 pps or more | | Closed (On) | Normal operation | Stopped | Normal operation | Alarm Mode (message) | No |
| 53 | TTL<0.0001p/s | Totalization rate is 0.00005 pps or more | | | | | | | |
| 54 | 4-20 Lmt Err | The condition [4-20 low limit (J11) < 4-20 high limit (J12)] is not satisfied. | | Closed (On) | Fixed | Normal operation | Normal operation | Alarm Mode (message) | No |
| 55 | Multi Rng Err | The condition [No. 1 range < No. 2 range < No. 3 range < No. 4 range] is not satisfied for multiple ranges. | | Closed (On) | Fixed | Stopped | Stopped | Alarm Mode (message) | No |
| 56 | H/L HH/LL Set | The condition [High Alarm (G11) - Low Alarm (G10) > H/L Alarm Hys (G14)] or the condition [High High Alarm (G13) - Low Low Alarm (G12) > H/L Alarm Hys (G14)] is not satisfied. | | Closed (On) | Normal operation | Normal operation | Normal operation | Alarm Mode (message) | No |
| 57 | Dens Set Err | Mass units have been selected for Base Flow Unit (C40) but density is set to 0. | | Closed (On) | Fixed | Stopped | Stopped | Alarm Mode (message) | No |
| 60 | PLS >10000p/s | Pulse rate is 11000 pps or more with 50% duty. | | Closed (On) | Normal operation | Normal operation | Stopped | Alarm Mode (message) | No |
| | | Pulse rate is 10000 pps or more with 0.05 ms selection. | | | | | | | |
| 61 | PLS > 5000p/s | Pulse rate is 5000 pps or more with 0.1 ms selection. | | | | | | | |
| 62 | PLS > 1000p/s | Pulse rate is 1000 pps or more with 0.5 ms selection. | | | | | | | |
| 63 | PLS > 500p/s | Pulse rate is 500 pps or more with 1 ms selection. | | | | | | | |
| 64 | PLS > 25p/s | Pulse rate is 25 pps or more with 20 ms selection. | | | | | | | |
| 65 | PLS > 15p/s | Pulse rate is 15 pps or more with 33 ms selection. | | | | | | | |
| 66 | PLS > 10p/s | Pulse rate is 10 pps or more with 50 ms selection. | | | | | | | |
| 67 | PLS > 5p/s | Pulse rate is 5 pps or more with 100 ms selection. | | | | | | | |
| 70 | PLS<0.0001p/s | Pulse rate is 0.00005 pps or less. | | | | | | | |
| 71 | Meas Mod Set | Measure Mode (C20) is set to Enhanced DF without selecting an optional code HF1 or HF2. | | Closed (On) | Fixed | Stopped | Stopped | Alarm Mode (message) | No |
| 72 | Size Set Err | A value of 3000.1 mm or more is set for Nominal Size (C32). | | Closed (On) | Fixed | Stopped | Stopped | Alarm Mode (message) | No |
| 73 | Adh Set Err | The condition [Level:1< Level:2<Level:3<Level:4] is not satisfied for adhesion diagnostic level. | | Closed (On) | Normal operation | Normal operation | Normal operation | Alarm Mode (message) | No |
| | Occurring of any alarm from 50 through 73 | - | YES (G30) | Open (Off) | Fixed | Stopped | Stopped | Alarm Mode (message) | No |

Note: • Alarm is output only when **F20: DO Function** or **F21: DIO Function** is set to "Alarm Output."
• The operation when "Open (Off) Act" is set for **F22: DO Active Mode** or "Open/Open Act" is set for **F23: DIO Active Mode** is shown in above table.
• 4-20mA output upon the occurrence of an alarm will be fixed at the value selected with **G21: 4-20mA Alarm Out**.

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## 6.5.3 Alarms & Warning Messages

| System Alarms (Device breakdown or inability to obtain correct measurements.) | | | |
|---|---|---|---|
| Display unit/BRAIN (□60) content | Alarm countermeasure message on display unit | Alarm description | Countermeasure |
| 10:uP Fault | Contact nearest office or service center | Microprocessor (CPU) failure | Contact your nearest Yokogawa office or service center. |
| 11:EEPROM Fault | Contact nearest office or service center | EEPROM failure | |
| 12:A/D(H) Fault | Contact nearest office or service center | A/D converter failure | |
| 13:A/D(L) Fault | Contact nearest office or service center | | |
| 14:A/D(Z) Fault | Contact nearest office or service center | | |
| 15:Coil Open | Cut the power and check coil & EX cable | Flowtube coil is open-circuit | Turn off the AXFA14 power supply and examine the excitation cable for breakage. If there is no breakage, contact your nearest Yokogawa office or service center. In case of the AXF integtal flowmeter, the excitation cable cannot be examined. Contact your nearest Yokogawa office or service center. |
| 16:EEPROM Dflt | Contact nearest office or service center | EEPROM default values | Contact your nearest Yokogawa office or service center. |

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| Process Alarms (Device is normal but process-related errors make correct measurement impossible.) | | | |
|---|---|---|---|
| Display unit/BRAIN (□60) content | Alarm countermeasure message on display unit | Alarm description | Countermeasure |
| 30:Sig Overflow | Check signal cable and grounding | Input signal error | Carry out an investigation as follows:<br>• Check the signal cable for breakage.<br>• Check for contact between signal cable, power cable, and excitation cable.<br>• Check for stray currents in the fluid.<br>• Check the grounding. |
| 31:Empty Pipe | Fill flow tube with fluid | Flowtube is not filled with fluid | Fill the flowtube with fluid. |
| 32:HH/LL Alm | Check the flow rate and setting value | Flow rate alarm for greater than High-High limit value or less than Low-Low limit value. | Check the flow rate and setting value of High High limit and Low Low limit. |
| 33:Adhesion Alm | Clean electrodes | Electrode adhesion alarm | Clean the electrodes. |

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| Setting Alarms (Device is normal but errors have been made in the setting of parameters.) | | | |
|---|---|---|---|
| Display unit/BRAIN (□60) content | Alarm countermeasure message on display unit | Alarm description | Countermeasure |
| 50:Span > 10m/s | Check parameter C40, C41, and C42 | Span flow velocity setting is 11 m/s or more | Check whether parameters C40, C41, and C42 are correct. In case that multiple range or forward and reverse flow measurement functions is used, check whether parameters F30 through F34 are correct. |
| 51:Span < 0.1m/s | Check parameter C40, C41, and C42 | Span flow velocity setting is 0.05 m/s or less | |
| 52:TTL>10000p/s | Check parameter D10 and D11 | Totalization rate is 11000 pps or more | Check whether parameters D10 and D11 are correct. |
| 53:TTL<0.0001p/s | Check parameter D10 and D11 | Totalization rate is 0.00005 pps or more | |
| 54:4-20 Lmt Err | Check parameter J11and J12 | The condition [4-20 low limit (J11) < 4-20 high limit (J12)] is not satisfied. | Check whether parameters J11 and J12 are correct. |
| 55:Multi Rng Err | Check parameter F30 to F34 | The condition [No. 1 range < No. 2 range < No. 3 range < No. 4 range] is not satisfied for multiple ranges. | Check whether parameters F30 through F34 are correct. |
| 56:H/L HH/LL Set | Check parameter G10 to G14 | The condition [High Alarm (G11) – Low Alarm (G10) > H/L Alarm Hys (G14)] or the condition [High High Alarm (G13) – Low Low Alarm (G12) > H/L Alarm Hys (G14)] is not satisfied. | Check whether parameters G10 through G14 are correct. |
| 57:Dens Set Err | Check parameter C40, C45, and C46 | Mass units have been selected for Base Flow Unit (C40) but density is set to 0. | Check whether parameters C40, C45, and C46 are correct. |
| 60:PLS > 10000p/s | Check parameter E10, E11, and E12 | Pulse rate is 11000 pps or more with 50% duty.<br>Pulse rate is 10000 pps or more with 0.05 ms selection. | Check whether parameters E10, E11, and E12 are correct. |
| 61:PLS > 5000p/s | Check parameter E10, E11, and E12 | Pulse rate is 5000 pps or more with 0.1 ms selection. | |
| 62:PLS > 1000p/s | Check parameter E10, E11, and E12 | Pulse rate is 1000 pps or more with 0.5 ms selection. | |
| 63:PLS > 500p/s | Check parameter E10, E11, and E12 | Pulse rate is 500 pps or more with 1 ms selection. | |
| 64:PLS > 25p/s | Check parameter E10, E11, and E12 | Pulse rate is 25 pps or more with 20 ms selection. | |
| 65:PLS > 15p/s | Check parameter E10, E11, and E12 | Pulse rate is 15 pps or more with 33 ms selection. | |
| 66:PLS > 10p/s | Check parameter E10, E11, and E12 | Pulse rate is 10 pps or more with 50 ms selection. | |
| 67:PLS > 5p/s | Check parameter E10, E11, and E12 | Pulse rate is 5 pps or more with 100 ms selection. | |
| 70:PLS<0.0001p/s | Check parameter E10, E11, and E12 | Pulse rate is 0.00005 pps or less. | |
| 71:Meas Mod Set | Check parameter C20 | Measure Mode (C20) is set to Enhanced DF without selecting an optional code HF1 or HF2. | Check whether parameter C20 is correct. |
| 72: Size Set Err | Check parameter C32 | A value of 3000.1 mm or more is set for Nominal Size (C32). | Check whether parameter C32 is correct. |
| 73: Adh Set Err | Check parameter K11 to K14 | The condition in Adhesion detection level, Level:1<Level:2<Level:3<Level:4 is not satisfied. | Check whether parameter K11, K12, K13 and K14 are correct. |

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| Setting Alarms (Device and measurements are normal but a warning is issued.) | | | |
|---|---|---|---|
| Display unit/BRAIN (□60) content | Alarm countermeasure message on display unit | Alarm description | Countermeasure |
| 80:Adhesion Wng | – | Slight adhesion to electrodes. | Clean and check the electrodes. Refer to parameter K13. |
| 82:Auto Zero Wng | – | Results of automatic zero adjustment are higher than the rated values. | Carry out adjustment as follows:<br>• Check if the flowtube is filled with fluid.<br>• Check if the flow velocity is completely zero.<br>• Check the condition of grounding. |
| 83:Fix Cur Wng | – | The current value is fixed. | Confirm whether the flow rate is in excess of the upper limit (108%) or below the lower limit (-8%), or whether upon entry to the Test Mode or not. |
| 84:Disp Over Wng (only for display unit) | – | Overflow in the display digits during instantaneous flow rate display. | Check whether parameter C43 is correct. |
| 90:Disp SW Wng (only for display unit) | – | Display unit switches are not operating. | Investigate whether the display unit cover is fitted or whether the cover's glass surface is dirty. |

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# 6.6 Precautions for the AXF Integral Flowmeter

Although the AXF integral flowmeter's software configurations are the same as the AXFA14, care must be taken in setting the following parameters:

**[C31: Nominal Size Unit]** Setting of the nominal size units
**[C32: Nominal Size]** Setting of the nominal size

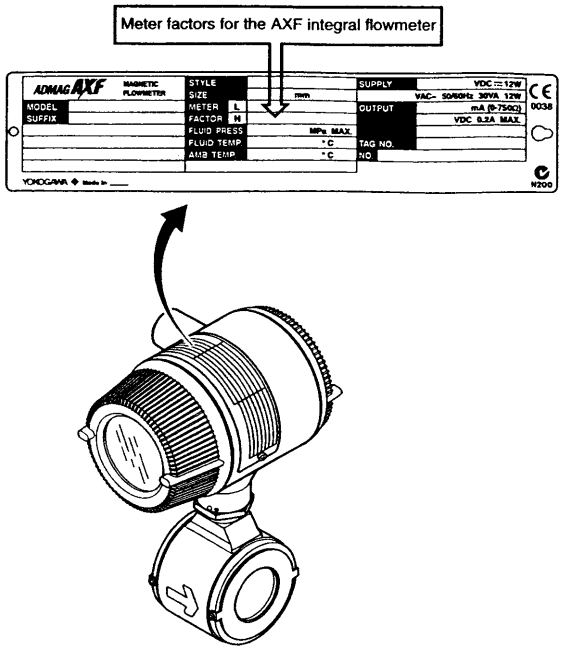
**NOTE**

The nominal size unit, nominal size and meter factor have been properly set upon shipment from the manufacturing plant. Do not change these parameters.

**[C21: Low MF]** Setting of the low-frequency meter factor
**[C22: High MF]** Setting of the high-frequency meter factor
**[C23: Low MF (EDF)]** Setting of the low-frequency meter factor for enhanced DF (i.e., enhanced dual frequency excitation)
**[C24: High MF (EDF)]** Setting of the high-frequency meter factor for enhanced DF (i.e., enhanced dual frequency excitation)

**NOTE**

**Setting the meter factor**

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(1) Confirm that the meter factors indicated on your AXF integral flowmeter's data plate has been set to the parameters.
(2) The meter factors are crucial in ensuring that the electromotive force is correctly in proportion to the flow velocity and are determined at the manufacturing plant by actual-flow calibration.

**NOTE**

For the hardware configuration of the AXF integral flowmeter, see the user's manual of the AXF Integral Flowmeter [Hardware Edition] (IM 01E20D01-01E).

# 7. OPERATION VIA BRAIN TERMINAL (BT200)

**NOTE**

This chapter describes the AXFA14 converter as an example. The same attention must be paid to the AXF integral flowmeter.

## 7.1 BT200 Basic Operations

### 7.1.1 Key Layout and Display

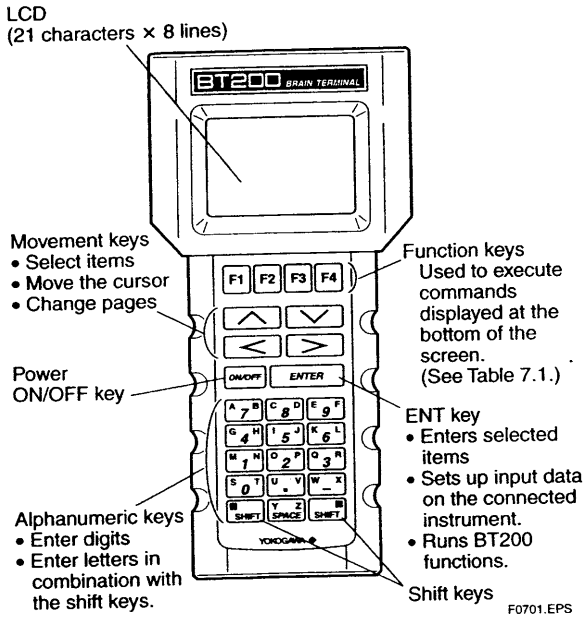
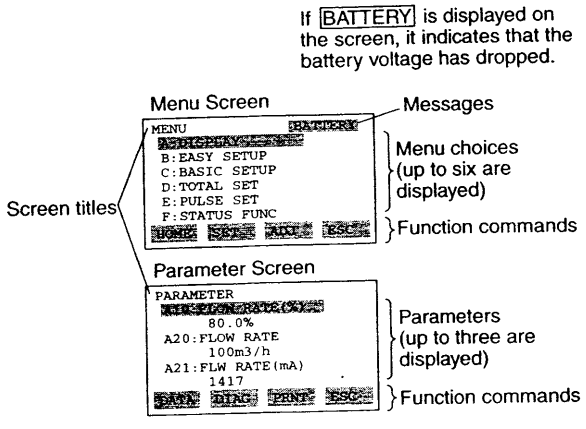


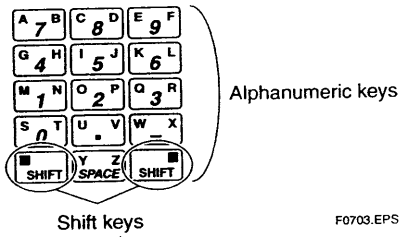

**Figure 7.1 Key Layout**




### 7.1.2 Key Descriptions

#### (1) Alphanumeric keys and shift keys

You can use the alphanumeric keys in conjunction with the shift keys to enter letters, digits, and symbols.




**a) Entering digits, symbols, and spaces [i.e., 0-9, period (.), hyphen (-), underscore (_)]**

Simply press the required alphanumeric key.

| Entry | Key-in sequence |
|---|---|
| -4 | [_ -] [4 G] |
| 0.3 | [0 S] [. U] [3 Q] |
| 1 _ -9 | [1 M] [SPACE Y Z] [_ -] [9 E] |

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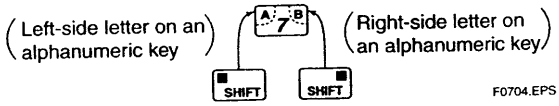
**b) Entering letters (i.e., A through Z)**

Press an alphanumeric key following a shift key to enter the letter shown on the same side as the shift key. The shift key must be pressed for each letter being input.




| Entry | Key-in sequence |
|---|---|
| W | [SHIFT] [_ -] |
| IC | [SHIFT] [5 J] [SHIFT] [8 D] |
| J. B | [SHIFT] [5 J] [. U] [SHIFT] [7 A] |

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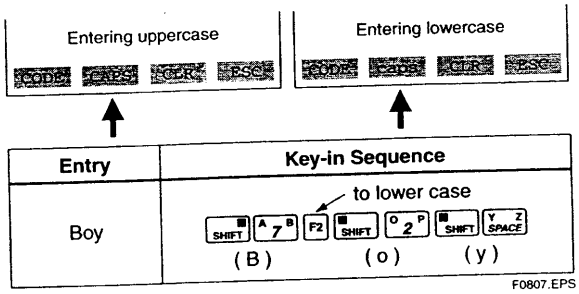
Use the function key [F2] CAPS to select between uppercase and lowercase (for letters only). The case toggles between uppercase and lowercase each time you press [F2] CAPS.



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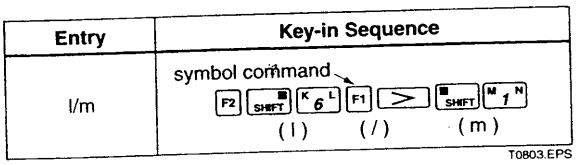
Use the function key [F1] CODE to enter symbols. The following symbols will appear in sequence, one at a time, at the cursor each time you press [F1] CODE:

/ . – , + * ) ( ' & % $ # " !

To enter characters next to these symbols, press [ > ] to move the cursor.



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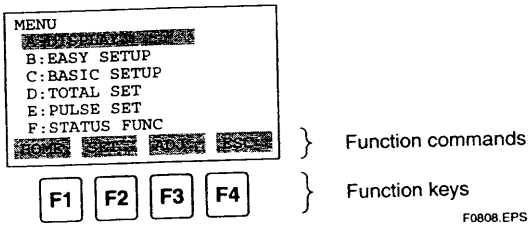
## (2) Function Keys

The functions of the function keys depend on the function commands on display.



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**Function Command List**

| Command | Function |
|---|---|
| ADJ | Displays the ADJ menu |
| CAPS/caps | Selects uppercase or lowercase |
| CODE | Selects symbols |
| CLR | Erases input data or deletes all data |
| DATA | Updates parameter data |
| DEL | Deletes one character |
| DIAG | Calls the self-check panel |
| ESC | Returns to the most recent display |
| HOME | Displays the menu panel |
| NO | Quits setup and returns to the previous display |
| OK | Proceeds to the next panel |
| PARM | Enters the parameter number setup mode |
| SET | Displays the SET menu |
| SLOT | Returns to the slot selection panel |
| UTIL | Calls the utility panel |
| *COPY | Prints out parameters on display |
| *FEED | Paper feed |
| *LIST | Lists all parameters in the menu |
| *PON/POFF | Automatic printout mode on or off |
| *PRNT | Changes to the print mode |
| *GO | Starts printing |
| *STOP | Cancels printing |

* Available on BT200-P00 (with printer).

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# 7.2 AXFA14 Operation Using a BT200

This section describes procedures for setting parameters using a BRAIN Terminal (BT200). For more details regarding AXFA14 functions, refer to Chapter 6: Parameter Description; and for more details regarding BT200 operation methods, refer to the BT200 User's Manual (IM IC0A11-01E).

## 7.2.1 BT200 Connection

### Connection to a 4 to 20 mA DC signal line

The communication signal is superimposed onto the 4 to 20 mA DC analog signals to be transmitted.

AXFA14 terminals

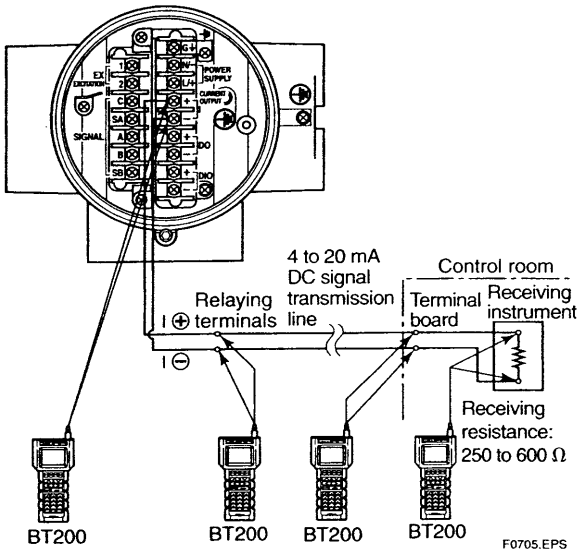


**Figure 7.2 Connecting the BT200**

**IMPORTANT**

Restrictions exist with regard to the distance over which communication is possible. (See Chapter 11: Outline.)

**IMPORTANT**

If the power of flowmeter is turned off within 30 seconds after parameters have been set, these settings will be canceled. Accordingly, please keep the power on for at least 30 seconds after setting parameters.

**IMPORTANT**

After approximately 5 minutes of inactivity, the Auto Power-Off function will operate to turn your BT200 off.

**NOTE**

In case of BT200, the parameters are displayed in English only.
Even if the language with the exception of English is selected at **B10/H30: Language**, the parameters are displayed in English upon BT200.

## 7.2.2 The data update and upload/ download function of BT200

### (1) The data update of BT200

When the following parameters are displayed, the measured data is updated automatically every seven seconds.

| Item | Name (BRAIN) | Item | Name (BRAIN) |
|---|---|---|---|
| A10 | FLOW RATE (%) | G42 | ALM TIME 1 |
| A20 | FLOW RATE | G43 | ALM RECORD2 |
| A21 | FLW RATE (mA) | G44 | ALM TIME 2 |
| A30 | TOTAL | G45 | ALM RECORD3 |
| A31 | REV TOTAL | G46 | ALM TIME 3 |
| A32 | DIF TOTAL | G47 | ALM RECORD4 |
| C44 | VELOCITY CHK | G48 | ALM TIME 4 |
| G22 | 4-20 BURNOUT | N32 | TEST DIO (I) |
| G40 | OPERATE TIME | P20 | W PROTECT |
| G41 | ALM RECORD1 | P23 | SOFT SEAL |

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### (2) Upload/download function of BT200

Upload function is used when the parameters of one AXFA14 are copied to the BT200. And download function is used when the parameters copied to the BT200 are set to another AXFA14.
For details, refer to BT200 User's Manual (IM 1C0A11-01E).
The targeted parameters for upload and download are following.

| Item | Name (BRAIN) | Item | Name (BRAIN) |
|---|---|---|---|
| C11/B20 | FLOW DAMPING | D10/B30 | TOTAL UNIT |
| C31 | SIZE UNIT | D11/B31 | TOTAL SCALE |
| C32 | NOMINAL SIZE | E10/B32 | PULSE UNIT |
| C40/B21 | FLOW UNIT | E11/B33 | PULSE SCALE |
| C41/B22 | TIME UNIT | H10/B40 | DISP SELECT1 |
| C42/B23 | FLOW SPAN | H11/B41 | DISP SELECT2 |
| C43/B24 | FLOW DECIMAL | H12/B42 | DISP SELECT3 |

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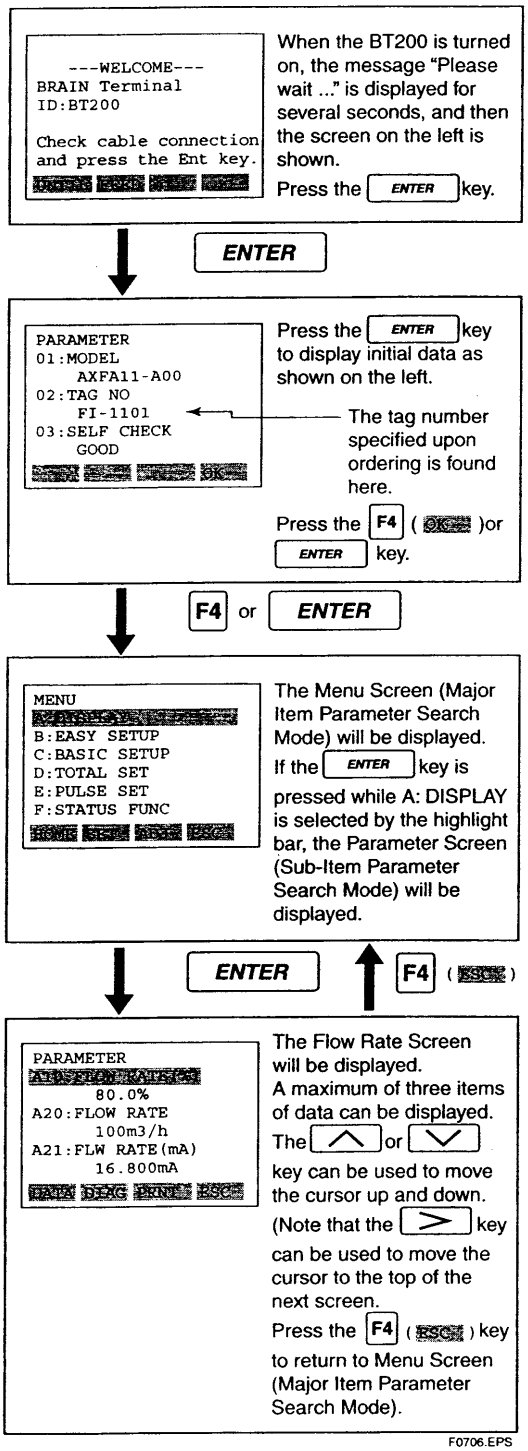
### 7.2.3 BT200 Screens & Flow Rate Data Display

Use the following procedure to display flow rate data on the BT200.

- The display of flow rate data is updated every 5 seconds.




## 7.3 Parameter Setting Using a BT200

This section describes the procedure for setting of parametes using a BT200.

**IMPORTANT**

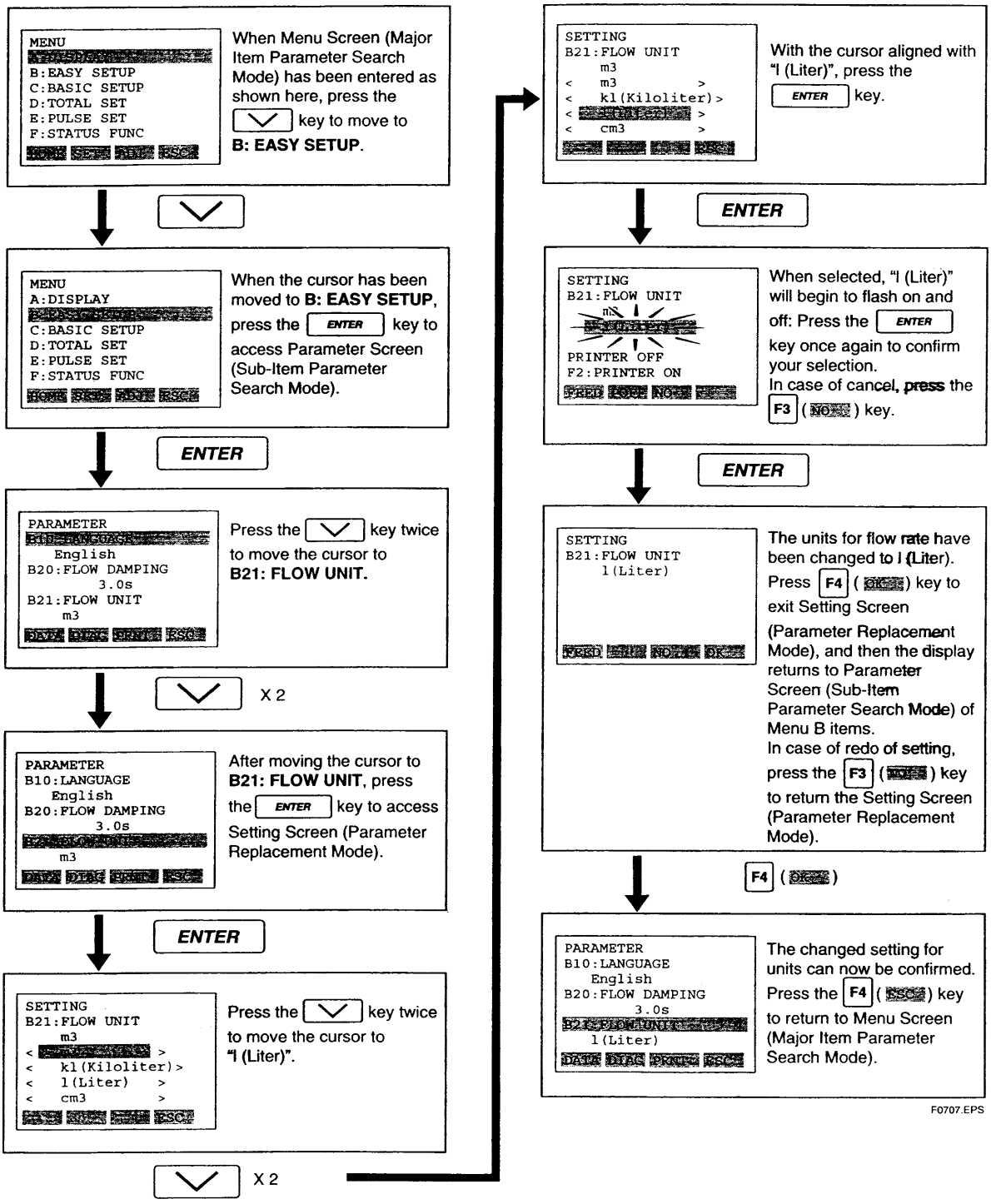
If the power of flowmeter is turned off within 30 seconds after parameters have been set, these settings will be canceled. Accordingly, please keep the power on for at least 30 seconds after setting parameters.

**NOTE**

Before updating any setting, remember to always check the data content you want to change as described in Chapter 6: Parameter Description.

## 7.3.1 BT200 Setting of Selection-Type Data: Flow rate units

In this example, the flow rate units specified by the selection-type parameter **B21: Flow Unit** are changed from $m^3$ to l (Liter).

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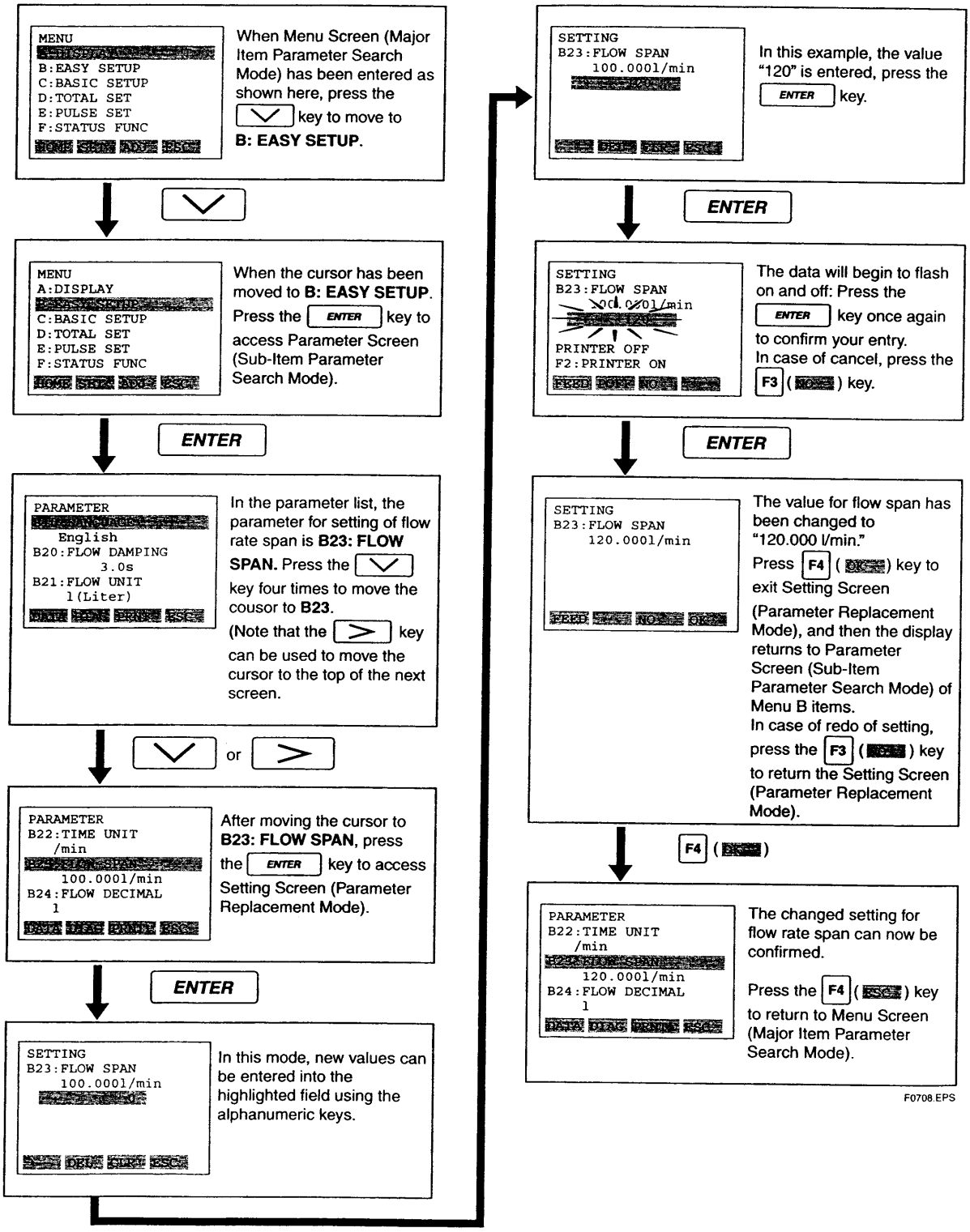
## 7.3.2 BT200 Setting of Numeric-Type Data: Flow rate span

In this example, the flow rate span specified by the numeric-type parameter **B23: Flow Span** is changed from 100.000 l/min. to 120.000 l/m.

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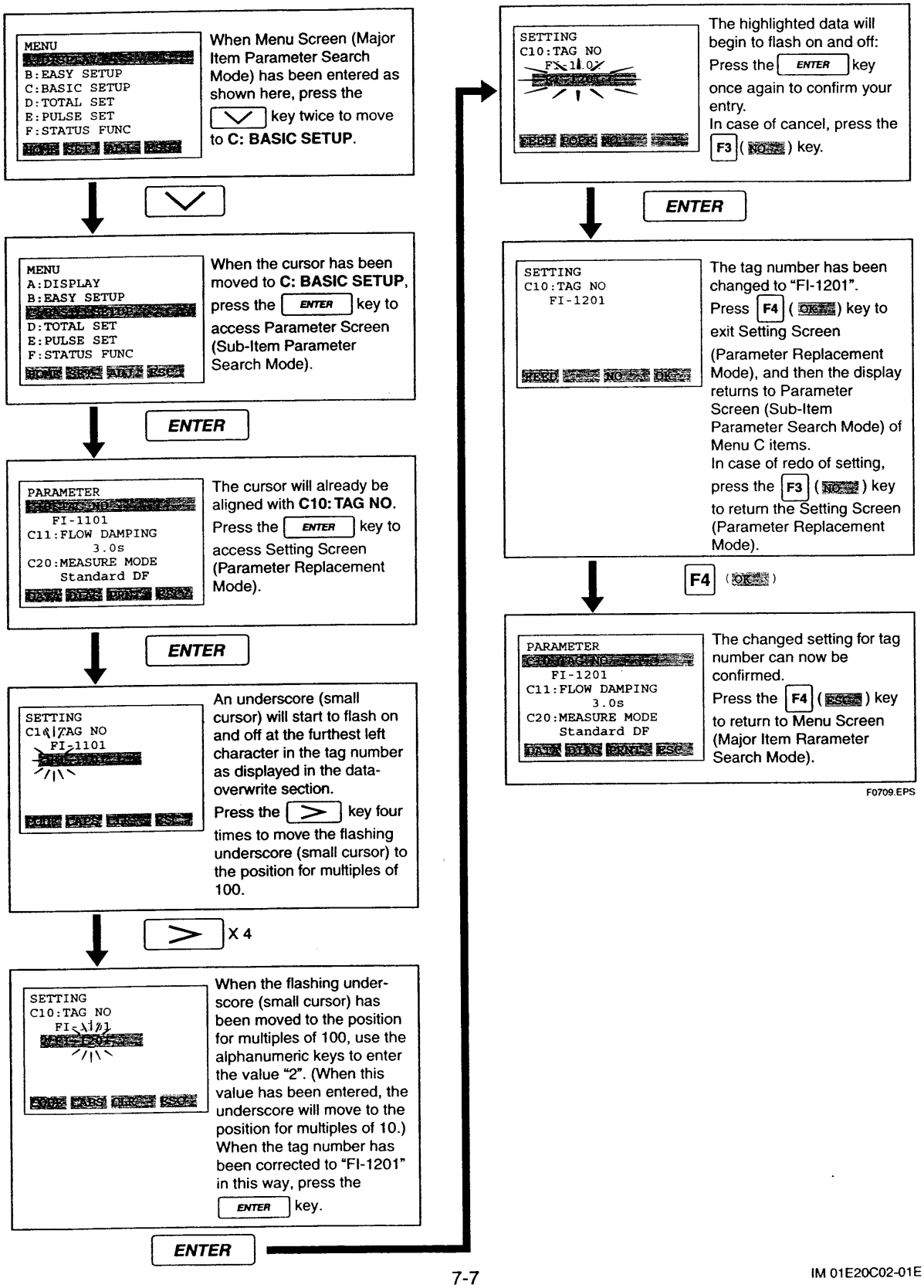
## 7.3.3 BT200 Setting of Alphanumeric-Type Data: Tag number

In this example, the tag number specified by the alphanumeric-type parameter **C10: TAG NO** is changed from "FI-1101" to "FI-1201".

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# 8. OPERATION VIA HART COMMUNICATOR

**NOTE**

This chapter describes the AXFA14 converter as an example. The same attention must be paid to the AXF integral flowmeter.

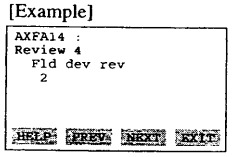
**CAUTION**

Matching of communicator DD and instrument DD

Before using the Model 275 HART Communicator, check that the DD (Device Description) installed in the communicator matches to that of the instruments to be set up. To check the DD in the instrument or the HART Communicator, follow the steps below. If the correct DD is not installed in the communicator, you must upgrade the DD at the official HART programming sites. For communication tools other than Model 275 HART Communicator, contact the respective vendors for upgrade information.

1. Checking the DD in the instrument
   1) Connect the communicator to the instrument to be set up.
   2) Open "Device Setup" and press [→].
   3) Select "Review" and press [→].
   4) Select "Review 4" and press [→].
   5) By pressing [NEXT] or [PREV], locate "Fld dev rev" to show the DD of the instrument.

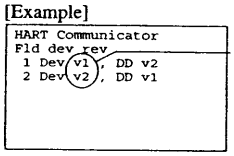
[Example]




"The instrument DD is Version 2"

2. Checking the DD in Model 275 HART Communicator.
   1) Turn on only the communicator alone.
   2) Select "Utility" from the main menu and press [→].
   3) Select "Simulation" and press [→].
   4) Select "YOKOGAWA" from the manufacturers list by pressing [↓] and then pressing [→] to enter selection.
   5) Select the model name of the instrument (i.e. AXFA14) by pressing [↓] and then press [→] to show the DD of the communicator.

[Example]




Versions 1 and 2

"The communicator DD supports Versions 1 and 2."

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**NOTE**

In case of HART Communicator, the parameters are displayed in English only. Even if the language with the exception of English is selected at "**Language**" setting display, the parameters are displayed in English upon HART Communicator.

# 8.1 Conditions of Communication Line

## 8.1.1 Interconnection between AXFA14 and HART Communicator

The HART Communicator can interface with the AXFA14 from the control room, the AXFA14 site, or any other wiring termination point in the loop, provided there is a minimum load resistance of 230 Ω between the connection and the receiving instrument. To communicate, it must be connected in parallel with the AXFA14, and the connections must be non-polarized. Figure 8.1.1 illustrates the wiring connections for a direct interface at the AXFA14 site. The HART Communicator can be used for remote access from any terminal strip as well.

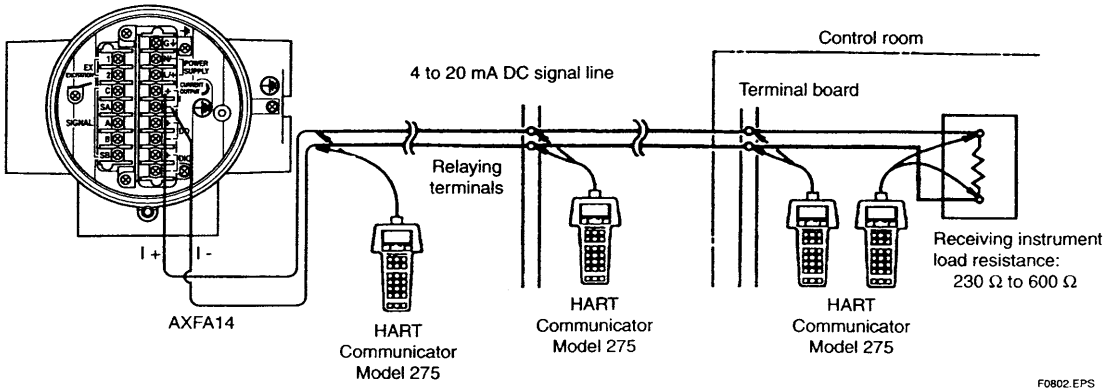


**Figure 8.1.1 Interconnection Diagram**

## 8.1.2 Communication Line Requirements

**Specifications for Communication Line:**

Load resistance: 230 to 600 Ω (including cable resistance)
Minimum cable size: 24 AWG, (0.51 mm diameter)
Cable type: Single pair shielded or multiple pair with overall shield
Maximum twisted-pair length: 6,500 ft (2,000 m)
Maximum multiple twisted-pair length: 3,200 ft (1,000 m)
Use the following formula to determine cable length for a specific application:

$$L = \frac{65\times10^6}{(R\times C)} - \frac{(C_f+10{,}000)}{C}$$

where: L = length in feet or meters
R = resistance in ohms, current sense resistance
C = cable capacitance in pF/ft or pF/m
$C_f$ = 15,000 pF

# 8.2 Basic Operation of the HART Communicator (Model 275)

## 8.2.1 Keys and Functions

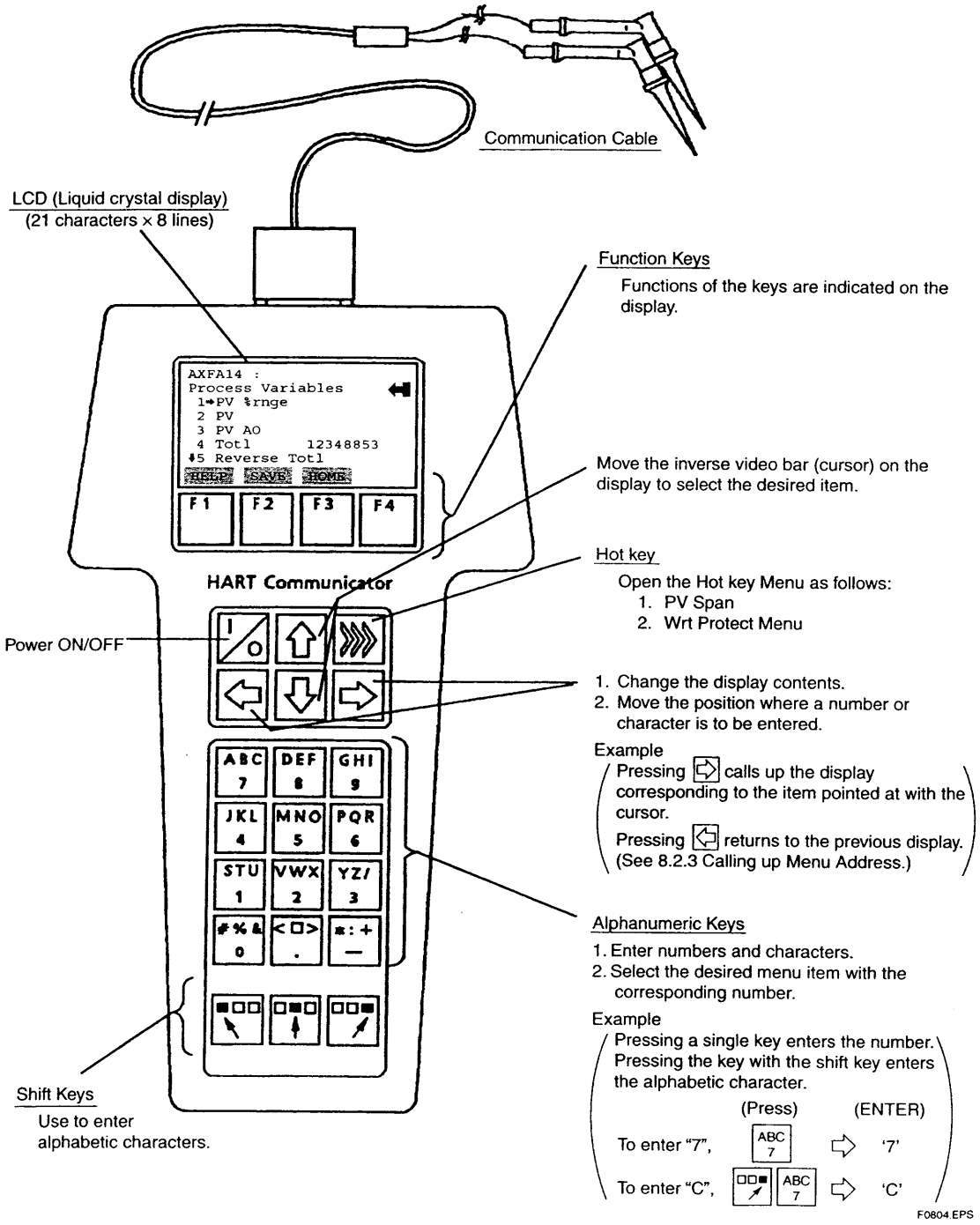


**Figure 8.2.1 HART Communicator**

## 8.2.2 Display

The HART Communicator automatically searches for the AXFA14 on the 4 to 20 mA loop when it is turned on. When the HART Communicator is connected to the AXFA14, it displays the "**Online**" menu as shown below.
(If AXFA14 is not found, the communicator displays the message "No Device Found. Press OK...." Press the OK 'F4' function key and the main menu appears. Please retry after confirming the connection with the AXFA14.)

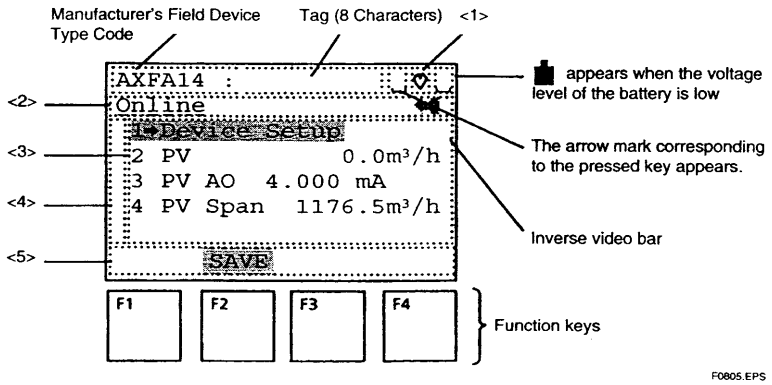


**Figure 8.2.2 Display**

<1> ♡ appears and flashes during communication between the HART Communicator and the AXFA14. In Burst Mode*, ♥ appears.

<2> The current display menu title appears.

<3> Each item in menu <2> appears.

<4> ↓ and/or ↑ appear when the items are scrolled out of the display.

<5> On any given menu, the label appearing above a function key indicates the function of that key for the current menu.

* Refer to "8.3.4.7 Burst Mode".

## 8.2.3 Calling Up Menu Addresses

The 8.3.5 Menu Tree shows the configuration of the "**Online**" menu which is needed for operation with the HART Communicator. The desired item can be displayed with ease by understanding the menu configuration.

When the HART Commnicator is connected to the AXFA14, the "**Online**" menu will be displayed after the power is turned on (see figure 8.2.2). Open the desired item as follows:

### Key Operation

There are two ways of selecting the desired menu item.

1. Use the [⇩] or [⇧] key to select the desired item, and then press the [⇨] key.

- To return to the previous display, press the [⇦] key, **EXIT (F4), ESC (F3)** or **ABORT (F3).**

**NOTE**

Setting parameters on the display unit of the AXFA14 is not possible during HART Communication.

### 8.2.4 Entering, Setting and Sending Data

The data which are input with the keys are set in the HART Communicator by pressing **ENTER (F4)**. Then, by pressing **SEND (F2)**, the data are sent to the AXFA14. Note that the data are not set in the AXFA14 if **SEND (F2)** is not pressed. All the data set with the HART Communicator is held in, memory unless power is turned off, so every data can be sent to the AXFA14 at one lot.

## 8.3 Parameters

### 8.3.1 Parameter Configuration

The parameters of the HART Communicator are constructed hierarchically. The menu tree for the "**Online**" menu is shown in the 8.3.3 Menu Tree.

See "Chapter 6. Parameter Description" about the function of each parameter. Note the differences between the parameters on the AXFA14 display and those on HART Communicator.

The "**Online**" menu summary is shown below.

**Table 8.1.3 Online Menu Summary**

| No. | Display Item | Contents |
|---|---|---|
| 1 | Device Setup | Set parameters for AXFA14. |
| 2 | PV | Display process value in engineering unit. |
| 3 | PV AO | Display analog output in mA. |
| 4 | PV Span | Display set span in engineering unit. |

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### 8.3.2 Data Renewing

There are two methods to load the AXFA14 data from/to the HART Communicator – periodic data renewing and discretionary data renewing.

(1) Periodic Data Renewing

The following data are renewed in 0.5 to 2 second cycles.

PV, PV AO, PV % rnge, Totl, Reverse Totl, Dif Totl, Power Frequency, Velocity Check, Operation Time, Alm Record1, Alm Record Time1, Alm Record2, Alm Record Time2, Alm Record3, Alm Record Time3, Alm Record4, Alm Record Time4, Test DIO (I), Write protect

(2) Discretionary Data Renewing

The following data can be loaded from/to the AXFA14. Upload can be done with **SAVE (F2)** on any the "**Online**" menu selection, and download can be done on the **Saved Configuration** menu in the "**Offline**" menu. (Refer to HART Communicator Manual.)

PV Damping, Nominal Size Unit, Nominal Size, Base Flow Unit, Base Time Unit, PV Span, Flow Decimal Pnt, Density Unit, Mass Flow Density, User Span Select, Flow User Unit, Flow User Span, Total Unit, Total Scale, Total Decimal Pnt, Total Low Cut, Total Execution, Ttl Set Val Lower, Ttl Set Val Upper, Ttl Switch Lower, Ttl Switch Upper, Ttl User Select, Ttl User Unit, Pulse Unit, Pulse Scale, Pulse Width, Pulse Low Cut, DO Function, DIO Function, DO Active Mode, DIO Active Mode, Forward Span2, Forward Span3, Forward Span4, Reverse Span1, Reverse Span2, Auto Range Hys, Bi Direction Hys, Low Alarm, High Alarm, Low Low Alarm, High High Alarm, H/L Alarm Hys, 4-20mA Alarm Out, Alm-Setting, Alm-Sig Over, Alm-Emp Pipe, Alm-HH/LL, Alm-Adhesion, Display Select1, Display Select2, Display Select3, Display Cycle, Language, 4-20mA Low Cut, 4-20mA Low Lmt, 4-20mA High Lmt, Flow Direction

**NOTE**

Data changed with the HART Communicator is sent to the AXFA14 by pressing **SEND (F2)** of the HART Communicator.

## 8.3.3 Checking for Problems

The self-diagnostic function of the AXFA14 is explained in Section 6.5 "Alarm Functions". By using the HART Communicator, it is also possible to carry out this function in the "Test/Status" parameter. Test for each error.

* Open the "**Test/Status**" setting display.

1. Device Setup → 2. Diag/Service → **1. Test/Status**

## 8.3.4 Setting Parameters

As mentioned in Section 5.2.2 "Setting Mode," the AXFA14's parameters are divided into three types:

i. Selection type
ii. Numeric type
iii. Alphanumeric type

This section describes how to set these parameters using a HART communicator.

**NOTE**

All three parameters must be set to obtain a correct signal.
Nominal size, flow rate span and meter factor must be set.

### 8.3.4.1 Example of Setting Selection-Type Data: Base Flow Unit

This example describes the setting of the flow rate units for the selection-type parameter "Base Flow Unit" from $m^3$ to l (Liter).

Open the "**Base Flow Unit**" setting display.

1. Device Setup → 3. Easy Setup → **3. Base Flow Unit**

1
```
AXFA14 : FI-1100
Base Flow Unit
↑ m3
  Kl(Kiloliter)
  l(Liter)
↓ cm3
        SEND  ENTER
```
↓ ×2 — Select "**l (Liter)**".

2
```
AXFA14 : FI-1100
Easy Setup
 1 Language
 2 PV Damping
 3 Base Flow Unit  l
 4 Base Time Unit   /h
 5 PV Span
      SEND  HOME
```
F4 (ENTER) — Press **ENTER (F4)**.

3
```
AXFA14 : FI-1100
Easy Setup
 1 Language
 2 PV Damp
 3 Base Flow Unit  l
 4 Base Time Unit   /h
 5 PV Span
      SAVE  HOME
```
F2 (SEND) — Press **SEND (F2)** to set the data into the AXFA14.

96

F0807.EPS



19.1.1

### 8.3.4.2 Example of Setting Numeric-Type Data: PV Span

This example describes the setting of the flow rate span for the numeric-type parameter "PV Span" from 100 l/min to 120 l/min.

There are two ways to open the "PV Span" setting display. Following the menu tree configration, "PV Span" is opened as follows:

To open "PV Span" using the "Hot key", proceed as follows:

1. Device Setup → 3. Easy Setup → **5. PV Span**

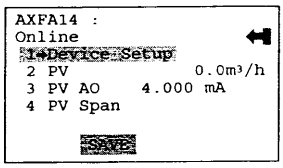
F0808.EPS

**NOTE**

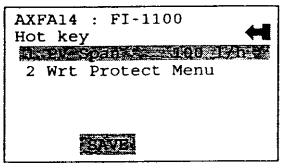
The "Hot key" can be used to set the easy call up parameters, "PV Span" (Flow Span) and "Wrt Protect Menu" (Write protect function).

Open the "**PV Span**" setting display.

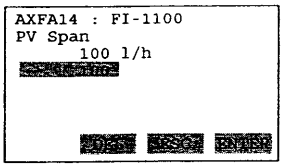
Hot key → **1. PV Span**

1 

Press **Hot key**.

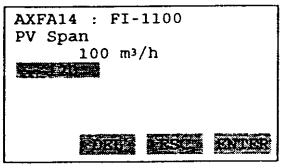
2 

Select "**PV Span**".

3 

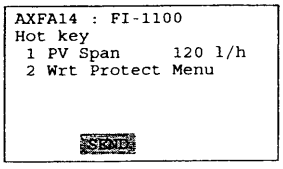

'120'

Enter "120" with alphanumeric keys.

4 


F4
(ENTER)

Press **ENTER (F4)**.

5 


F2
(SEND)

Press **SEND (F2)** to set the data into the AXFA14.

Return to the previous display by pressing or .

F0809.EPS

### 8.3.4.3 Example of Setting Alphanumeric-Type Data: Tag Number

This example describes the setting of the tag number for the alphanumeric-type parameter '**Tag**' from "FI-1101" to "FI-1201".

1. Device Setup → 4. Detailed Setup → 1. Basic Setup → **1. Tag**

| | Display | Operation | |
|---|---|---|---|
| 1 | AXFA14 : FI-1101<br>Basic Setup<br>1➡Tag FI-1101<br>2 PV Damping<br>3 MF Set<br>4 Select Flow Tube<br>⬍5 Nominal Size Unit<br>HELP SAVE HOME | ⇨ or STU 1 | Select "**Tag**". |
| 2 | AXFA14 : FI-1101<br>Tag<br>FI-1101<br>FI-1101<br>HELP DEL ESC ENTER | | The display for the Tag setting appears.<br>(The default value of "Tag" is blank.) |
| 3 | AXFA14 : FI-1101<br>Tag<br>FI-1101<br>FI-1201<br>HELP DEL ESC ENTER | ⇨ ×4 | Move the cursor to "1".<br>Then press "**2**" to change the Tag No. "FI-1101" to "FI-1201". |
| 4 | AXFA14 : FI-1101<br>Basic Setup<br>1➡Tag FI-1201<br>2 PV Damping<br>3 MF Set<br>4 Select Flow Tube<br>⬍5 Nominal Size Unit<br>HELP SEND HOME | F4<br>(ENTER) | Press **ENTER (F4)** . |
| 5 | AXFA14 : FI-1201<br>Basic Setup<br>1➡Tag FI-1201<br>2 PV Damping<br>3 MF Set<br>4 Select Flow Tube<br>⬍5 Nominal Size Unit<br>HELP SEND HOME | F2<br>(SEND) | Press **SEND (F2)** to set the data into the AXFA14.<br>Press **HOME (F3)**, and return to the "**Online**" menu. |

F0810.EPS

**NOTE**

In case of HART protocol, up to 8 characters can be set with "**Tag**".

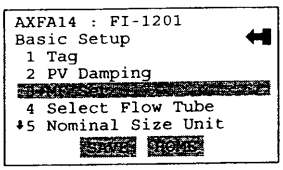
### 8.3.4.4 Example 1 of Other Settings: Meter Factor

The "**Meter Factor**" is engraved on the data plate of the combined flowtube.

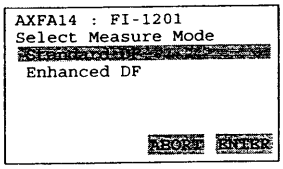
The meter factor is required to compute the correct electromotive force proportional to the fluid velocity, and is determined by actual flow-test calibration at the factory.

Open the "**MF**" setting display:

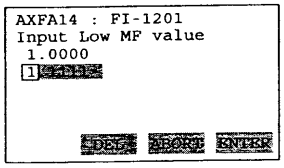
1. Device Setup → 4. Detailed Setup → 1. Basic Setup → **3. MF Set**

1 

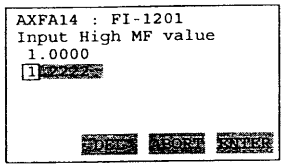

[⇨] or [YZ/ 3] Select " **MF Set** ".

2 

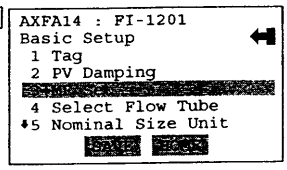

[STU 1] or [F4] (ENTER) Select " Standard DF ".

3 


[F4] (ENTER) Enter "1.1111" with alphanumeric keys.
Press **ENTER (F4)**.

4 


[F4] (ENTER) Enter "1.2222" with alphanumeric keys.
Press **ENTER (F4)**.

5 


[F3] (HOME) Press **HOME (F3)**, and return to the "**Online**" menu.

F0812.EPS

### 8.3.4.5 Example 2 of Other Settings: Power Frequency (For DC version only)

**IMPORTANT**

In a situation where a DC power supply is used for converters, set the local commercial power frequency in area where the converter is installed. The flowmeter is set to 50.00 Hz at the factory.
Set "No" for "**Power Synch**" and the local commercial power frequency for "**Power Frequency**".

Open the "**Power freq**" setting display:

1. Device Setup → 4. Detailed Setup → 4. Function Set → 5. Aux → **Power Frequency**
( ⇩ ×9 )

1
```
AXFA14 : FI-1201
Aux
↑6 Dead Time          Os
 7 Pulsing Flow       No
 8 T/P Damp Select
 9 Power Synch        No
↓10 Power Frequency   50.00
      SAVE  HOME
```
⇩ Select "**Power Frequency**".

2
```
AXFA14 : FI-1201
Power Frequency
 50.00  Hz
 60.00
      DEL  ESC  ENTER
```
'60.0' Enter "60.00" with alphanumeric keys.

3
```
AXFA14 : FI-1201
Power Frequency
 50.00
 60.00
      DEL  ESC  ENTER
```
F4 (ENTER) Press **ENTER (F4)**.

4
```
AXFA14 : FI-1201
Aux
↑6 Dead Time          Os
 7 Pulsing Flow       No
 8 T/P Damp Select
 9 Power Synch        No
↓10 Power Frequency   60.00
      SAVE  HOME
```
F2 (SEND) Press **SEND (F2)** to set the data into the AXFA14.

F3 (HOME) Press **HOME (F3)**, and return to the "**Online**" menu.

F0813.EPS

### 8.3.4.6 Example 3 of Other Settings: Trim Analog Output

Fine output adjustment is carried out with "**D/A trim**" or "**Scaled D/A trim**".

- **D/A trim**
  "**D/A trim**" is to be carried out if the calibration digital ammeter does not read exactly 4.000 mA and 20.000 mA with output signals of 0% and 100%.
- **Scaled D/A trim**
  "**Scaled D/A trim**" is to be carried out if the output is adjusted using a voltmeter or other types of meters with a 0% to 100% scale.

**IMPORTANT**

When "**D/A trim**" or "**Scaled D/A trim**" is carried out, the warning message "**83: Fix Cur Wng**" is displayed on the display unit.

Example 1: For adjustments using an ammeter (capable of measuring ±1uA.)

F0814-1.EPS

Open the "**Output trim**" display:

1. Device Setup → 2. Diag/Service → 2. Adjustment → **3. D/A trim**

1
```
AXFA14 : FI-1201
Adjustment
 1 Auto Zero Exe
 2 Magflow Zero
 3 D/A trim
 4 Scaled D/A trim
        SAVE  HOME
```
⇨ Select "**D/A trim**".

2
```
AXFA14 : FI-1201
WARN-Loop should be
removed from
automatic control
              ABORT  OK
```
F4 (OK) Press **OK (F4)**.

3
```
AXFA14 : FI-1201
Connect reference
meter
              ABORT  OK
```
F4 (OK) Connect an ammeter (capable of measuring ±1μA), and press **OK (F4)**.

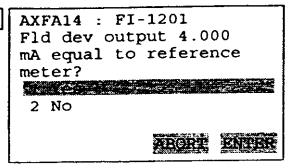
4
```
AXFA14 : FI-1201
Setting fld dev
output to 4mA
              ABORT  OK
```
F4 (OK) Press **OK (F4)**, and the AXFA14 outputs an output signal of 0%.

5
```
AXFA14 : FI-1201
Enter meter value
[          4.0000]
HELP  DBG  ABORT  ENTER
```
'4.115' F4 (ENTER)

Ammeter reading: 4.115

Enter the ammeter's reading of **4.115**, and press **ENTER (F4)**. (The output of the AXFA14 changes.)

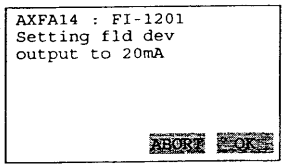
F0814-2.EPS

6



F4 (ENTER)

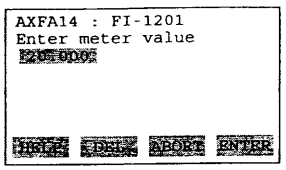
Ammeter reading: 4.000

Because the reading on the ammeter is 4.000 mA, select "**Yes**" and press **ENTER (F4)**.
If the reading is not 4.000 mA, select "**No**".
Repeat step 5 until the ammeter reads 4.000 mA.

7



F4 (OK)

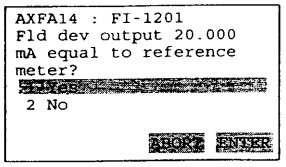
Press **OK (F4)**, and the AXFA14 outputs an output signal of 100%.

8



'19.050'
F4 (ENTER)

Ammeter reading: 19.050

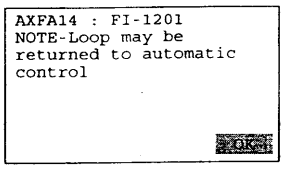
Carry out the same procedures as those described in 5.

9



F4 (ENTER)

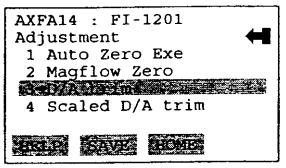
Ammeter reading: 20.000

"**Returning fld dev to original output**" appears.

10



F4 (OK)

Press **OK (F4)**.

11


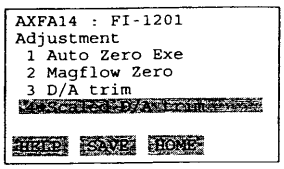

F3 (HOME)

Press **HOME (F3)**, and return to the "**Online**" menu.

F0814-3.EPS

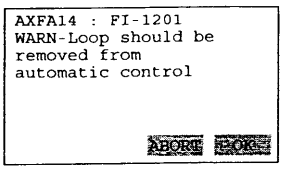
Example 2: For adjustments using a voltmeter

F0816-1.EPS

1


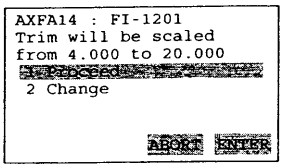

JKL 4

Select the "**4. Scaled D/A trim**".

2


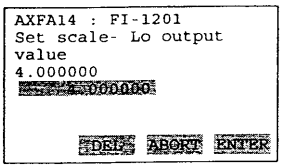

F4 (OK)

Press **OK (F4)**.

3


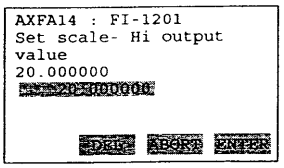

VWX 2

Select "**Change**".
The same operations as for "**D/A trim**" are required when selecting "**Proceed**".

4


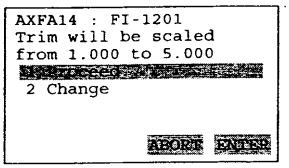

'1' F4 (ENTER)

Enter the reading value on the meter when the signal is 4 mA. In this case, enter the value of the voltage across a 250 Ω resistor (1 V), and press **ENTER (F4)**.

5


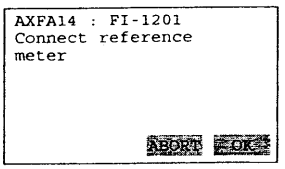

'5' F4 (ENTER)

Enter the reading value on the meter when the signal is 20 mA. Then, enter "**5**" (5 V), and press **ENTER (F4)**.

6


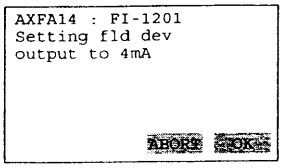

STU 1 or F4 (ENTER)

Select "**Proceed**" and press **ENTER (F4)**.

7



F4 (OK)

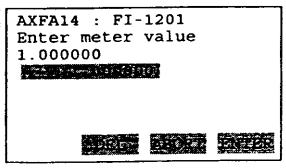
Connect the voltmeter, and press **OK (F4)**.

8



F4 (OK)

Press **OK (F4)**. The output signal of 0% is output.

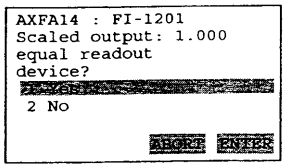
F0816-2.EPS

9



'1.01'
F4
(ENTER)

Voltmeter reading: 1.010

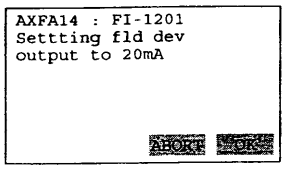
Enter the voltmeter's reading of 1.010, and press **ENTER (F4)**.
(The output of the AXFA14 changes.)

10



F4
(ENTER)

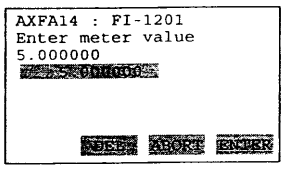
Voltmeter reading: 1.000

Because the reading on the voltmeter is 1.000, select "**Yes**" and press **ENTER (F4)**.
If the reading is not 1.000, select "**No**".
Repeat step 9 until the voltmeter reads 1.000 V.

11



F4
(OK)

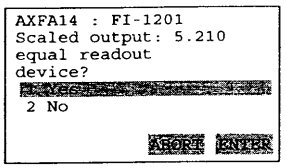
Press **OK (F4)**. The output signal of 100% is output.

12



'5.21'
F4
(ENTER)

Voltmeter reading: 5.210

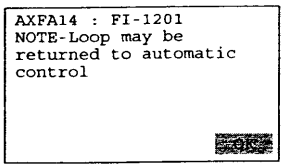
Enter the voltmeter's reading of 5.210, and press **ENTER (F4)**.

13



F4
(ENTER)

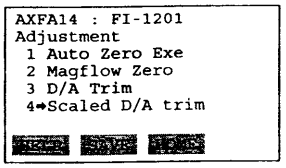
Voltmeter reading: 5.000

Select "**Yes**" and press **ENTER (F4)**.
"**Returning fld dev to original output**" appears.

14



F4
(OK)

Press **OK (F4)**.

15



F3
(HOME)

Press **HOME (F3)**, and return to the "**Online**" menu.

F0816-3.EPS

**IMPORTANT**

D/A trim should be executed only at single range mode. If D/A trim is executed at Bi direction mode, it is possible that the current output becomes 108%.

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19.1.1

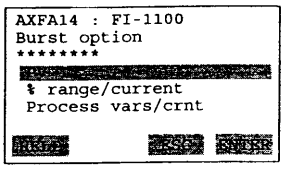
### 8.3.4.7 Example 4 of Other Settings: Burst Mode

The AXFA14 continuously sends its stored data when the "**Burst mode**" is set to "On". Any one of instantaneous flow rate, output in %, totalization values or current output can be selected and sent. The data is sent intermittently as a digital signal when the AXFA14 is set in the "**Burst mode**".

#### Setting of Burst Mode

Open the "**Burst option**" display:

1. Device Setup → 4. Detailed Setup → 5. HART Output → **4. Burst option**




F4 (ENTER)

F2 (SEND)

Select the type of data to be sent.

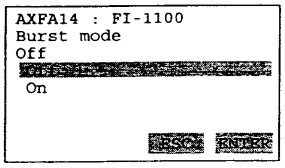
- Instantaneous flow rate (PV)
- Output in % and current output (% range/current)
- Instantaneous flow rate, totalization value* and current output (Process vars/crnt)

  * "Totl", "Reverse Totl" or "Dif Totl"

Call up "**Burst mode**" display.

5. HART Output → **3. Burst mode**

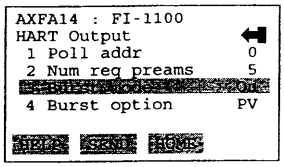
1




↓ F4 (ENTER)

Select "**On**" and press **ENTER (F4)**.

2




F2 (SEND)

Press **SEND (F2)**.

F0817.EPS

#### Exiting Burst Mode

Open the "**Burst mode**" display, and select "**Off**".

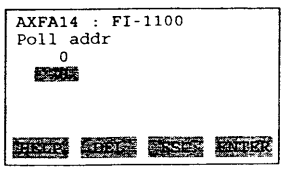
### 8.3.4.8 Example 5 of Other Settings: Multidrop Mode

Field devices in "**Multidrop Mode**" refers to the connection of several field devices on a single communication line. Up to 15 field devices can be connected when set to the multidrop mode. To activate multidrop communication, the field device address must be changed to a number from 1 to 15. This change deactivates the 4 to 20 mA output and changes it to 4 mA.

#### Setting of Multidrop Mode

Open the "**Poll addr**" display:

1. Device Setup → 4. Detailed Setup → 5. HART Output → **1. Poll addr**




'1'

F4 (ENTER)

F2 (SEND)

Set the polling address (a number from 1 to 15) and press **ENTER (F4)**.

Then, press **SEND (F2)** to send the data.

F0818.EPS

Open the "**Auto Poll**" display:

5. HART Output → Online Menu → Main Menu → ⇦ → 4. Utility → 1. Configure Communication → **1. Polling**

F3 : HOME

1
```
AXFA14 : FI-1201
HART Output
2 Num req preams      5
3 Burst mode         On
4 Burst option       PV
```
F3 (HOME)

Return to the "**Online**" menu with **HOME (F3)**.

2
```
AXFA14 : FI-1201
Online
 1 Device Setup
 2 PV              20m3/h
 3 PV AO             20mA
 4 PV Span         20m3/h
```
⇦

Return to the "**Main**" menu with a "previous" key.

3
```
HART Communicator
 1 Offline
 2 Online
 3 Frequency Device
 4 Utility
```
JLK 4

Select "**4. Utility**".

4
```
HART Communicator
Utility
 2 System Information
 3 Listen for PC
 4 Storage Location
 5 Simulation
```
STU 1 or ⇨

Select "**1. Configure Communication**".

5
```
HART Communicator
Configure Communica
 2 Contrast
 3 Off Time
 4 Ignore diagnostics
 5 Delete Configs
```
STU 1 or ⇨

Select "**1. Polling**".

6
```
HART Communicator
Polling
Never Poll
 Ask Before Polling
 Always Poll
 Digital Poll
```
⇩ ×3, F4 (ENTER)

Select "**Digital Poll**" and press **ENTER (F4)**.

F0819.EPS

**NOTE**

1. If "Never Poll" is selected in "Polling" when the address is assigned, the "Online Menu" cannot be called up and displayed. Be sure to select "Digital Poll" in "Polling" after assigned the polling address.
2. When the same polling address is assigned for two or more field devices in multidrop mode, communication with these field devices is disabled.

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19.1.1

Example: Communication when set in the multidrop mode.

F0820-1.EPS

1
```
HART Communicator
Online
2  2: FIC-2A
3  3: PIC-1A
```

The HART Communicator searches for field devices that are set in the multidrop mode when the HART Communicator is turned on.
When the HART Communicator is connected to one of these field devices, tag will be displayed.

2
```
AXFA14 : FI-1201
Online
2 PV
3 PV AO
4 PV Span
```

Select the desired field device. After that, normal communication with the selected field device is possible. The communication speed, however, is slow in this case.

3
```
HART Communicator
1 Offline
3 Frequency Device
4 Utility
```

To communicate with another field device, open display 3, and select "**Online**".

Display 1 will appear. Repeat the above operation.

F0820-2.EPS

### Exiting Multidrop Mode

First, open the "**Poll addr**" display, and assign the address to **0**.
Then, open the "**Polling**" display, and select "**Never Poll**".

**NOTE**

If the above exiting method is carried out in the reverse order, the "Online" menu cannot be called up.

### 8.3.4.9 Example 6 of Other Settings: Write Protection

The "**Write Protection**" function is used to inhibit parameter changes to the AXFA14. For a more detailed description, refer to Chapter 6. Parameter Description, and Chapter 9.Maintenance.

**NOTE**

When the write protection function is activated, data setting changes in all parameters of the AXFA14 are inhibited and cannot be changed using either the HART Communicator or the AXFA14 front panel key switches.

## Setting Password

Example: Set the password to "**1 2 3 4**"

F0821-1.EPS

Open "**Wrt Protect Menu**" in the **Hot key** Menu.

Hot key → 2. Wrt Protect Menu → **3. New Password**

1
```
AXFA14 : FI-1201
Hot key
 1 PV Span          1 m/s
 2 Wrt Protect Menu
 3 Live
```
VWX 2 or ⇨ Select "**Wrt Protect Menu**".

2
```
AXFA14 : FI-1201
Wrt Protect Menu
 1 Write protect        No
 2 Enable Wrt 10min
 3 New Password
 4 Software Seal      Keep
HELP SAVE
```
YZ / 3 Select "**New Password**".

3
```
AXFA14 : FI-1201
Enter new password to
change state of write
protect
DELETE ABORT ENTER
```
Enter "**1 2 3 4**" and press **ENTER (F4)**.

STU 1 | VWX 2 | YZ / 3 | JKL 4

F4 (ENTER)

4
```
AXFA14 : FI-1201
Re-enter new password
within 30 seconds:
 1234
DELETE ABORT ENTER
```
STU 1 | VWX 2 | YZ / 3 | JKL 4

F4 (ENTER)

Enter "**1 2 3 4**" again and press **ENTER (F4)**.

5
```
AXFA14 : FI-1201
Change to new
password
```

6
```
AXFA14 : FI-1201
It changed the state
of protection related
password.
OK
```
F4 (OK) Press **OK (F4)**.

7
```
AXFA14 : FI-1201
Wrt Protect Menu
 1 Write protect   Yes
 2 Enable Wrt 10min
 3 New Password
 4 Software Seal   Keep
```
⇦ ×2 Press ⇦ twice, and return to the "**Online**" menu.

F0821-2.EPS

## Changing Password

Example: Change the password from "**1 2 3 4**" to "**6 7 8 9 A**".

F0822-1.EPS

Open "**Wrt Protect Menu**" in the **Hot key** Menu.

Hot key → 2. Wrt Protect Menu → **2. Enable Wrt 10min**

1
```
AXFA14 : FI-1201
Enter current
password to enable to
write for 10
minutes:
[redacted]
[redacted] ABORT [redacted]
```
"1 2 3 4"
F4 (ENTER)

Enter the password and press **ENTER (F4)**.

2
```
AXFA14 : FI-1201
Release the write
protection for 10
minutes.
ABORT [redacted]
```
F4 (OK)

Press **OK (F4)**.
Write protect status is released for 10 minutes.

3
```
AXFA14 : FI-1201
If you wish to
release completely,
you have to change
password to all of
spaces.
ABORT [redacted]
```
F4 (OK)

Press **OK (F4)**.

4
```
AXFA14 : FI-1201
Wrt Protect Menu
 1 Write protect  No
 2 Enable Wrt 10min
[redacted]
 4 Software Seal  Keep
[redacted]
```
⇨ or YZ/3

Select "**New Password**".

5
```
AXFA14 : FI-1201
Enter new password to
change state of write
protect
[redacted]
[redacted] ABORT [redacted]
```
"6 7 8 9 A"
F4 (ENTER)

Enter "**6 7 8 9 A**" and press **ENTER (F4)**.

6
```
AXFA14 : FI-1201
Re-enter new Password
write 30 seconds:
 6789A
[redacted]
[redacted] ABORT [redacted]
```
"6 7 8 9 A"
F4 (ENTER)

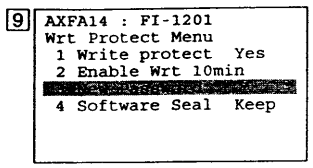
Enter "**6 7 8 9 A**" again and press **ENTER (F4)**.

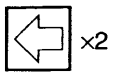
7
```
AXFA14 : FI-1201
Change to New
password
```

8
```
AXFA14 : FI-1201
It changed the state
of protection related
password.
[redacted]
```
F4 (OK)

Press **OK (F4)**.

F0822-2.EPS




Press ⇦ twice, and return to the "**Online**" menu.

F0822-3.EPS

**NOTE**

1. "**Enable Wrt 10min**" releases write protection status for 10 minutes. While write protection status is released, it is possible to enter a new password after selecting "**New Password**". It will not be possible after the 10 minutes have elapsed.
2. To release write protection status completely, enter 8 spaces in the "**New Password**". This causes the "**Write protect**" status to change from "**Yes**" to "**No**".
3. If the power supply to either the AXFA14 or the HART Communicator are turned off and then on again within 10 minutes after exiting write protection status, the enabled write protection status becomes defunct.

* "**Joker password**" and "**Software Seal**"
When you forget the password that you have input, it is possible to release the mode for 10 minutes by setting a joker password in "**Enable Wrt 10 min**". This joker password can be obtained by contacting your Yokogawa sales office.
If this joker password is used, the status shown in the parameter "**Software Seal**" is changed from "**Keep**" to "**Break**". Press Hot key and select "**Wrt Protect Menu**". Current status is shown in "**Software Seal**".
This status will be returned from "**Break**" to "**Keep**" by registering a new password.

### 8.3.4.10 Other Functions and Operations

Set any other required parameters in the same way as those previous. Refer to the following document for operation information.

Product Manual for the HART Communicator: MAN 4250

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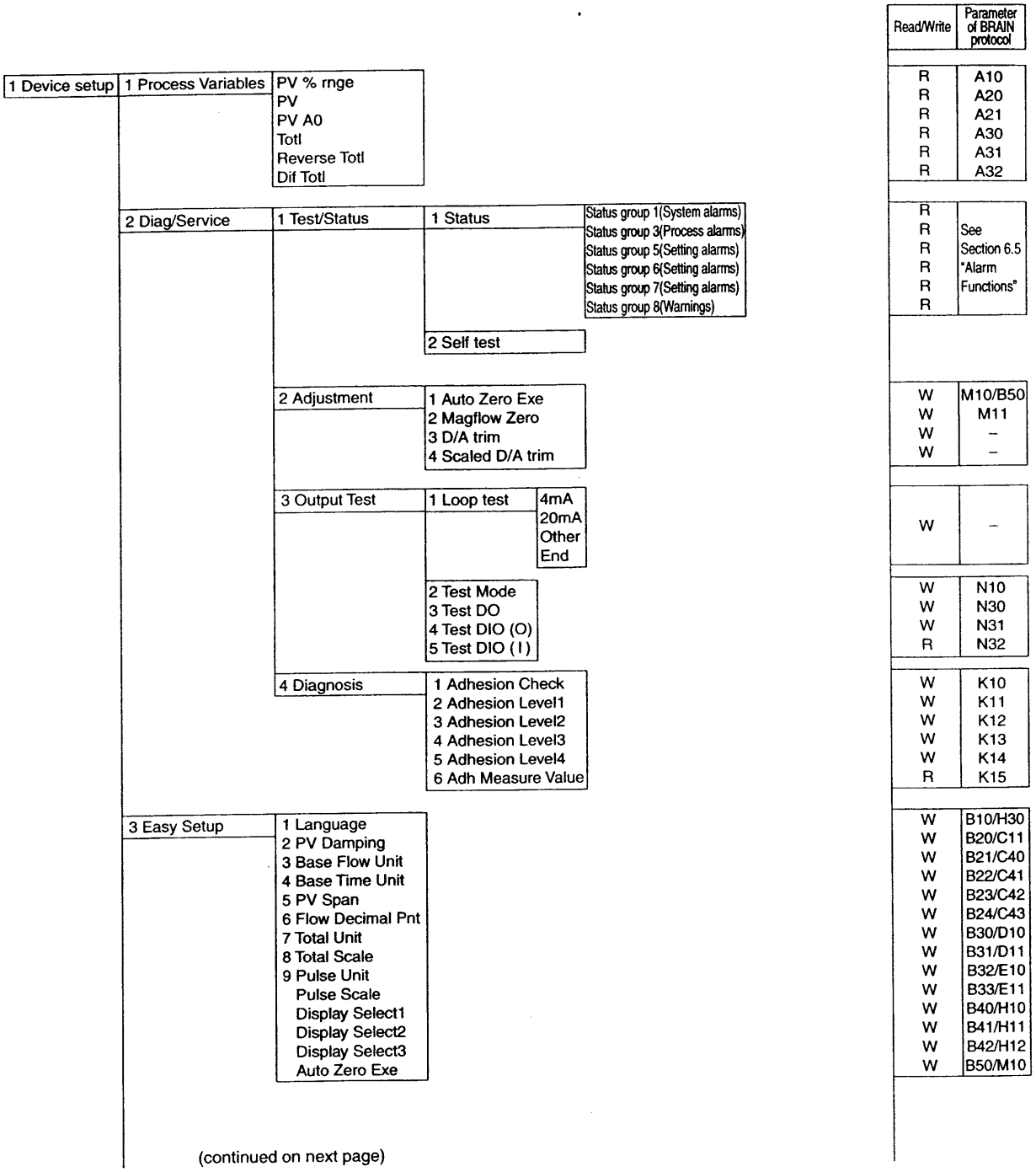
## 8.3.5 Menu Tree

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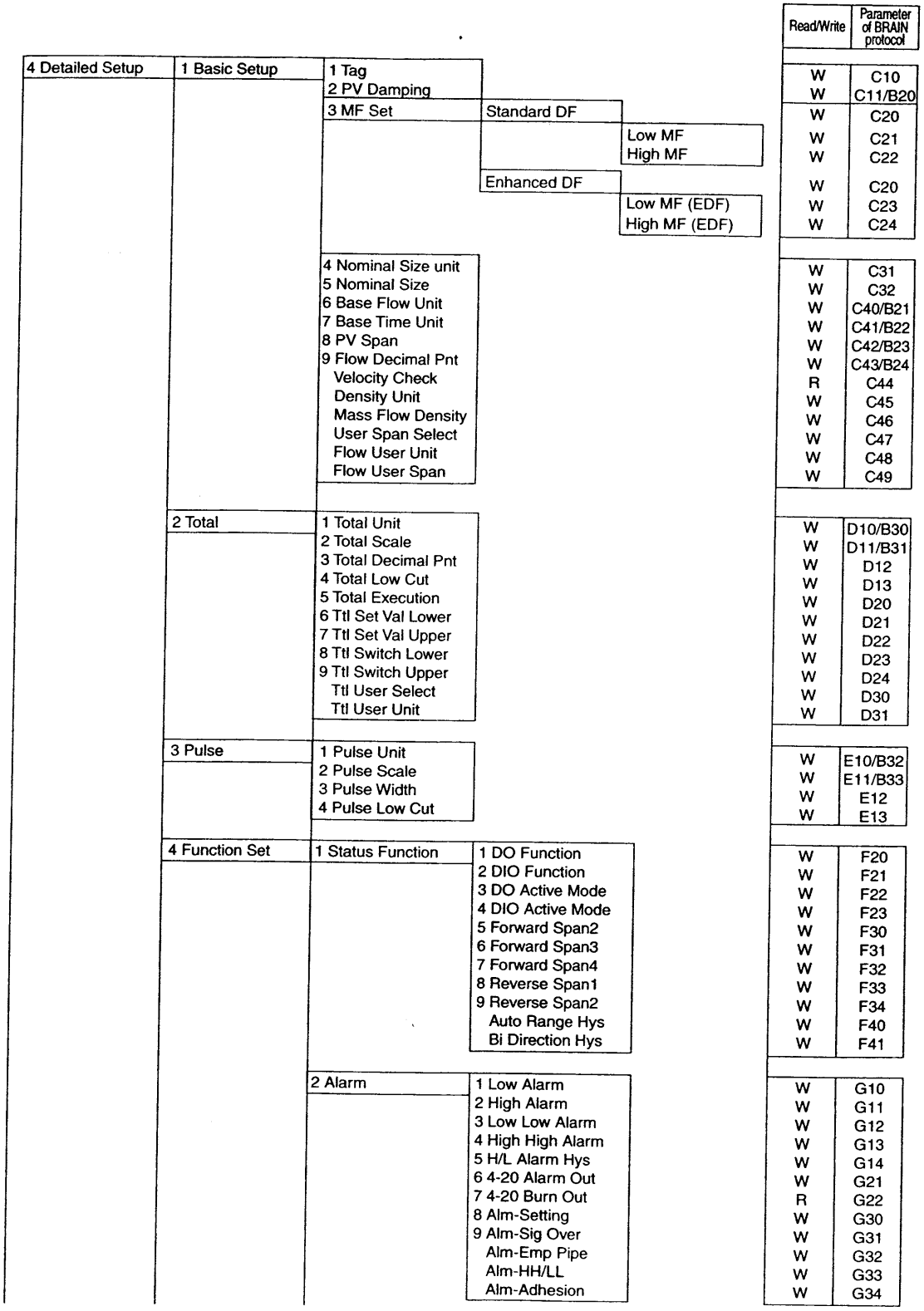
F0823-1.EPS

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F0823-2.EPS

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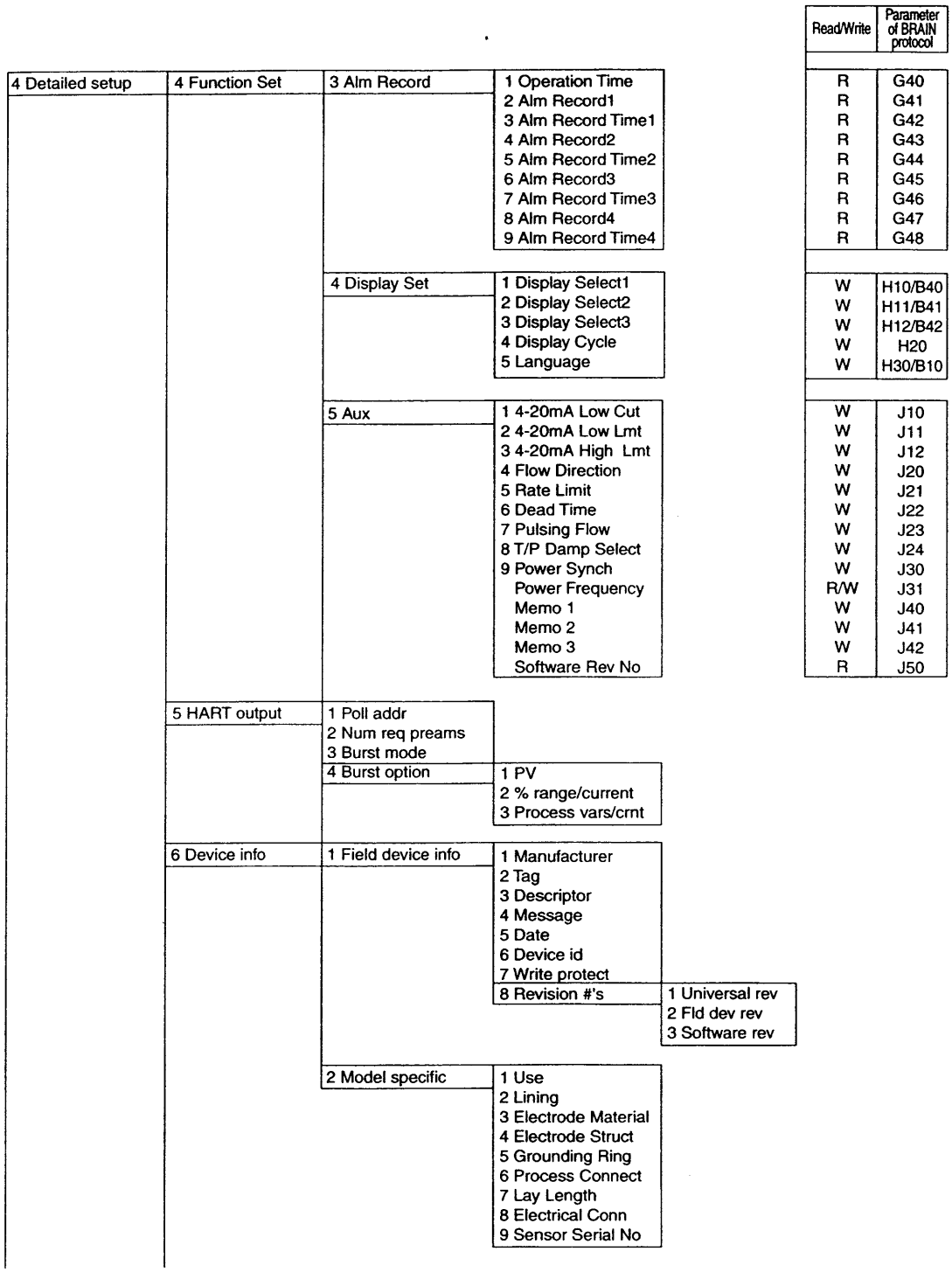


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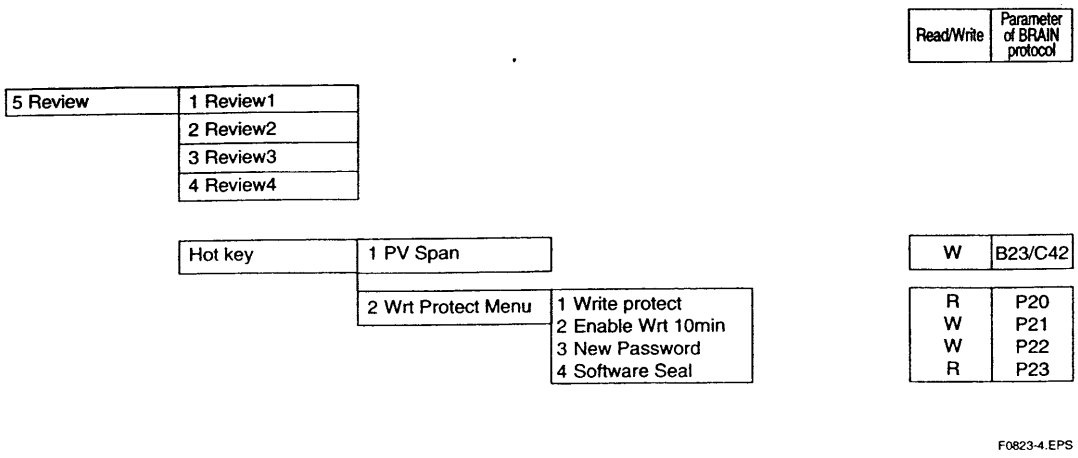
F0823-3.EPS




F0823-4.EPS



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19.1.1

# 9. ACTUAL OPERATION

After you have installed the flowtube into the process piping, wired the input/output terminals, set up the required parameters, and performed a pre-operation zero adjustment, the magnetic flowmeter should output an accurate flow signal from its terminals as soon as flow of the fluid to be measured begins. This section describes zero adjustment and the corresponding procedures.

## 9.1 Pre-operation Zero Adjustment

Zero adjustment is carried out to ensure that the output for zero flow is 0% (i.e., 4 mA). Although adjustment to zero is performed at the manufacturing plant prior to shipment, this procedure must be carried out once again following the installation of piping in order to match the magnetic flowmeter to its operating conditions.

This section describes the zero adjustment procedure using display unit switches from the converter and using the external status input; accordingly, one of these methods should be selected and implemented.

**IMPORTANT**

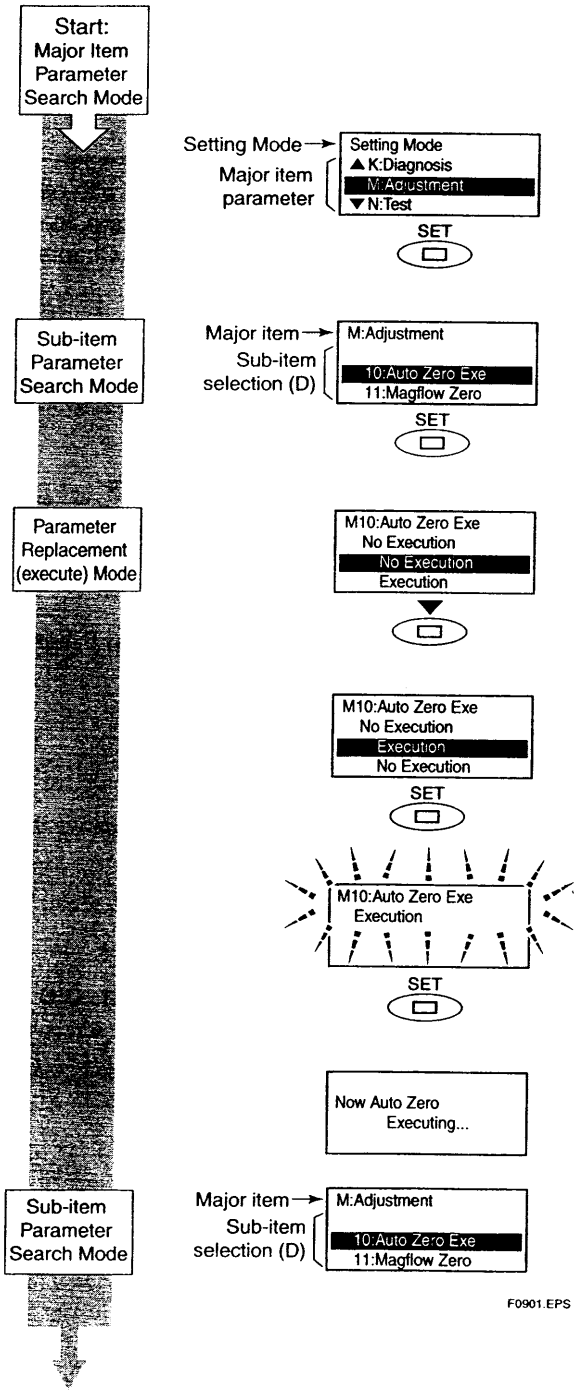
- Zero adjustment should be carried out before actual operation. Note that setting and update functions cannot be carried out during this procedure (i.e., for approximately 30 seconds).
- Zero adjustment should only be carried out when the flowtube has been filled with fluid and the fluid velocity is completely zero by closing the valve.
- Each time that the fluid being measured is changed, it will be necessary for zero adjustment to be carried out for the new fluid.

## 9.1.1 Zero Adjustment Using Display Unit Switches

This section describes the procedure for zero adjustment using the display unit switches. (For more details regarding setting methods using these switches, refer to Chapter 5: Basic Operating Procedures.)

The parameters for zero adjustment are **B50/M10: Auto Zero Exe** (and either of these can be used to carry out this procedure). For more details regarding these parameters, refer to Chapter 6: Parameter Description.

The parameter **M10: Auto Zero Exe** will be used in the following description.




F0901.EPS

Once in Setting Mode, use the ▼ switch to move the cursor to **M: Adjustment.**

Touch the SET switch to access Sub-item Parameter Search Mode.

Upon selection of **M: Adjustment**, the cursor will be positioned at **M10: Auto Zero Exe**. (Sub-item selection (D))
Touch the SET switch to access Parameter Replacement Mode.

Touch the ▼ switch to move the cursor to "Execution".

Touch the SET switch to select the "Execution".

In order to request confirmation, the entire display flashes on and off. Touch the SET switch once again at this time to fix selection of the automatic zero adjustment function.

Auto zero adjustment function is being executed (about 30 seconds).

When zero adjustment function has been completed, the system returns automatically to the sub-item selection screen (D).

**NOTE**

The results of **M10: Auto Zero Exe** can be displayed using **M11: Magflow Zero**. Alternatively, if the results of the automatic zero adjustment exceed the rated value, the warning **82: Auto Zero Wng** will be displayed.

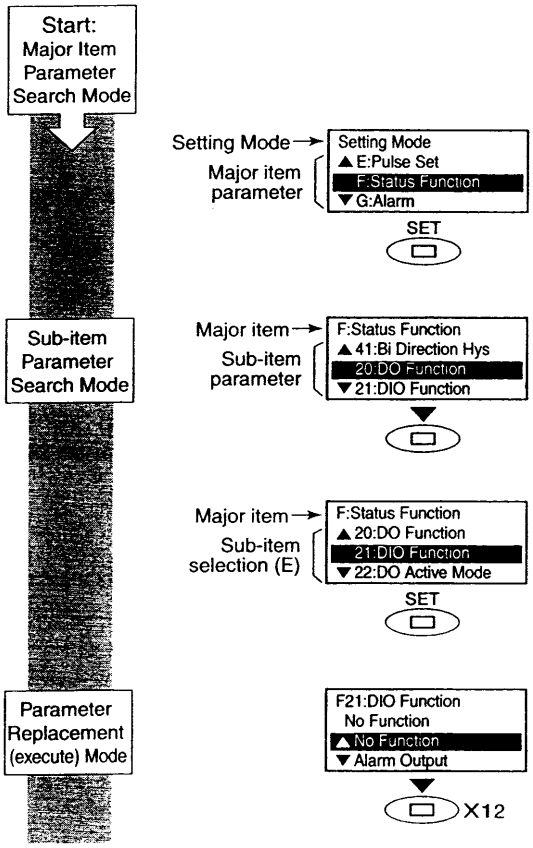
## 9.1.2 Zero Adjustment via External Status Input

This section describes the procedure for zero adjustment via external status input. (For more details regarding external status input, refer to Chapter 6: Parameter Description.)

**CAUTION**

In certain cases where the multiple range function is being used with other status inputs, it may not be possible to perform settings for automatic zero adjustment. For more details, refer to the description of multiple ranges from Chapter 6: Parameter Description.

In order to carry out zero adjustment via external status input, it will be necessary to set "Ext Auto Zero (I)" using **F21: DIO Function**. The following describes the setting procedure:




Once in Setting Mode, use the ▼ switch to move the cursor to **F: Status Function**.

Touch the SET switch to access Sub-item Parameter Search Mode.

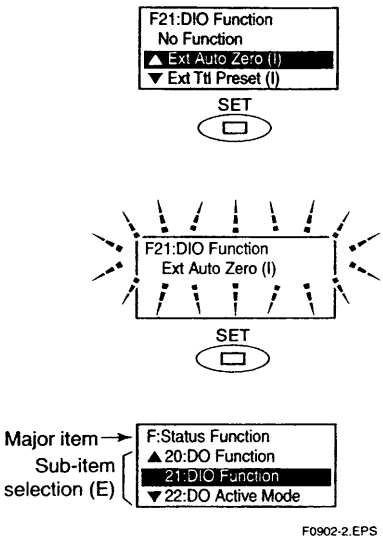
Touch the ▼ switch once to move the cursor to **F21: DIO Function**.

The cursor has been moved to **F21: DIO Function** in this screen. (Sub-item selection screen (E))
Touch the SET switch to access Parameter Replacement Mode.

Touch the ▼ switch twelve times to move the cursor to "Ext Auto Zero (I)".

F0902-1.EPS

Sub-item Parameter Search Mode




F0902-2.EPS

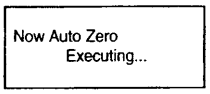
Touch the SET switch to select "Ext Auto Zero (Zero adjustment via external status input)".

In order to request confirmation, the entire display flashes on and off. Touch the SET switch once again at this time to fix selection of the automatic zero adjustment function.

The system returns automatically to sub-item selection screen (E).

Zero adjustment will be started if the DIO terminals are shorted (when the active mode has been set to "Closed/Short Act" using **F23: DIO Active Mode**).

This process will end after approximately 30 seconds.




F0902-3.EPS

Auto zero adjustment function is being executed. (about 30 seconds.)

**NOTE**

When the DIO terminals continue to be shorted, this zero adjustment is automatically repeated.

# 10. MAINTENANCE

## 10.1 Components Replacement

**⚠ WARNING**

- Component replacement and the associated operations must be carried out by expert engineer or skilled personnel and not by operators.
- Before opening the cover, it is important to ensure that at least 10 minutes have passed since the power was turned off. Furthermore, opening of the cover must also be carried out by expert engineer or skilled personnel.

**⚠ CAUTION**

- Explosion protected type must be, as a rule, removed to a non-hazardous area for maintenance and be disassembled and reassembled to the original state.
- The display cover is locked by the special screw. In case of opening the display cover, use the hexagonal wrench attached.
- Be sure to lock the cover by the special screw using the hexagonal wrench attached after installing the cover.

**IMPORTANT**

- As a rule, maintenance of this flowmeter should be implemented in a maintenance service shop where the necessary tools are provided.
- The amplifier assembly contains sensitive parts that may be damaged by static electricity. Excercise care so as not to directly touch the electronic parts or circuit patterns on the board, for example, by preventing static electrification by using grounded wrist straps when handing the assembly. Also take precautions such as placing a removed amplifier assembly into a bag with an antistatic coating.

### 10.1.1 Fuse Replacement

**⚠ CAUTION**

Be sure to turn off the power before performing fuse replacement. Also be sure to use the spare fuse that was supplied with the product, or ones supplied by Yokogawa's sales or service offices.

The fuse holder is located on the farthest circuit board from the front.

(1) Remove the amplifier assembly by following the procedures shown in Section 10.1.3 "Amplifier Replacement."

(2) The fuse can be seen after step (1). Remove the fuse from the fuse holder.

(3) Push a new fuse into the holder until it clicks.

(4) Reinstall the amplifier assembly by following the procedures shown in Section 10.1.3.

Spare fuses are shipped with the instrument.

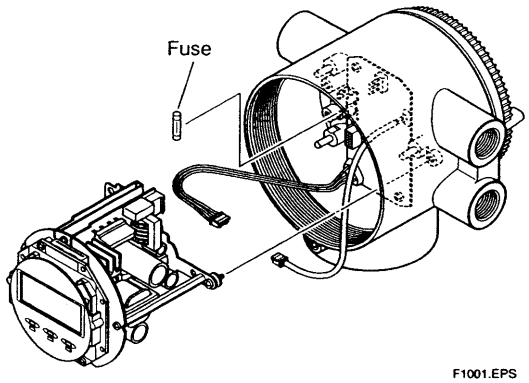



**Figure 10.1.1 Fuse Replacement**

## 10.1.2 Display Unit Replacement

### 10.1.2.1 Removing the Display Unit

(1) Turn off the power.

(2) Loosen cover locking screw 1 clockwise using a hexagonal wrench (nominal size 3) to unlock the cover. (Upon shipment from the manufacturing plant, the cover is locked.) Hold the flowmeter with your hand and remove the cover by turning it in the direction of the arrow as shown below.

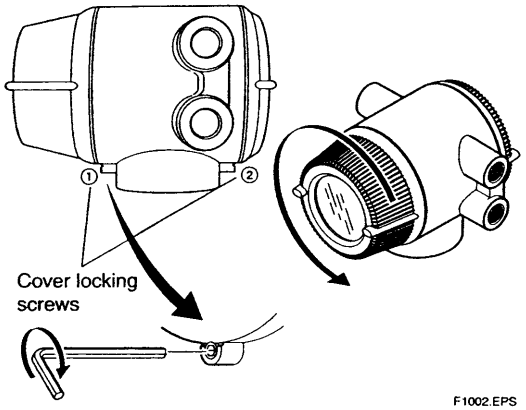



**Figure 10.1.2 Removing the Display Cover**

(3) Hold the display unit with your hand and remove the two mounting screws. Remove the connector of the display unit by pulling it to the left, taking care not to damage it (refer to Figure 10.1.3).

### 10.1.2.2 Assembling the Display Unit

(1) Align the display unit with the protrusion of the connector facing the amplifier assembly and then make the required connection.

(2) Secure the display unit using its two mounting screws.

(3) Replace the cover by following the procedures used to remove it in the reverse order.

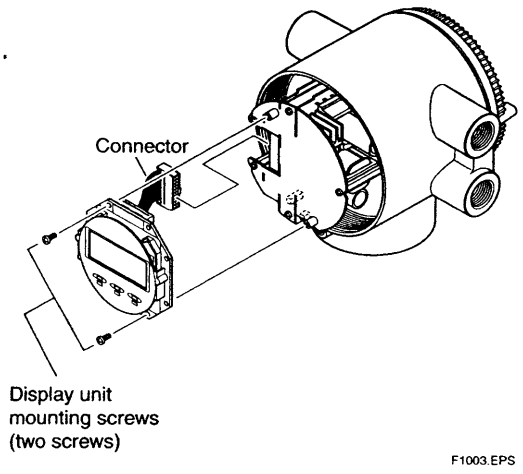



**Figure 10.1.3 Removing and Assembling the Display Unit**

### 10.1.2.3 Changing the Display Unit Orientation 90 Degrees

(1) Hold the display unit with your hand and remove the two mounting screws.

(2) Turn the display unit 90 degrees clockwise and confirm the assembling position, taking care of the connector and wire of the display unit.

(3) Secure the display unit using its two mounting screws.

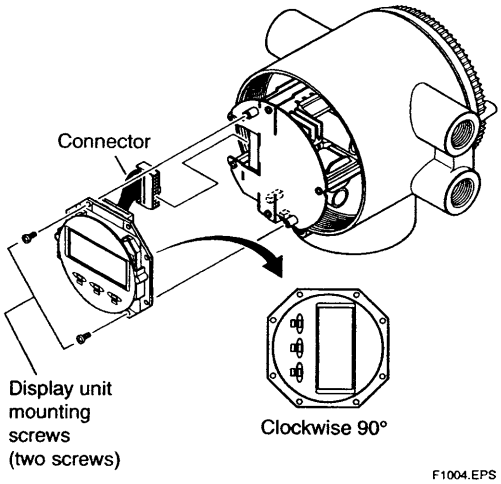



**Figure 10.1.4 Assembling the Display Unit**

### 10.1.2.4 Installing the Cover

(1) Install the cover to the flowmeter by turning it in the direction of the arrow as shown below. Tighten cover locking screw 1 counterclockwise using a hexagonal wrench (nominal size 3) to lock the cover.

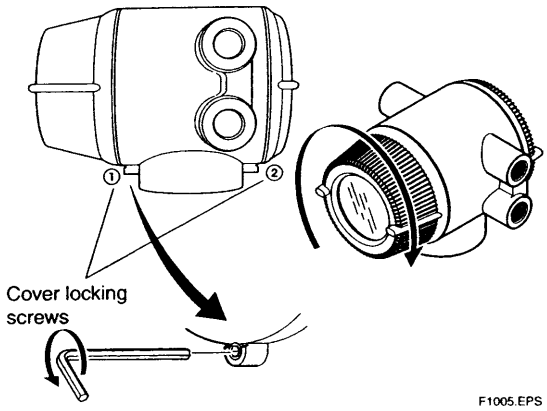



**Figure 10.1.5 Installing the Display Cover**

## 10.1.3 Amplifier Replacement

**IMPORTANT**

In case of amplifier replacement, it is necessary to perform the parameter resetting.
For parameters, refer to Chapter 6: Parameter Description.

### 10.1.3.1 Removing the Amplifier Assembly

(1) Turn off the power.

(2) Remove the cover.

(3) Remove wiring connectors 1 and 2 (refer to Figure 10.1.6) from the amplifier assembly. Remove them carefully, without applying excessive force.

(4) Loosen the three mounting screws while holding the assembly with your hand.

(5) Pull the assembly straight out.

### 10.1.3.2 Assembling the Amplifier Assembly

(1) To replace the amplifier assembly, follow the procedures used to remove it in the reverse order.

(2) Replace the assembly by pushing it in, taking care not to damage the amplifier mounting connectors on the circuit board.

(3) Carefully connect wiring connectors 1 and 2 to the amplifier assembly, making sure that the connectors' directions are correct. Let wiring connector 2 pass along the amplifier side of the rod.

(4) Tighten the three mounting screws while holding the assembly with your hand.

(5) Replace the cover, taking care not to entangle the cables of the wiring connectors.

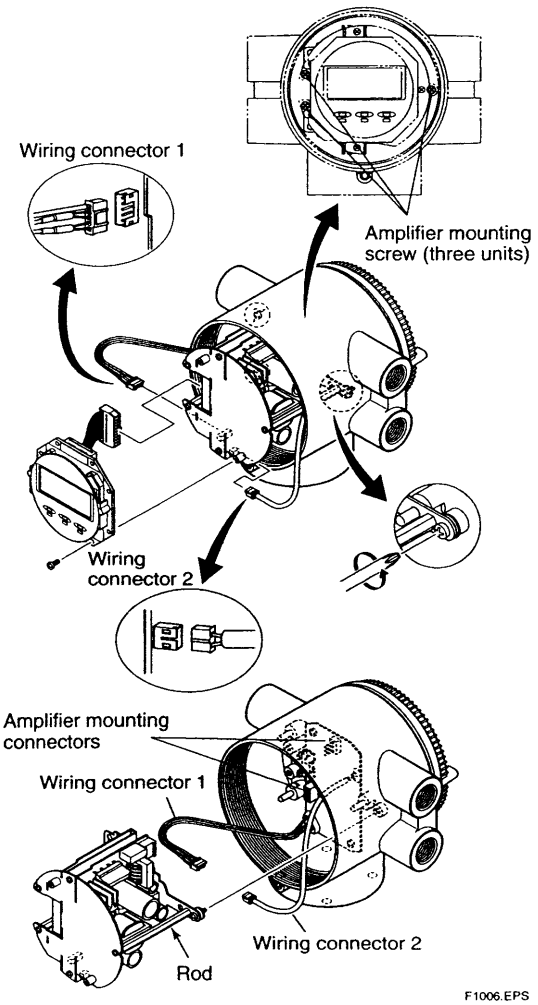



**Figure 10.1.6 Assembling the Amplifier**

# 10.2 Setting of Switches

## 10.2.1 Setting of Burnout Switch

The burnout function sets the direction of current output in situations where the CPU has become damaged. Upon shipment from the manufacturing plant, the burnout direction is set to High (i.e., 25 mA); however, in cases where the optional code C1 has been specified, the output direction will be set to Low (i.e., 0 mA).

Modification of the burnout direction must be carried out using the setting switch from the amplifier's CPU board (i.e., Switch 1) (See Figure 10.2.1).

**Table 10.2.1 Output Setting Pins for Burnout**

| Position of Pin | Burnout Direction | Burnout Output | Remarks |
|---|---|---|---|
| Low High | High | 25 mA | Set to High before shipment |
| Low High | Low | 0 mA | Set to Low for optional code C1 |

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**NOTE**

On the amplifier's CPU board, the burnout setting switch (i.e., Switch 1) and the write protect switch (i.e., Switch 2) are located adjacent to each other. Accordingly, special care should be taken when making switch settings.

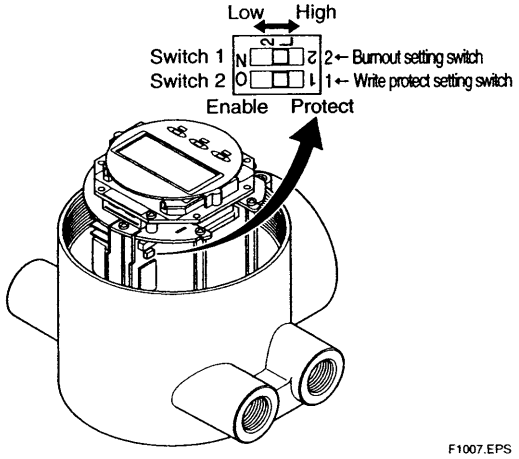


**Figure 10.2.1 Switch Configuration**

## 10.2.2 Setting of Write Protect Switch

By setting the write protect function to "Protect" it is possible to prevent the overwriting of parameters. Write protection can be carried out using either the hardware switch on the CPU board (i.e., Switch 2) or software parameter settings. If either of these items is set to "Protect," the overwriting of parameters will be prohibited.

**NOTE**

If the hardware switch is set to "Protect," it will not be possible to overwrite parameters; furthermore, this condition will be maintained until the switch is set to "Enable."

For more details regarding usage of the write protect function and the software's parameter switches, refer to "Chapter 6: Parameter Description" in this user's manual.

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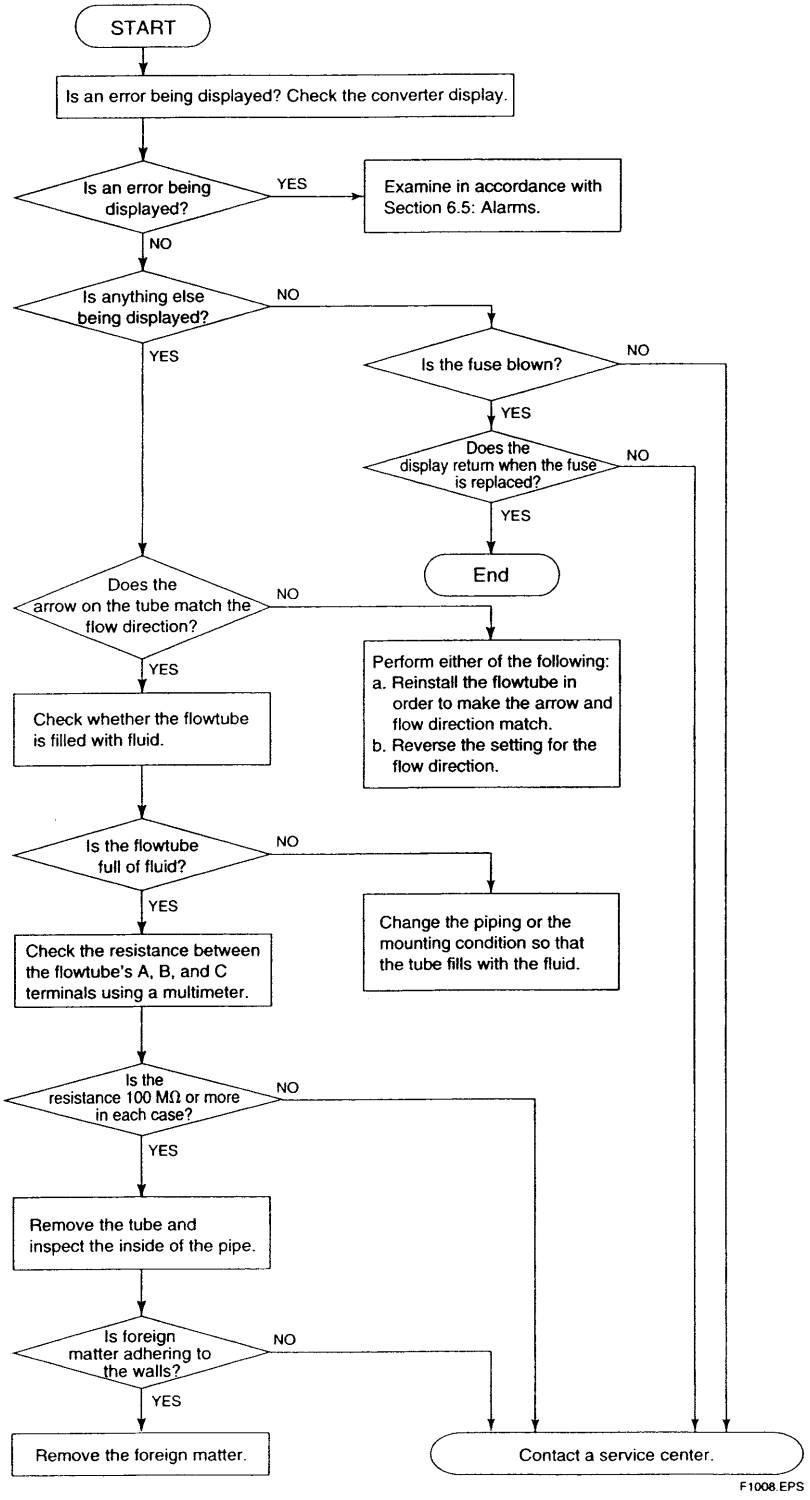
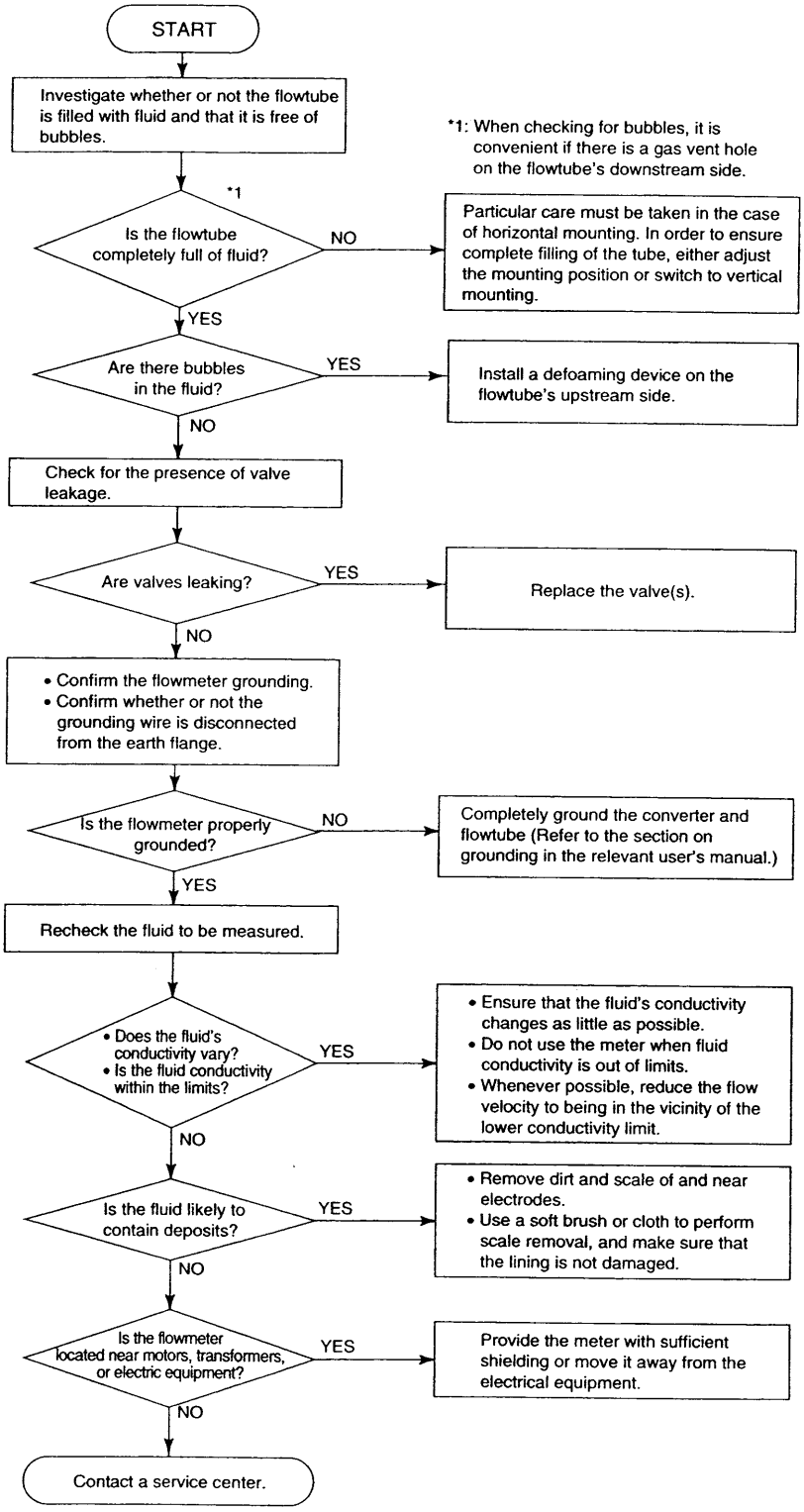
# 10.3 Troubleshooting

Although magnetic flowmeters rarely require maintenance, failures may occur when the instrument is not operated correctly. This section describes troubleshooting procedures where the cause of the breakdown is identified through receiver indication.

## 10.3.1 No Indication



## 10.3.2 Unstable Zero

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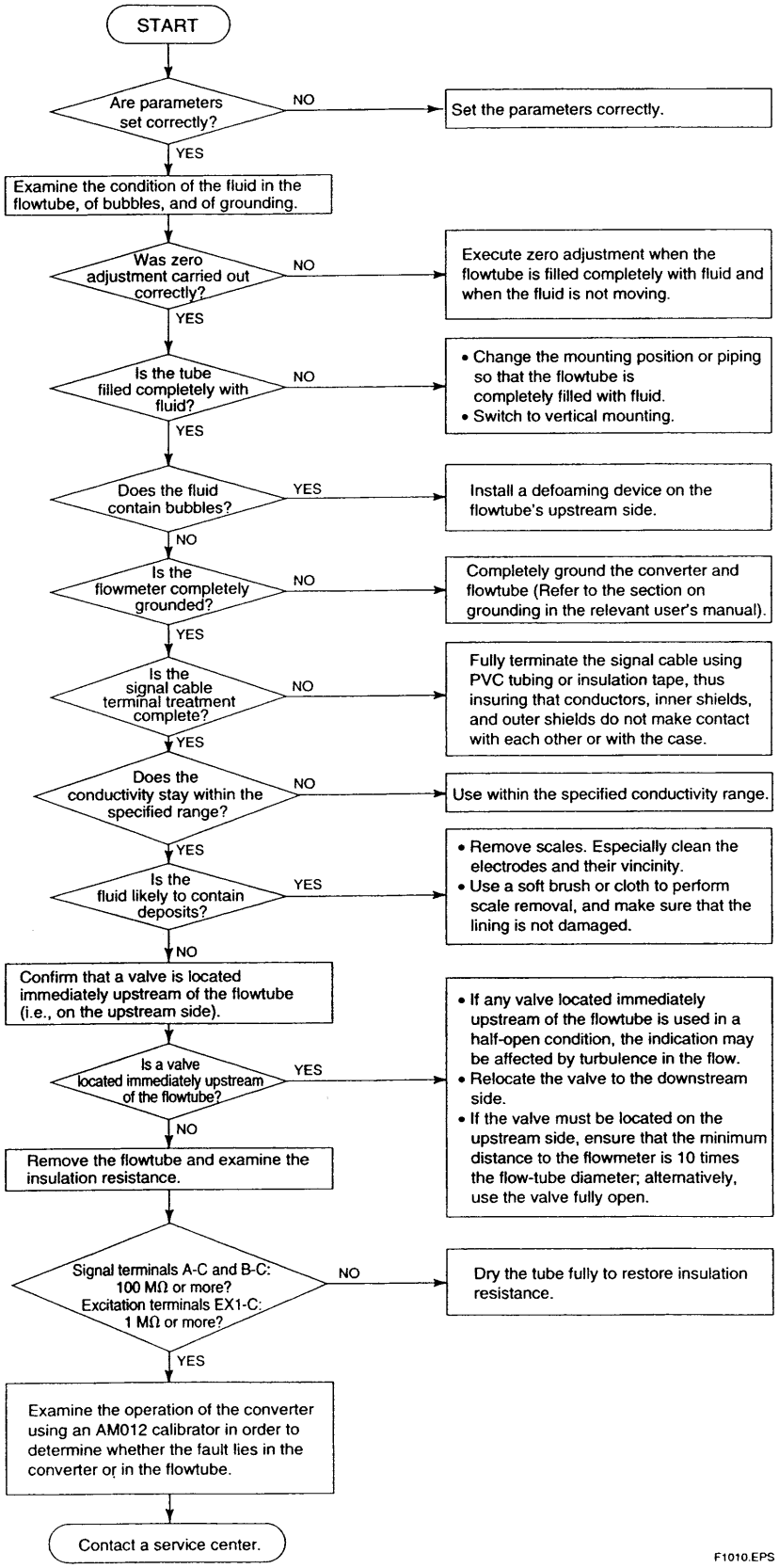
## 10.3.3 Disagreement Between Indication and Actual Flow

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# 11. OUTLINE

## ■ STANDARD SPECIFICATIONS

### ● Converter

*1: Select two points from: one pulse output, one alarm output, one status input, or two status outputs.
*2: For models without an indicator, the hand-held terminal is necessary to set parameters.

**Excitation Method: (Combined with AXF Remote Flowtube)**
- Standard dual frequency excitation:
  Size 2.5 to 400 mm (0.1 to 16 in.)
- Enhanced dual frequency excitation:
  Size 25 to 200 mm (1.0 to 8.0 in.)
  (Optional code HF1 or HF2)

**Input Signal (*1):**
One Status Input: Dry contact
Load resistance: 200 Ω or less (ON), 100 kΩ or more (OFF)

**Output Signals:**
- One Current Output: 4 to 20 mA DC (load resistance: 750 Ω maximum, including cable resistance)
- One Pulse Output (*1):
  Transistor contact output (open collector)
  Contact capacity: 30 V DC (OFF), 200 mA (ON)
  Output rate: 0.0001 to 10,000 pps (pulse/second)
- One Alarm Output (*1):
  Transistor contact output (open collector)
  Contact capacity: 30 V DC (OFF), 200 mA (ON)
- Two Status Outputs (*1):
  Transistor contact output (open collector)
  Contact capacity: 30 V DC (OFF), 200 mA (ON)

**Communication Signals:**
BRAIN or HART communication signal
(Superimposed on the 4 to 20 mA DC signal)
Distance from power line: 15 cm (6 in.) or more (Parallel wiring should be avoided.)

**BRAIN:**

**Communication Distance:**
Up to 2 km (1.25 miles), when polyethylene insulated PVC-sheathed cables (CEV cables) are used. Communication distance varies depending on the type of cable and wiring used.

**Load Resistance:**
250 to 600 Ω (including cable resistance)

**Load Capacitance:** 0.22 μF or less

**Load Inductance:** 3.3 mH or less

**Input Impedance of Communicating Device:**
10 kΩ or more (at 24 kHz)

**HART:**

**Communication Distance:**
Up to 1.5 km (0.9 mile), when using multiple twisted pair cables. Communication distance varies depending on the type of cable used.

**Load Resistance:**
230 to 600 Ω (including cable resistance)

**Cable Length for Specific Applications:**
Use the following formula to determine the cable length for specific applications:

$$L = \frac{65\times10^6}{(R\times C)} - \frac{(Cf+10{,}000)}{C}$$

where:
L = length in meters or feet
R = resistance in Ω (including barrier resistance)
C = cable capacitance in pF/m or pF/ft
Cf = maximum shunt capacitance of receiving devices in pF/m or pF/ft

Note: HART is a registered trademark of the HART Communication Foundation.

**Data Security During Power Failure:**
Data (parameters, totalizer value, etc.) storage by EEPROM. No back-up battery required.

**Indicator (*2):**
Full dot-matrix LCD (32×132 pixels)

**Lightning Protector:**
The lightning protector is built into the excitation current output, the current output, the signal common, pulse/alarm/status input and output terminals. When optional code A is selected, the lightning protector is built into the power terminals.

**Protection:**
General-purpose Use/Sanitary Type/TIIS Flame proof type:
IP66, IP67, JIS C0920 immersion-proof type
Explosion proof type except TIIS:
In case of explosion proof type except TIIS, refer to description of "Enclosure" in "HAZARDOUS AREA CLASSIFICATION".

**Coating:**
Case and Cover: Polyurethane corrosion-resistant
Coating Color: Mint green (Munsell 5.6 BG 3.3/2.9 or its equivalent)

**Converter Material:**
Case and Cover: Aluminum alloy

**Mounting/Shapes:**
- Electrical Connection: ANSI 1/2 NPT female
  ISO M20 ×1.5 female
  JIS G1/2 (PF1/2) female
- Terminal Connection: M4 size screw terminal

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**Grounding:**

Grounding resistance 100 Ω or less
When optional code A is selected, grounding resistance 10 Ω or less shall be applied.

* In case of explosion proof type except TIIS, follow the domestic electrical requirements as regulated in each country.
* In case of TIIS Flame proof type, refer to description of "HAZARDOUS AREA CLASSIFICATION".

**Combined Remote Flowtube:**

- AXFA14 Converter can be combined with size 2.5 to 400 mm (0.1 to 16 in.) of AXF Remote Flowtube.
- If a combined converter is changed from AXFA14 to AXFA11 or vice versa, a new meter factor must be adjusted by flow calibrations.
- In case that size 250 mm (10 in.) or larger is used in low conductivity or high concentration slurries, please use the AXFA11 Converter.

## Functions

**How to Set Parameters (*2):**

The indicator's LCD and three infra-red switches enable users to set parameters without opening the case cover. Parameters can also be set by means of the HHT(Hand-held terminal).

**Displayed Languages (*2):**

Users can choose a language from among English, Japanese, German, French, Italian, Spanish.

**Instantaneous Flow Rate/Totalized Value Display Functions (for models with an indicator) (*2):**

The full dot-matrix LCD enables user selections of displays from one line to three lines for:

- Instantaneous flow rate
- Instantaneous flow rate (%)
- Instantaneous flow rate (bar graph)
- Current output value (mA)
- Totalized value
- Tag No.
- Results of electrode adhesion diagnostics

**Totalizer Display Function (*2):**

The flow rate is counted one pulse at a time according to the setting of totalization pulse weights. For forward and reverse flow measurement functions, the totalized values of the flow direction (forward or reverse) and the flow direction are displayed on the indicator together with the units. The difference of totalized values between the forward and reverse flow rate can be displayed. Totalization for the reverse flow rate is carried out only when "Forward and reverse flow measurement functions" is selected.

**Damping Time Constant (*2):**

Time constant can be set from 0.1 second to 200.0 seconds (63% response).

**Span Setting Function (*2):**

Span flows can be set in units such as volume flow rate, mass flow rate, time, or flow rate value. The velocity unit can also be set.

Volume Flow Rate Unit: kcf, cf, mcf, Mgal (US), kgal (US), gal (US), mgal (US), kbbl (US)*, bbl (US)*, mbbl (US)*, µbbl (US)*, Ml (megaliter), $m^3$, kl (kiloliter), l (liter), $cm^3$

Mass Flow Rate Unit (Density must be set.): klb (US), lb (US), t (ton), kg, g

Velocity Unit: ft, m (meter)

Time Unit: s (sec), min, h (hour), d (day)

* "US Oil" or "US Beer" can be selected.

**Pulse Output (*1)(*2):**

Scaled pulse can be output by setting a pulse weight.

Pulse Width: Duty 50% or fixed pulse width (0.05, 0.1, 0.5, 1, 20, 33, 50, 100 ms) can be selected.

Output Rate: 0.0001 to 10,000 pps (pulse/second)

**Multi-range Function (*1)(*2):**

- Range switching via status input
  Status input enables the switching of up to two ranges.
- Automatic range switching
  When the flow rate exceeds 100 % of the range, transition to the next range (up to four ranges) is carried out automatically. Range switching can be confirmed by status outputs and indicator.

**Forward and Reverse Flow Measurement Functions (*1)(*2):**

Flows in both forward and reverse directions can be measured. The reverse flow measurement can be confirmed by status output and indicator.

**Totalization Switch (*1)(*2):**

The status output is carried out when output if a totalized value becomes equal to or greater than the set value.

**Preset Totalization (*1)(*2):**

The parameter setting or status input enables a totalized value to be preset to a setting value or zero.

**0% Signal Lock (*1)(*2):**

Status input forcibly fixes the instantaneous flow rate display, current output, pulse output, and flow rate totalization to 0%.

**Alarm Selection Function (*2):**

Alarms are classified into System Alarms (hard failures), Process Alarms (such as 'Empty Pipe', 'Signal Overflow' and 'Adhesion Alarm'), Setting Alarms, and Warnings. Whether alarms should be generated or not can be selected for each item.

The current output generated for an alarm can be selected from among 2.4 mA or less, fixed to 4 mA, 21.6 mA or more, or HOLD.

**Alarm Output (*1)(*2):**

Alarms are generated only for the items selected via the 'Alarm Selection Function' if relevant failures occur.

**Self Diagnostics Functions (*2):**

If alarms are generated, details of the System Alarms, Process Alarms, Setting Alarms and Warnings are displayed together with concrete descriptions of counter-measures.

**Flow Upper/Lower Limit Alarms (*1)(*2):**

If a flow rate becomes greater or smaller than the set value, this alarm is generated. In addition, two upper limits (H, HH) and two lower limits (L, LL) can be set.

If a flow rate becomes greater or smaller than any of the set values, the status is output.

**Electrode Adhesion Diagnostics Function (*1) (*2):**

This function enables monitoring of the adhesion level of insulating substances to the electrodes. Depending on the status of adhesion, users are notified by a warning or an alarm via status outputs. If replaceable electrodes are used, they can be removed and cleaned when adhesion occurs.

## ■ HAZARDOUS AREA CLASSIFICATION

### FM:

Applicable Standard: FM3600, FM3615, FM3810, ANSI/NEMA 250
Explosion proof for Class I, Division 1, Groups A, B, C & D.
Dust-ignition proof for Class II/III, Division 1, Groups E, F & G.
"SEAL ALL CONDUITS WITHIN 18 INCHES"
"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"

Maximum power supply voltage: 250 Vac/130 Vdc
Excitation Circuit: 140V max
Enclosure: NEMA 4X
Temperature Code: T6
Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

Note: Installation shall be in accordance with the manufacturer's instructions and National Electric code, ANSI/NFPA-70.

### CENELEC ATEX (KEMA):

Applicable Standard: EN 50014, EN 50018, EN 50281-1-1, EN 60529, EN 61010-1
Certificate: KEMA 03ATEX2435

**CENELEC ATEX (KEMA) Flame proof Type**

Group: II
Category: 2G
EEx d IIC T6
Maximum power supply voltage: 250 Vac/130 Vdc
Excitation Circuit: 140V max
Enclosure: IP66, IP67
Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

**CENELEC ATEX (KEMA) Type of Protection "Dust"**

Group: II
Category: 1D
Maximum power supply voltage: 250 Vac/130 Vdc
Excitation Circuit: 140V max
Enclosure: IP66, IP67
Maximum surface temperature: T75°C (+167°F)
Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

### CSA:

Applicable Standard:
For CSA C22.2 Series;
C22.2 No 0, C22.2 No 0.4, C22.2 No 0.5, C22.2 No 25, C22.2 No 30, C22.2 No 94, C22.2 No 1010.1
For CSA E79 Series;
CAN/CSA-E79-0, CAN/CSA-E79-1,
Certificate: 1481213

**For CSA C22.2 Series**

Explosion proof for Class I, Division 1, Groups A, B, C & D.
Dust-ignition proof for Class II/III, Division 1, Groups E, F & G.
"SEAL ALL CONDUITS WITHIN 50 cm OF THE ENCLOSURE"
"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"

Maximum power supply voltage: 250 Vac/130 Vdc
Excitation Circuit: 140V max
Enclosure: Type 4X
Temperature Code: T6
Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

**For CSA E79 Series**

Flame proof for Zone 1, Ex d IIC T6

Maximum power supply voltage: 250 Vac/130 Vdc
Excitation Circuit: 140V max
Enclosure: IP66, IP67
Temperature Code: T6
Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

### TIIS:

- Certificate: C16678
- Construction: Ex d IIC T6
  : Explosion proof
- Ambient Temperature: –20°C to 60°C (power supply code 1)
  : –20°C to 50°C (power supply code 2)
- Maximum power supply voltage: 250V AC/130V DC
- Grounding: JIS Class C (grounding resistance 10Ω or less) or JIS Class A (grounding resistance 10Ω or less)

*In case that ambient temperature exceeds 50°C, use heat-resistant cables with maximum allowable temperature of 70°C or above.

## ■ STANDARD PERFORMANCE

**Reference Conditions:**

Similar to BS EN 29104 (1993); ISO9104 (1991)
- Fluid temperature: 20°C ±10°C (+68°F ±18°F)
- Ambient temperature: 25°C ±5°C (+77°F ±9°F)
- Warm-up time: 30 min
- Straight runs
  Upstream > 10 × DN
  Downstream > 5 × DN
- Properly grounded
- Properly centered

**Accuracy (Combined with AXF Remote Flowtube at reference conditions)**

**Pulse Output:**

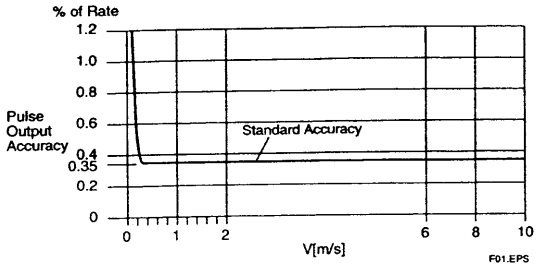
**PFA/Ceramics Lining:**

| Size mm (in.) | Flow Velocity V m/s (ft/s) | Standard Accuracy (Calibration code B) | Flow Velocity V m/s (ft/s) | High grade Accuracy (Calibration code C) |
|---|---|---|---|---|
| 2.5 (0.1) to 15 (0.5) | V < 0.3 (1) | ±1.0 mm/s | — | |
| | 0.3 ≦ V ≦ 10 (1) (33) | ±0.35% of Rate | | |
| 25 (1.0) to 200 (8.0) | V < 0.15 (0.5) | ±0.5 mm/s | V <0.15 (0.5) | ±0.5 mm/s |
| | 0.15 ≦ V ≦ 10 (0.5) (33) | ±0.35% of Rate | 0.15 ≦ V <1 (0.5) (3.3) | ±0.18% of Rate ±0.2mm/s |
| | | | 1 ≦ V ≦10 (3.3) (33) | ±0.2% of Rate |
| 250 (10) to 400 (16) | V < 0.15 (0.5) | ±0.5 mm/s | — | |
| | 0.15 ≦ V ≦ 10 (0.5) (33) | ±0.35% of Rate | | |

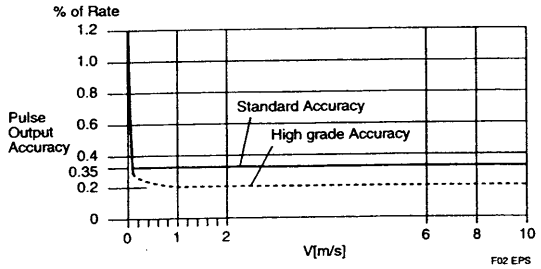
T01.EPS

Enhanced dual frequency excitation (Option code HF2):
Standard accuracy ± 1 mm/ s

**Size 2.5 mm (0.1 In.) to 15 mm (0.5 In.)**




**Size 25 mm (1.0 in.) to 400 mm (16 in.)**



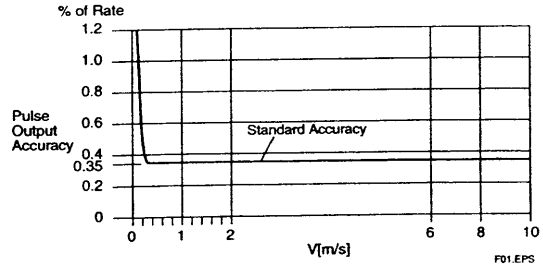

**Polyurethane Rubber/Natural Soft Rubber/EPDM Rubber Lining**

| Size mm (in.) | Flow Velocity *V* m/s (ft/s) | Standard Accuracy (Calibration code B) |
|---|---|---|
| 25 (1.0) to 400 (16) | $V < 0.3$ (1.0) | ±1.0 mm/s |
| | $0.3 \leqq V \leqq 10$ (1.0) (33) | ±0.35% of Rate |

T02 EPS

Enhanced dual frequency excitation (Optional code HF2): Standard accuracy ± 1 mm/ s

**Size 25 mm (1.0 in.) to 400 mm (16 in.)**




**Current Output:** Pulse output accuracy plus ±0.05% of Span

**Repeatability:**

±0.1% of Rate (V ≧ 1 m/s (3.3 ft/s))

±0.05% of Rate ±0.5 mm/s (V < 1 m/s (3.3 ft/s))

**Maximum Power Consumption:**

Combined with AXF Remote Flowtube: 12 W

**Insulation Resistance(*1) :**

Between power supply terminals and ground terminal: 100MΩ at 500V DC

Between power supply terminals and input/output/ excitation current terminals : 100MΩ at 500V DC

Between ground terminal and input/output/excitation current terminals: 20MΩ at 100V DC

Between input/output/excitation current terminals :20MΩ at 100V DC

**Withstand Voltage(*1) :**

Between power supply terminals and ground terminal: 1390V AC for 2 seconds

Between power supply terminals and input/output terminals: 1390V AC for 2 seconds

Between excitation current terminal and ground terminal: 160V AC for 2 seconds

Between excitation current terminal and input /output terminals: 200V AC for 2 seconds

**⚠ CAUTION**

*1: When performing the Insulation Resistance Test or the Withstand Voltage Test, please obey the following caution.

- Following the relevant test, wait for more than 10 seconds after the power supply has been turned off before removing the cover.
- Remove all wires from terminals before testing.
- When the power terminal has a lighting protector (optional code A), remove the short bar at the ground terminal.
- After testing, be sure to discharge by using a resistance and return all wires and the short bar to its correct position.
- Screws must be tightened to a torque of 1.18 N-m or more.
- After closing the cover, the power supply can be restored.

**Safety Requirement Standards:**

EN61010-1

- Altitude at installation site: Max. 2000 m above sea level
- Installation category based on IEC1010: Overvoltage category II ("II" applies to electrical equipment which is supplied from a fixed installation-like distribution board.)
- Pollution degree based on IEC1010 Pollution degree 2 ("Pollution degree" describes the degree to which a solid, liquid, or gas which deteriorates dielectric strength or surface resistivity is adhering. "2" applies to a normal indoor atmosphere.)

**EMC Conformity Standards:**

EN61326

EN61000-3-2, EN61000-3-3

AS/NZS CISPR11

## ■ NORMAL OPERATING CONDITIONS

**Ambient Temperature:** –40°C to +60°C (–40°F to +140°F)
- Indicator's operating range: –20°C to +60°C (–4°F to +140°F)
- Maximum temperature should be 50°C in the case of power supply code 2.

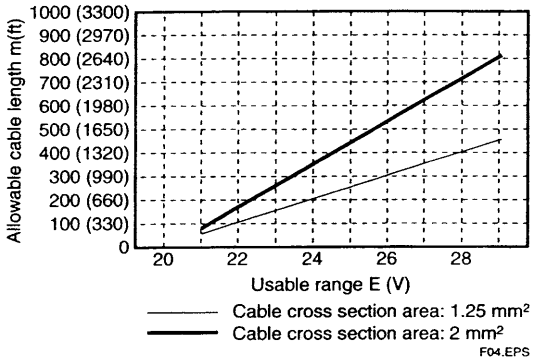
**Ambient Humidity:** 0 to 100%
Lengthy continuous operation at 95% or more is not recommended.

**Power Supply**

**Power supply code 1:**
- AC specifications
  Rated power supply: 100 to 240 V AC, 50/60 Hz
  (Operating voltage range: 80 to 264 V AC)
- DC specifications
  Rated power supply: 100 to 120 V DC
  (Operating voltage range: 90 to 130 V DC)

**Power supply code 2:**
- AC specifications
  Rated power supply: 24 V AC, 50/60 Hz
  (Operating voltage range: 20.4 to 28.8 V AC)
- DC specifications
  Rated power supply: 24 V DC
  (Operating voltage range: 20.4 to 28.8 V DC)

**Supplied Power and Cable Length for Power Supply Code 2**



F04.EPS

**Vibration Conditions:**
Level of vibration in conformity with IEC 60068-2-6 (SAMA31. 1-1980)
1 G or less (frequency 500 Hz or less)
Note: Avoid locations with much vibration (with a vibration frequency of 500 Hz or more), which may cause damage to the equipment.

## ■ ACCESSORIES

Fuse (T2.0A, 250 V): 1 pc.
*Time lag fuse
Mounting bracket: 1 set
Hexagonal wrench: 1 pc.

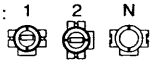
## ■ MODEL AND SUFFIX CODE

**AXFA14 Magnetic Flowmeter Remote Converter:**

| Model | Suffix Code | Description |
|---|---|---|
| AXFA14 | | Magnetic Flowmeter Remote Converter |
| Use (*2) | G | General-Purpose Use<br>For AXF Remote Flowtube of Size 2.5 to 400 mm (0.1 in. to 16 in.) |
| | C | Explosion proof Type<br>For Remote Flowtube of Size 2.5 to 400 mm (0.1 in. to 16 in.) |
| Output Signal and Communication | -D | 4 to 20 mA DC, BRAIN Communication |
| | -E | 4 to 20 mA DC, HART Communication |
| Power Supply | 1 | 100 V to 240 V AC or 100 to 120 V DC |
| | 2 | 24 V AC/DC |
| Electrical Connections (*3) | -0 | JIS G1/2 female |
| | -2 | ANSI 1/2 NPT female |
| | -4 | ISO M20 × 1.5 female |
| Indicator (*1)(*4) | 1 | With Indicator (Horizontal) |
| | 2 | With Indicator (Vertical) |
| | N | None |
| Option | /□ | Optional code (See the Table of Optional Specifications) |

T03.EPS

*1: 1 2 N



*2: For explosion proof types, specify type of explosion proof certification using the optional codes. In case of the TIIS flame proof type, the remote flowtube is available only for combined use with the AXFA14. For the TIIS flame proof type with wiring using a flame proof packing adapter, select optional code G12 or G11. Available only for JIS G1/2 electrical connections.
*3: JIS G1/2 Female electrical connection is available only for TIIS flame proof type.
*4: In case of integral flowmeters of the TIIS flame proof type, select "with indicator"(code 1 or 2).

**Signal Cable:**

| Model | Suffix Code | Description |
|---|---|---|
| AXFC | | Magnetic Flowmeter<br>Dedicated Signal cable for the ADMAG AXF series |
| Termination | -0 | No Termination. |
| | -4 | A set of termination parts for M4 screws is attached.<br>Terminated for the AXFA11/14 Remote Converter. |
| Cable Length | -L□□□ | Designate the cable length, unit: m<br>Following "L", specify the cable in three digits as multiple of 1 meter (e.g., 001, 002, or 005) for a length up to 5 m, or as a multiple of 5 meters (i.e., 005, 010, 015, or the like).<br>The maximum cable length:<br>200 m for combined use with AXFA11<br>100 m for combined use with AXFA14 |
| Option | /C□ | With termination parts sets.<br>Following "C", specify the q'ty of sets of termination parts in one digits. |

T04.EPS

Note:
- The cable is constructed with double shielding over the two conductors, and uses heat-resistant vinyl as the outer covering material.
  Finished diameture: 10.5 mm (0.41 in.)
  Maximum temperature: +80°C (+175°F)
- Unnecessary to order the above cable for submersible type flowtube or for the optional code DHC flowtube because the flowtube is wired with 30 m (98 ft) cable.
- For excitation cable, prepare a two-core cable at the customer side.

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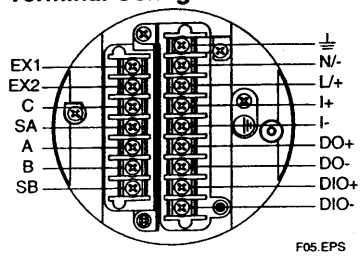
19.1.1

## ● Terminal Configuration




F05.EPS

## ● Terminal Wiring

| Terminal Symbols | Description |
|---|---|
| EX1<br>EX2 | Excitation current Output |
| C<br>SA<br>A<br>B<br>SB | Flow singal input |

| Terminal Symbols | Description |
|---|---|
| ⏚ | Functional grounding |
| N/–<br>L/+ | Power supply |
| I+<br>I– | Current output 4 to 20mA DC |
| DO+<br>DO– | Pulse output/ Alarm output/ Status output |
| DIO+<br>DIO– | Alarm output/ Status output/ Status input |
| ⏚ | Protective grounding (Outside of the terminal) |

T06.EPS

## ■ OPTIONAL SPECIFICATIONS FOR AXFA14 REMOTE CONVERTER

O: Available –: Not available

| Item | Specification | | General-Purpose use | Explosion proof Type | Code |
|---|---|---|---|---|---|
| Lightning Protector | A lightning protector is built into the power terminals. | | O | O | A |
| DC Noise Cut Circuit | The DC Noise Cut Circuit is built in. Available for 15 mm (0.5 in.) and larger sizes, and for fluids with the conductivity of 50 µS/cm or higher. Nullifies the empty check and electrode adhesion diagnostic function. | | O | O | ELC |
| Burn Out Down | The output level is set to 0 mA during a CPU failure and is set 2.4 mA (-10%) or less during an alarm. Standard products are delivered with a setting 25 mA during a CPU failure and 21.6 mA (110%) or more during an alarm. | | O | O | C1 |
| NAMUR NE43 Compliance | Output signal limits: 3.8 to 20.5 mA | Failure alarm down-scale: The output level is set to 0 mA during a CPU failure and is set 2.4 mA (–10%) or less during an alarm. | O | O | C2 |
| | | Failure alarm up-scale. The output level is set to 25 mA during a CPU failure and is set 21.6 mA (110%) or more during an alarm. | O | O | C3 |
| Active Pulse Output | Active pulses are output in order to drive an external electromagnetic or electronic counter directly using the converter's internal power supply. (Nullfies the standard transistor contact pulse output.)<br>Output voltage: 24 V DC ±20%<br>Pulse specifications:<br>• The drive current of 30 to 150 mA<br>• Pulse rate: 0.0001 to 2 pps (pulse/second); Pulse width: 20, 33, 50, or 100 ms | | O | O | EM |
| Waterproof Glands | Waterproof glands are attached to the electrical connections. Available only for JIS G1/2 electric connections. | | O | – | EG |
| Waterproof Glands with Union Joints | Waterproof glands with union joints are attached to the electrical connections. Available only for JIS G1/2 electric connections. | | O | – | EU |
| Plastic Glands | Plastic glands are attached to the electrical connections. Available only for JIS G1/2 electric connections. | | O | – | EP |
| Stainless Steel Mounting Bracket | Provided with a JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) stainless steel mounting bracket in lieu of the standard carbon steel bracket. | | O | O | SB |
| Stainless Steel Tag Plate | Screwed JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) stainless steel tag plate. Choose this option when an SS tag plate is required in addition to the standard nameplate with the tag number inscribed on it.<br>Dimension (Height × Width): Appr. 12.5 (4.92) × 40 (15.7) mm (inch) | | O | O | SCT |
| Painting Color Change | Coated in black (Munsell N1.5 or its equivalent.) | | O | O | P1 |
| | Coated in jade green (Munsell 7.5BG4/1.5 or its equivalent.) | | O | O | P2 |
| | Coated in metallic silver. | | O | O | P7 |
| Epoxy Resin Coating | Epoxy resin coating which has alkali-resistance instead of standard polyurethane resin coating. The color is same as standard type. | | O | O | X1 |
| High Anti-corrosion Coating | Three-layer coating (polyurethane coating on two-layer epoxy resin coating) in the same range as that for the standard coating. The color is same as standard type.<br>Salt/alkali/acid/weather-resistance. | | O | O | X2 |
| Calibration Certificate | Level 2: The Declaration and the Calibration Equipment List are issued. | | O | O | L2 |
| | Level 3: The Declaration and the Primary Standard List are issued. | | O | O | L3 |
| | Level 4: The Declaration and the Yokogawa Measuring Instruments Control System are issued. | | O | O | L4 |
| FM Approval | FM Explosion proof<br>See "HAZARDOUS AREA CLASSIFICATION" | | – | O | FF1 |
| CENELEC ATEX Certification (KEMA Approval) | ATEX Explosion proof<br>See "HAZARDOUS AREA CLASSIFICATION" | | – | O | KF2 |
| CSA Certification | CSA Explosion proof<br>See "HAZARDOUS AREA CLASSIFICATION" | | – | O | CF1 |
| TIIS Certification *1 | TIIS Flame proof<br>See "HAZARDOUS AREA CLASSIFICATION" | | – | O | JF3 |
| Flame proof packing adapter for TIIS Flame proof Type | Four flame proof packing adapters | | – | O | G14 |
| | Three flame proof packing adapters and one blind plug.<br>Available only when a four-wires cable is used for power input and signal output with DC power supply. | | – | O | G13 |

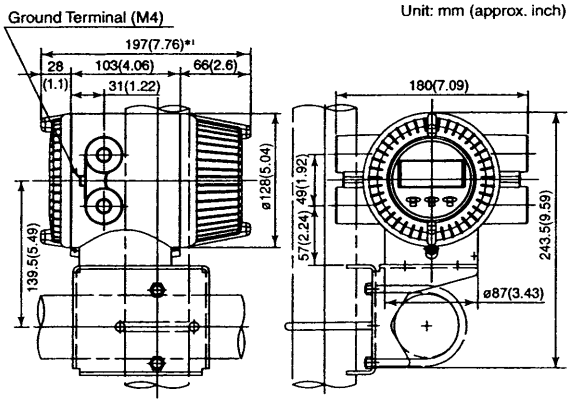
*1: Select optional code G14 or G13 when TIIS Flame proof type with wiring using a flame proof packing adapter. Available only for JIS G1/2 electric concections.

T05.EPS

## ■ EXTERNAL DIMENSIONS

### ● Remote Converter AXFA14G/C

Unit: mm (approx. inch)



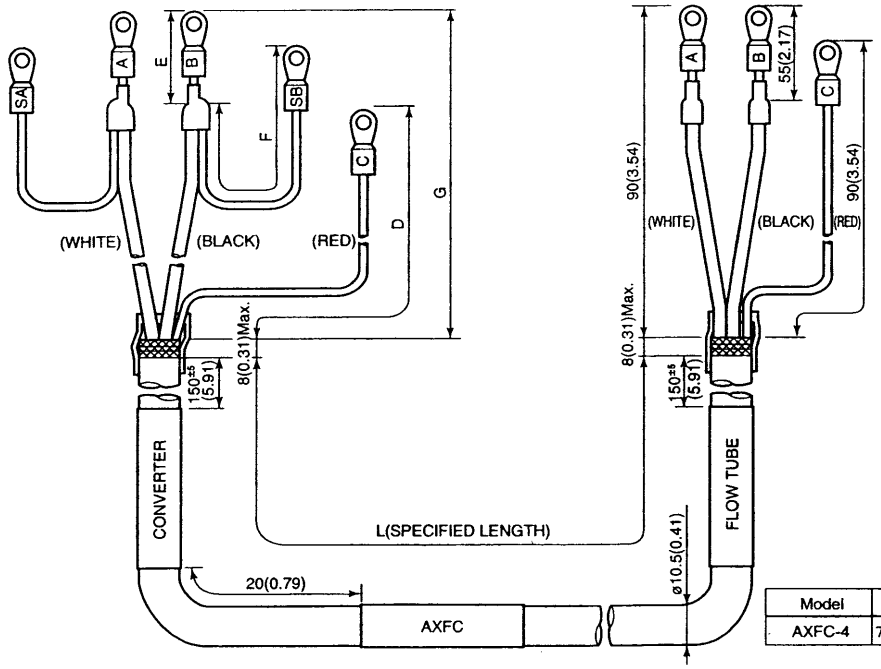

Weight: 2.8kg (6.2lb)

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
In case of explosion proof type with indicator, add 5 mm (0.2 inch) to it. F06.EPS

### ● Dedicated Signal Cable

**AXFC-4-L□□□**

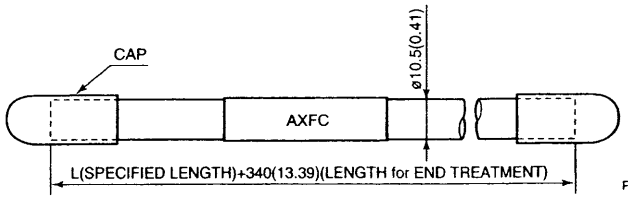
Unit: mm (approx. inch)




| Model | D | E | F | G |
|---|---|---|---|---|
| AXFC-4 | 70(2.76) | 25(0.98) | 50(1.97) | 60(1.36) |

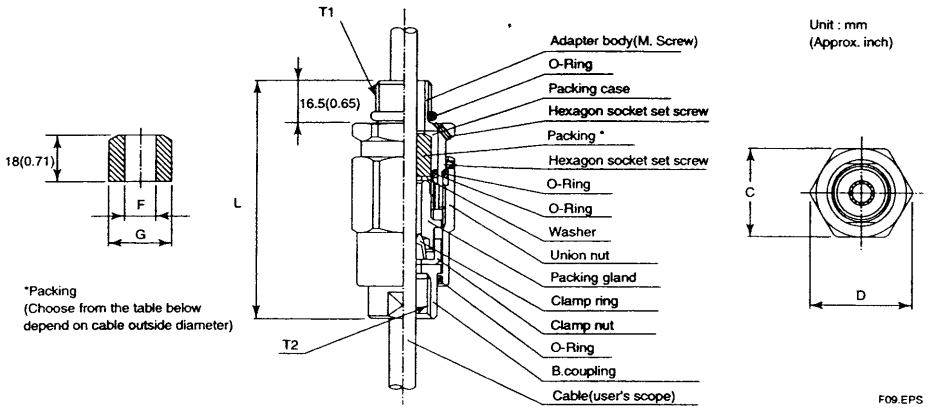
F07.EPS

**AXFC-0-L□□□**




F08.EPS

## ● Flame proof packing adapter for TIIS flame proof type (optional code G14 or G13)




| Dimension | | | | | Cable outer diameter | Packing diameter | | Identification mark | Weight kg (lb) |
|---|---|---|---|---|---|---|---|---|---|
| T1 | T2 | C | D | L | | F | G | | |
| G 1/2 | G 1/2 | 35 (1.38) | 39 (1.54) | 94.5 (3.72) | ϕ8.0 to ϕ10.0 (0.31 to 0.39) | ϕ10.0(0.39) | ϕ20.0 (0.79) | 16 8-10 | 0.26 (0.57) |
| | | | | | ϕ10.0 to ϕ12.0 (0.39 to 0.47) | ϕ12.0(0.47) | | 16 10-12 | |

T013.EPS

## ● Unless otherwise specified, difference in the dimensions are refer to the following table.

General tolerance in the dimensional outline drawing.

Unit : mm (approx.inch)

| Category of basic dimension | | Tolerance | Category of basic dimension | | Tolerance |
|---|---|---|---|---|---|
| Above | Equal or below | | Above | Equal or below | |
| | 3 (0.12) | ±0.7 (±0.03) | 500 (19.69) | 630 (24.80) | ±5.5 (±2.17) |
| 3 (0.12) | 6 (0.24) | ±0.9 (±0.04) | 630 (24.80) | 800 (31.50) | ±6.25 (±0.25) |
| 6 (0.24) | 10 (0.39) | ±1.1 (±0.04) | 800 (31.50) | 1000 (39.37) | ±7.0 (±0.28) |
| 10 (0.39) | 18 (0.71) | ±1.35 (±0.05) | 1000 (39.37) | 1250 (49.21) | ±8.25 (±0.32) |
| 18 (0.71) | 30 (1.18) | ±1.65 (±0.06) | 1250 (49.21) | 1600 (62.99) | ±9.75 (±0.38) |
| 30 (1.18) | 50 (1.97) | ±1.95 (±0.08) | 1600 (62.99) | 2000 (78.74) | ±11.5 (±0.45) |
| 50 (1.97) | 80 (3.15) | ±2.3 (±0.09) | 2000 (78.74) | 2500 (98.43) | ±14.0 (±0.55) |
| 80 (3.15) | 120 (4.72) | ±2.7 (±0.11) | 2500 (98.43) | 3150 (124.02) | ±16.5 (±0.65) |
| 120 (4.72) | 180 (7.09) | ±3.15 (±0.12) | | | |
| 180 (7.09) | 250 (9.84) | ±3.6 (±0.14) | | | |
| 250 (9.84) | 315 (12.40) | ±4.05 (±0.16) | | | |
| 315 (12.40) | 400 (15.75) | ±4.45 (±0.18) | | | |
| 400 (15.75) | 500 (19.69) | ±4.85 (±0.19) | | | |

Remarks: The numeric is based on criteria of tolerance class IT18 in JIS B 0401.

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19.1.1

# 12. EXPLOSION PROTECTED TYPE INSTRUMENT

In this section, further requirements and differences for explosion proof type instrument are described.

**⚠ WARNING**

- Magnetic flowmeters with the model name AXFA14C are products which have been certified as explosion proof type instruments. Strict limitations are applied to the structures, installation locations, external wiring work, maintenance and repairs, etc. of these instruments. Sufficient care must be taken, as any violation of the limitations may cause dangerous situations.
  Be sure to read this chapter before handling the instruments.
  For explosion proof type instrument, the description in this chapter is prior to other description in this user's manual.
  For TIIS flame proof type instruments, be sure to read "INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAME PROOF EQUIPMENT" at the end of this manual.

**⚠ WARNING**

The terminal box cover and display cover is locked by special screw. In case of opening the cover, please use the hexagonal wrench attached.
The covers of explosion proof type products are locked. Use the attached hexagonal wrench to open and close the cover. Before opening the cover, be sure to check that the power of flowmeter has been turned off. Once the cover is closed, be sure to re-lock the product.
Be sure to lock the cover with the special screw using the hexagonal wrench attached after tightening the cover.

## 12.1 CENELEC ATEX (KEMA)

**⚠ WARNING**

Only trained persons use this instrument in industrial locations.

### (1) Technical Data

**CENELEC ATEX (KEMA):**

Applicable Standard:
EN 50014, EN 50018, EN 50281-1-1,
EN 60529, EN 61010-1
Certificate: KEMA 03ATEX2435

**CENELEC ATEX (KEMA) Flame proof Type**

Group: II
Category: 2G
EEx d IIC T6
Maximum power supply voltage: 250 Vac/130 Vdc
Excitation Circuit: 140V max
Enclosure: IP66, IP67
Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

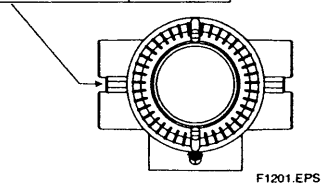
**CENELEC ATEX (KEMA) Type of Protection "Dust"**

Group: II
Category: 1D
Maximum power supply voltage: 250 Vac/130 Vdc
Excitation Circuit: 140V max
Enclosure: IP66, IP67
Maximum surface temperature: T75°C (+167°F)
Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

### (2) Electrical Connection

The type of electrical connection is stamped near the electrical connection port accordiing to the following codes.

| Screw Size | Marking |
|---|---|
| ISO M20x1.5 female | ⚠M |
| ANSI 1/2NPT female | ⚠A |



### (3) Installation

**WARNING**

- All wiring shall comply with local installation requirements and local electrical code.
- In hazadous locations, the cable entry devices shall be of a certified ATEX flame proof type, suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with suitable flame proof certified blanking elements. (The plug attached is flame proof certified.)

### (4) Operation

**WARNING**

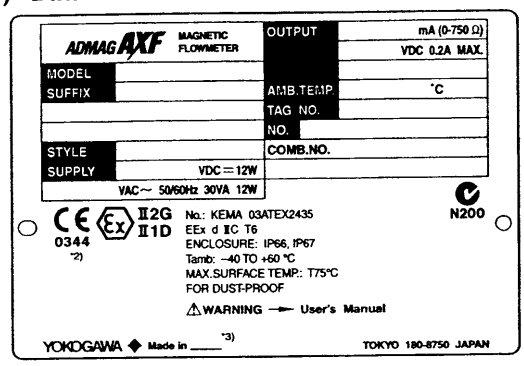
- After de-energizing, delay 20 minutes before opening.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

### (5) Maintenance and Repair

**WARNING**

The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

### (6) Data Plate




MODEL: Specified model code
SUFFIX: Suffix codes of the model code
STYLE: Specified style code
SUPPLY: Power supply voltage of apparatus
OUTPUT: Output signal of apparatus
AMB. TEMP., Tamb: Ambient temperature
No.: Manufacturing serial number *1)
CE: CE marking
II 2G: Group II Category 2 Gas atmosphere
II 1D: Group II Category 1 Dust atmosphere
No.: KEMA 03ATEX2435:
EC Type Examination certificate number
EEx d IIC T6: Protection type and temp. class
ENCLOSURE: Enclosure protection code

**WARNING**: Warning to apparatus
YOKOGAWA ◆ TOKYO 180-8750 JAPAN :
Name and address of manufacturer

*1) The third figure from the last shows the last one figure of the year of production. For example, the year of production of the product engraved as follows is year 2003.
No. F261GA091 3 13
↑
Produced in 2003

*2) The identification number of the notified body:
0344 KEMA Netherland

*3) The product-producing country

## 12.2 FM

### (1) Technical Data

Applicable Standard:
FM3600, FM3615, FM3810, ANSI/NEMA 250
Explosion proof for Class I, Division 1, Groups A, B, C & D.
Dust-ignition proof for Class II/III, Division 1, Groups E, F & G.
"SEAL ALL CONDUITS WITHIN 18 INCHES"
"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"

Maximum power supply voltage: 250 Vac/130 Vdc
Excitation Circuit: 140V max
Enclosure: NEMA 4X
Temperature Code: T6
Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

### (2) Installation

**WARNING**

- All wiring shall comply with National Electrical Code ANSI/NFPA 70 and Local Electrical Code.
- In hazardous locations, wiring to be in conduit as shown in Figure 12.2.1.
- When installed in Division 2, "SEALS NOT REQUIRED"

### (3) Operation

**WARNING**

- "OPEN CIRCUIT BEFORE REMOVING COVERS."
- "SEAL ALL CONDUITS WITHIN 18 INCHES" in hazardous locations.
- When installed in Division 2, "SEALS NOT REQUIRED"
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

### (4) Maintenance and Repair

**WARNING**

The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the approval of Factory Mutual Research Corporation.

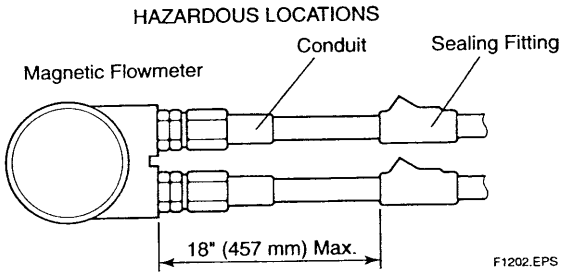



**Figure 12.2.1 Conduit Wiring**

# 12.3 CSA

### (1) Technical Data

Applicable Standard:

For CSA C22.2 Series;

C22.2 No 0, C22.2 No 0.4, C22.2 No 0.5, C22.2 No 25, C22.2 No 30, C22.2 No 94, C22.2 No 1010.1

For CSA E79 Series;

CAN/CSA-E79-0, CAN/CSA-E79-1,

Certificate: 1481213

**For CSA C22.2 Series**

Explosion proof for Class I, Division 1, Groups A, B, C & D.

Dust-ignition proof for Class II/III, Division 1, Groups E, F & G.

"SEAL ALL CONDUITS WITHIN 50 cm OF THE ENCLOSURE"

"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"

Maximum power supply voltage: 250 Vac/130 Vdc

Excitation Circuit: 140V max

Enclosure: Type 4X

Temperature Code: T6

Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

**For CSA E79 Series**

Flame proof for Zone 1, Ex d IIC T6

Maximum power supply voltage: 250 Vac/130 Vdc

Excitation Circuit: 140V max

Enclosure: IP66, IP67

Temperature Code: T6

Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

### (2) Installation

**For CSA C22.2 Series**

**WARNING**

- All wiring shall comply with Canadian Electrical Code Part I and Local Electrical Codes.
- In hazardous location, wiring shall be in conduit as shown in Figure 12.3.1.

**WARNING** : SEAL ALL CONDUITS WITHIN 50cm OF THE ENCLOSURE'.
UN SCELLEMENT DOIT ÉTRE INSTALLÉ À MOINS DE 50cm DU BOÎTIER.

- When installed in Division 2, "SEALS NOT REQUIRED"

**For CSA E79 Series**

**WARNING**

- All wiring shall comply with local installation requirements and local electrical code.
- In hazadous locations, the cable entry devices shall be of a certified flame proof type, suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with suitable flame proof certified blanking elements. (The plug attached is flame proof certified.)

### (3) Operation

**For CSA C22.2 Series**

**⚠ WARNING**

**WARNING :** OPEN CIRCUIT BEFORE REMOVING COVER.
OUVRIR LE CIRCUIT AVANT D'ENLEVER LE COUVERCLE.

- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous location.

**For CSA E79 Series**

**⚠ WARNING**

**WARNING :** AFTER DE-ENERGIZING, DELAY 20 MINUTES BEFORE OPENING.
APRÉS POWER-OFF, ATTENDRE 20 MINUTES AVANT D'OUVRIR.

- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

### (4) Maintenance and Repair

**⚠ WARNING**

The instrument modification or parts replacement by other than authorized representative of YOKOGAWA Electric Corporation or YOKOGAWA Corporation of AMERICA is prohibited and will void Canadian Standards Explosionproof Certification.

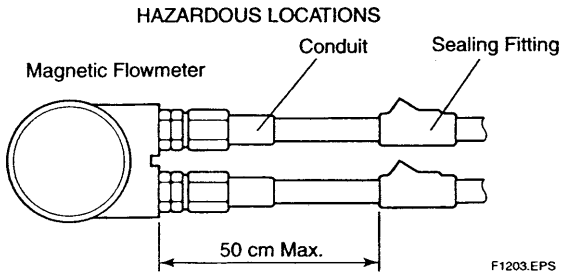



**Figure 12.3.1 Conduit Wiring**

## 12.4 TIIS

**⚠ CAUTION**

The model AXFA14C magnetic flowmeter remote converter with optional code JF3, which has obtained certification according to technical criteria for explosion-protected construction of electric machinery and equipment (Standards Notification No. 556 from the Japanese Ministry of Labor) conforming to IEC standards, is designed for hazardous areas where inflammable gases or vapors may be present. (This allows installation in Division 1 and 2 areas)
To preserve the safety of flameproof equipment requires great care during mounting, wiring, and piping. Safety requirements also place restrictions on maintenance and repair activities. Users absolutely must read "INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAME PROOF EQUIPMENT" at the end of this manual.

### (1) Technical Data

- Certificate: C16678
- Construction: Ex d IIC T6
  : Explosion proof
- Ignition and Explosion Class of gas or vapour: IIC T6
- Ambient Temperature: –20 to 60°C (power supply code 1)
  : –20 to 50°C (power supply code 2)
- Maximum power supply voltage: 250V AC/130V DC
- Grounding: JIS Class C(grouding resistance 10Ω or less) or JIS Class A(grounding resistance 10Ω or less)

**⚠ WARNING**

In case that ambient temperature exceeds 50°C, use heat-resistant cables with maximum allowable temperature of 70°C or above.

**⚠ WARNING**

* In case of TIIS Flame proof type, a remote flowtube is available for combined use with the AXFA14 only.

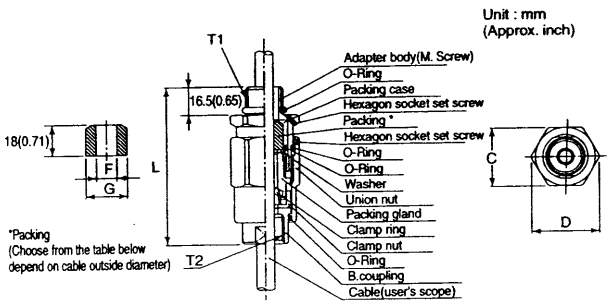
### (2) Wiring Installation

For the external wiring of flame proof types, use a flame proof packing adapter approved by Yokogawa (refer to Figure 12.4.2) or cable wiring using a flame proof metal conduit (refer to Figure 12.4.4 and "INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAME PROOF EQUIPMENT" at the end of this manual).

### (2-1) Wiring Cable through Flame proof Packing Adapter

**WARNING**

For the TIIS flame proof type with wiring using a flame proof packing adapter, wire cables through the packing adapters approved by Yokogawa (optional code G14 or G13).

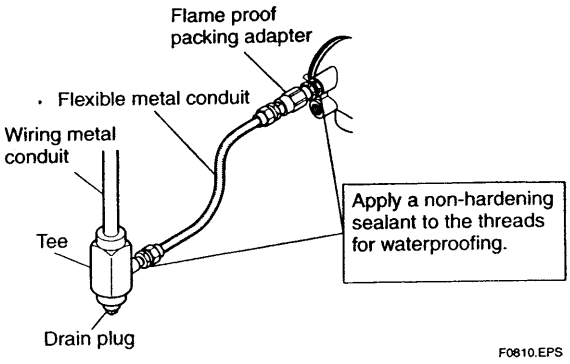



| Dimension | | | | | Cable outer diameter | Packing diameter | | Identification mark | Weight kg (lb) |
|---|---|---|---|---|---|---|---|---|---|
| T1 | T2 | C | D | L | | F | G | | |
| G 1/2 | G 1/2 | 35 (1.38) | 39 (1.54) | 94.5 (3.72) | ϕ8.0 to ϕ10.0 (0.31 to 0.39) | ϕ10.0(0.39) | ϕ20.0 (0.79) | 16 8-10 | 0.26 (0.57) |
| | | | | | ϕ10.0 to ϕ12.0 (0.39 to 0.47) | ϕ12.0(0.47) | | 16 10-12 | |

F0809.EPS

**Figure 12.4.1 Flame proof Packing Adapter**

- Apply a nonhardening sealant to the terminal box connection port and to the threads on the flame proof packing adapter for waterproofing.
- The same wiring as described below is required for all of the terminal box connection ports except when a four-wire cable is used for power input and signal output with DC power supply.




F0810.EPS

**Figure 12.4.2 Typical Wiring Using Flexible Metal Conduit**

Follow the procedure for flame proof packing adapter setting. (refer to Figure 12.4.3)

**CAUTION**

Before fighting, confirm cable length from terminal to flame proof packing adapter when setting. Once it is tightened, loosening and re-tightening may damage its sealing performance.

(a) Loosen the locking screw and remove the terminal box cover.
(b) Measure the cable outer diameter in two directions to within 0.1 mm.
(c) Calculate the average of the two diameters, and use packing with an internal diameter nearest to this value (see Table 12.4.1).
(d) Screw the flame proof packing adapter into the terminal box until the O-ring touches the wiring port (at least 6 full turns), and firmly tighten the lock nut.
(e) Insert the cable through the union cover, the union coupling, the clamp nut, the clamp ring, the gland, the washer, the rubber packing, and the packing box, in that order.
(f) Insert the end of the cable into the terminal box.
(g) Tighten the union cover to grip the cable. When tightening the union cover, tighten approximately one turn past the point where the cable will no longer move up and down.
Proper tightening is important. If it is too tight, a circuit break in the cable may occur; if not tight enough, the flame proof effectiveness will be compromised.
(h) Fasten the cable by tightening the clamp nut.
(i) Tighten the lock nut on the union cover.
(j) Connect the cable wires to each terminal.

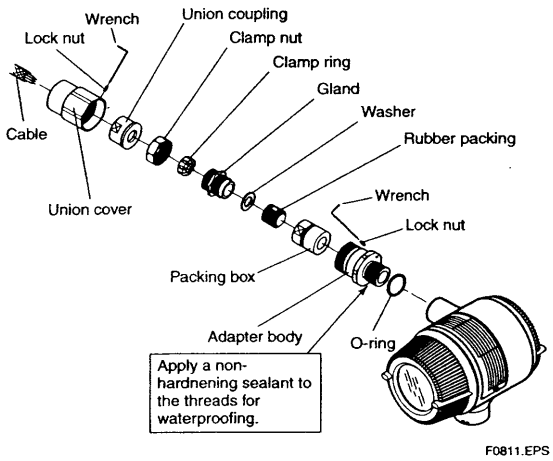



**Figure 12.4.3 Installing Flame proof Packing Adapter**

## (2-2) Cable Wiring Using Flame proof Metal Conduit

- A seal fitting must be installed near the terminal box connection port for a sealed construction.
- Apply a non-hardening sealant to the threads of the terminal box connection port, flexible metal conduit and seal fitting for waterproofing.
- The same wiring as described below is required for all of the terminal box connection ports except when a four-wire cable is used for power input and signal output with DC power supply.

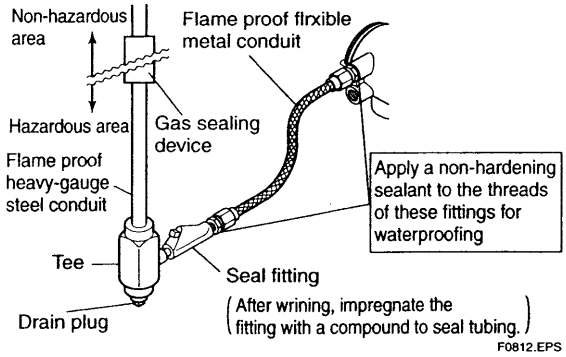



**Figure 12.4.4 Typical Wiring Using Flame proof Metal Conduit**

# General Specifications

GS 01E20D01-01E

AXF
Magnetic Flowmeter
Integral Flowmeter
/Remote Flowtube

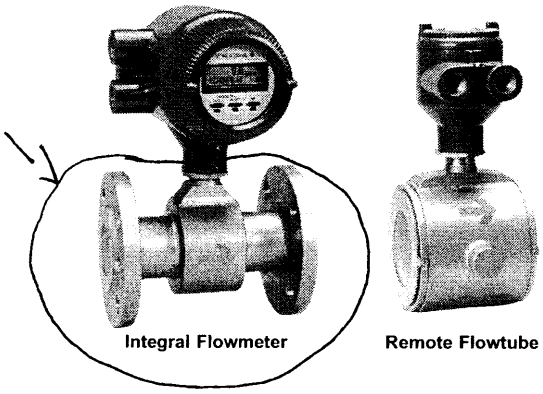
ADMAG AXF™

*The AXF magnetic flowmeter series are sophisticated products with outstanding reliability and ease of operation, developed on the basis of decades of field-proven experience.*

*The combination of a replaceable electrode and the diagnostic to defect adhesion level on the electrodes dramatically improves maintainability.*

*The AXF employs the fluid noise free "Dual Frequency Excitation Method" (for sizes up to 400 mm (16 in.)) and the newly added "Enhanced Dual Frequency Excitation Method" as an option for more difficult applications to ensure greater stability and quicker response.*

Note: The "Dual Frequency Excitation Method" is Yokogawa's unique technology.




## ■ FEATURES

### ● User-oriented Functionality

**Fluid Adhesion Level Diagnosis**

By constantly monitoring the level of insulating substance on the electrodes, it is possible to determine when maintenance is required.
With the utilization of an optional replaceable electrode, the electrodes can be easily removed from the flowmeter and cleaned.

**Flexible Electrical Connection Direction**

The converter or the terminal box can be rotated arbitrarily to change the directions of electrical connection on the site.

**Clear and Versatile Indications**

The LCD indicator employs a large, backlit full dot-matrix, that can facilitate various displays.

One to three lines are available. When there is an alarm condition, a full description of the countermeasure is indicated.

**"Easy Setup" Parameters**

The most frequently used parameters are arranged in a group at the top.
The infra-red switches enable the users to set parameters without opening the cover.

### ● Expansion of Product Lineup

**Improved Accuracy Specification**

The standard accuracy is 0.35% of reading. Also available is an optional high accuracy calibration rated at 0.2% of reading.

**Extra Small Size Flange Type**

The flange type is now available from a 2.5 mm size.

**Various Sanitary Connections**

A variety of sanitary connections are available, such as Tri-Clamp, ISO, DIN and SMS.

### ● Enhanced Performance and Specifications

**Enhanced Dual Frequency Excitation Method**

The "Enhanced Dual Frequency Excitation Method" can be optionally selected.
For difficult applications such as for high concentration slurries or low conductivity fluid, extremely stable measurements can be realized.

**Improved Minimum Conductivity**

The newly designed AXF converter permits the measurement of fluids with conductivity as low as 1μS/cm.

**High-Speed Pulse Output**

The pulse rate now goes up to 10,000 pps (pulse/second) for use with high speed applications such as in short time batch processes.

**Versatile Input/ouput Function Now Available for Integral Flowmeter**

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YOKOGAWA ◆

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19.1.2

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19.1.2

# 4. Installation of Flameproof Apparatus

## (1) Installation Area

Flameproof apparatus may be installed, in accordance with applicable gases, in a hazardous area in Zone 1 or 2, where the specified gases are present. Those apparatus shall not be installed in a hazardous area in Zone 0.

Note: Hazardous areas are classified in zones based upon the frequency of the appearance and the duration of an explosive gas atmosphere as follows:
Zone 0: An area in which an explosive gas atmosphere is present continuously or is present for long periods.
Zone 1: An area in which an explosive gas atmosphere is likely to occur in normal operation.
Zone 2: An area in which an explosive gas atmosphere is not likely to occur in normal operation and if it does occur it will exist for a short period only.

## (2) Environmental Conditions

The standard environmental condition for the installation of flameproof apparatus is limited to an ambient temperature range from –20°C to +40°C (for products certified under Technical Criteria). However, some field-mounted instruments may be certified at an ambient temperature up to +60°C as indicated on the instrument nameplates. If the flameproof apparatus are exposed to direct sunshine or radiant heat from plant facilities, appropriate thermal protection measures shall be taken.

# 5. External Wiring for Flameproof Apparatus

Flameproof apparatus require cable wiring or flameproof metal conduits for their electrical connections. For cable wiring, cable glands (cable entry devices for flameproof type) to wiring connections shall be attached. For metal conduits, attach sealing fittings as close to wiring connections as possible and completely seal the apparatus. All non-live metal parts such as the enclosure shall be securely grounded. For details, see the "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.

## (1) Cable Wiring

- For cable wiring, cable glands (cable entry devices for flameproof type) specified or supplied with the apparatus shall be directly attached to the wiring connections to complete sealing of the apparatus.
- Screws that connect cable glands to the apparatus are those for G-type parallel pipe threads (JIS B 0202) with no sealing property. To protect the apparatus from corrosive gases or moisture, apply nonhardening sealant such as liquid gaskets to those threads for waterproofing.
- Specific cables shall be used as recommended by the "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.
- In necessary, appropriate protective pipes (conduit or flexible pipes), ducts or trays shall be used for preventing the cable run (outside the cable glands) from damage.
- To prevent explosive atmosphere from being propagated form Zone 1 or 2 hazardous location to any different location or non-hazardous location through the protective pipe or duct, apply sealing of the protective pipes in the vicinity of individual boundaries, or fill the ducts with sand appropriately.
- When branch connections of cables, or cable connections with insulated cables inside the conduit pipes are made, a flameproof or increased-safety connection box shall be used. In this case, flameproof or increased-safety cable glands meeting the type of connection box must be used for cable connections to the box.

## (2) Flameproof Metal Conduit Wiring

- For the flameproof metal conduit wiring or insulated wires shall be used as recommended by the USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry, published in 1994.
- For conduit pipes, heavy-gauge steel conduits conforming to JIS C 8305 Standard shall be used.
- Flameproof sealing fittings shall be used in the vicinity of the wiring connections, and those fittings shall be filled with sealing compounds to complete sealing of the apparatus. In addition, to prevent explosive gases, moisture, or flame caused by explosion form being propagated through the conduit, always provide sealing fittings to complete sealing of the conduit in the following locations:
  (a) In the boundaries between the hazardous and non-hazardous locations.
  (b) In the boundaries where there is a different classification of hazardous location.
- For the connections of the apparatus with a conduit pipe or its associated accessories, G-type parallel pipe threads (JIS B 0202) shall be used to provide a minimum of five-thread engagement to complete tightness. In addition, since these parallel threads do not have sealing property, nonhardening sealant such as liquid gaskets shall thus be applied to those threads for ensuring waterproofness.
- If metal conduits need flexibility, use flameproof flexible fittings.

# 6. Maintenance of Flameproof Apparatus

To maintain the flameproof apparatus, do the following. (For details, see Chapter 10 "MAINTENANCE OF EXPLOSION-PROTECTED ELECTRICAL INSTALLATION" in the USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry.)

### (1) Maintenance servicing with the power on.

Flameproof apparatus shall not be maintenance-serviced with its power turned on. However, in cases where maintenance servicing is to be conducted with the power turned on, with the equipment cover removed, always use a gas detector to check that there is no explosive gas in that location. If it cannot be checked whether an explosive gas is present or not, maintenance servicing shall be limited to the following two items:

(a) Visual inspection
Visually inspect the flameproof apparatus, metal conduits, and cables for damage or corrosion, and other mechanical and structural defects.

(b) Zero and span adjustments
These adjustments should be made only to the extent that they can be conducted from the outside without opening the equipment cover. In doing this, great care must be taken not to cause mechanical sparks with tools.

### (2) Repair

If the flameproof apparatus requires repair, turn off the power and transport it to a safety (non-hazardous) location. Observe the following points before attempting to repair the apparatus.

(a) Make only such electrical and mechanical repairs as will restore the apparatus to its original condition. For the flameproof apparatus, the gaps and path lengths of joints and mating surfaces, and mechanical strength of enclosures are critical factors in explosion protection. Exercise great care not to damage the joints or shock the enclosure.

(b) If any damage occurs in threads, joints or mating surfaces, inspection windows, connections between the transmitter and terminal box, shrouds or clamps, or external wiring connections which are essential in flameproofness, contact Yokogawa Electric Corporation.

**⚠ CAUTION**

Do not attempt to re-process threaded connections or refinish joints or mating surfaces.

(c) Unless otherwise specified, the electrical circuitry and internal mechanisms may be repaired by component replacement, as this will not directly affect the requirements for flameproof apparatus (however, bear in mind that the apparatus must always be restored to its original condition). If you attempt to repair the flameproof apparatus, company-specified components shall be used.

(d) Before starting to service the apparatus, be sure to check all parts necessary for retaining the requirements for flameproof apparatus. For this, check that all screws, bolts, nuts, and threaded connections have properly been tightened.

### (3) Prohibition of specification changes and modifications

Do not attempt to change specifications or make modifications involving addition of or changes in external wiring connections.

# 7. Selection of Cable Entry Devices for Flameproof Type

**⚠ CAUTION**

The cable glands (cable entry devices for flameproof type) conforming to IEC Standards are certified in combination with the flameproof apparatus. So, Yokogawa-specified cable entry devices for flameproof type shall be used to meet this demand.

### References:

(1) Type Certificate Guide for Explosion-Protected Construction Electrical Machinery and Equipment (relating to Technical Standards Conforming to International Standards), issued by the Technical Institution of Industrial Safety, Japan

(2) USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry (1994), issued by the Japanese Ministry of Labour, the Research Institute of Industrial Safet

# 1. INTRODUCTION

This instrument has been adjusted at the factory before shipment.

To ensure correct use of the instrument, please read this manual thoroughly and fully understand how to operate the instrument before operating it.

**NOTE**

This manual describes the hardware configuration of integral flowmeter and remote flowtube of the AXF magnetic flowmeters.

For details of the "basic operating procedures", "parameter description", "operation via BRAIN terminal (BT200)", "operation via HART communicator", and "actual operation" for the AXF integral flowmeter, see the user's manual of the AXF Integral Flowmeter [Software Edition] (IM 01E20C02-01E).

## ■ Regarding This User's Manual

- This manual should be provided to the end user.
- Before use, read this manual thoroughly to comprehend its contents.
- The contents of this manual may be changed without prior notice.
- All rights are reserved. No part of this manual may be reproduced in any form without Yokogawa's written permission.
- Yokogawa makes no warranty of any kind with regard to this material, including, but not limited to, implied warranties of merchantability and suitability for a particular purpose.
- All reasonable effort has been made to ensure the accuracy of the contents of this manual. However, if any errors or omissions are found, please inform Yokogawa.
- Yokogawa assumes no responsibilities for this product except as stated in the warranty.
- Please note that this user's manual may not be revised for any specification changes, construction changes or operating part changes that are not considered to affect function or performance.
- If the customer or any third party is harmed by the use of this product, Yokogawa assumes no responsibility for any such harm owing to any defects in the product which were not predictable, or for any indirect damages.

**NOTE**

For details of the AXFA11G magnetic flowmeter converter, see the IM01E20C01-01E instruction manual. For details on the AXFA14G/C magnetic flowmeter converter, see the IM01E20C02-01E instruction manual.

## ■ Safety and Modification Precautions

- The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Yokogawa assumes no liability for the customer's failure to comply with these requirements. If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.
- Yokogawa will not be liable for malfunctions or damage resulting from any modification made to this instrument by the customer.
- The following safety symbol marks are used in this user's manual and instrument.

**WARNING**

A WARNING sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death of personnel.

**CAUTION**

A CAUTION sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

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# 1.4 ATEX Documentation

This procedure is only applicable to the countries in European Union.

GB

All instruction manuals for ATEX Ex related products are available in English, German and French. Should you require Ex related instructions in your local language, you are to contact your nearest Yokogawa office or representative.

DK

Alle brugervejledninger for produkter relateret til ATEX Ex er tilgængelige på engelsk, tysk og fransk. Skulle De ønske yderligere oplysninger om håndtering af Ex produkter på eget sprog, kan De rette henvendelse herom til den nærmeste Yokogawa afdeling eller forhandler.

I

Tutti i manuali operativi di prodotti ATEX contrassegnati con Ex sono disponibili in inglese, tedesco e francese. Se si desidera ricevere i manuali operativi di prodotti Ex in lingua locale, mettersi in contatto con l'ufficio Yokogawa più vicino o con un rappresentante.

E

Todos los manuales de instrucciones para los productos antiexplosivos de ATEX están disponibles en inglés, alemán y francés. Si desea solicitar las instrucciones de estos artículos antiexplosivos en su idioma local, deberá ponerse en contacto con la oficina o el representante de Yokogawa más cercano.

NL

Alle handleidingen voor producten die te maken hebben met ATEX explosiebeveiliging (Ex) zijn verkrijgbaar in het Engels, Duits en Frans. Neem, indien u aanwijzingen op het gebied van explosiebeveiliging nodig hebt in uw eigen taal, contact op met de dichtstbijzijnde vestiging van Yokogawa of met een vertegenwoordiger.

SF

Kaikkien ATEX Ex -tyyppisten tuotteiden käyttöhjeet ovat saatavilla englannin-, saksan- ja ranskankielisinä. Mikäli tarvitsette Ex -tyyppisten tuotteiden ohjeita omalla paikallisella kielellännne, ottakaa yhteyttä lähimpään Yokogawa-toimistoon tai -edustajaan.

P

Todos os manuais de instruções referentes aos produtos Ex da ATEX estão disponíveis em Inglês, Alemão e Francês. Se necessitar de instruções na sua língua relacionadas com produtos Ex, deverá entrar em contacto com a delegação mais próxima ou com um representante da Yokogawa.

F

Tous les manuels d'instruction des produits ATEX Ex sont disponibles en langue anglaise, allemande et française. Si vous nécessitez des instructions relatives aux produits Ex dans votre langue, veuillez bien contacter votre représentant Yokogawa le plus proche.

D

Alle Betriebsanleitungen für ATEX Ex bezogene Produkte stehen in den Sprachen Englisch, Deutsch und Französisch zur Verfügung. Sollten Sie die Betriebsanleitungen für Ex-Produkte in Ihrer Landessprache benötigen, setzen Sie sich bitte mit Ihrem örtlichen Yokogawa-Vertreter in Verbindung.

S

Alla instruktionsböcker för ATEX Ex (explosionssäkra) produkter är tillgängliga på engelska, tyska och franska. Om Ni behöver instruktioner för dessa explosionssäkra produkter på annat språk, skall Ni kontakta närmaste Yokogawakontor eller representant.

GR

Όλα τα εγχειρίδια λειτουργίας των προϊόντων με ATEX Ex διατίθενται στα Αγγλικά, Γερμανικά και Γαλλικά. Σε περίπτωση που χρειάζεστε οδηγίες σχετικά με Ex στην τοπική γλώσσα παρακαλούμε επικοινωνήστε με το πλησιέστερο γραφείο της Yokogawa ή αντιπρόσωπο της.

# 2. HANDLING PRECAUTIONS

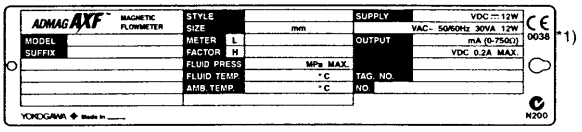
This instrument has been inspected carefully at the factory before shipment. When the instrument is delivered, visually check that no damage has occurred during transportation.

Read this section carefully as it contains important information on handling this instrument. Refer to the relevant sections for information not contained in this section. If you have any problems or questions, please contact Yokogawa sales office.

## 2.1 Checking Model and Specifications

The model code and specifications are found on the data plate located on the outside of the case. Check that the model code and specifications match what you have ordered.

Be sure you have your model number and serial number available when contacting Yokogawa.



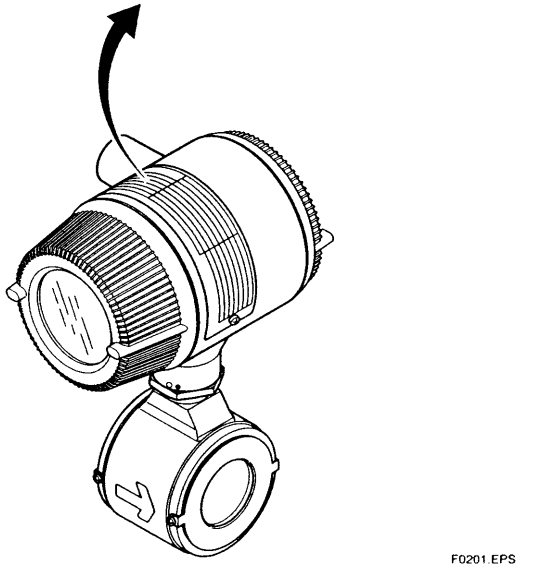
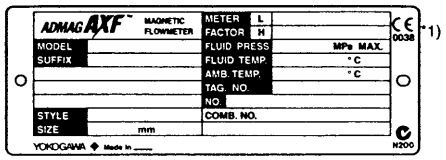




**Figure 2.1.1 Data Plate (Integral Flowmeter Type)**

*1) In case of the sizes of 2.5 to 25mm (0.1 to 1.0 in.) , "0038" is not described.



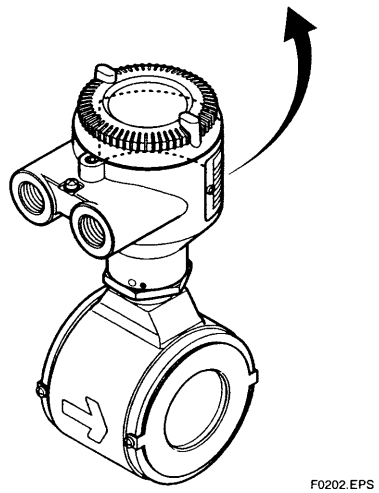




**Figure 2.1.2 Data Plate (Remote Flowtube Type)**

*1) In case of the sizes of 2.5 to 25mm (0.1 to 1.0 in.) , "0038" is not described.
In case of the sizes of 500 to 2600mm (20 to 104 in.), CE marking and "0038" are not described.

## 2.2 Accessories

Check that the parts shown below are included in the package:

- Remote Flowtube(size 2.5 to 1000 mm(0.1 to 40 in.)):
  Centering device (wafer type only): 1 pc.
  Hexagonal wrenche: 2 pcs. (one each of 1.5 mm and 3 mm nominal sizes)
- Integral Flowmeter:
  Centering device (wafer type only): 1 pc.
  Spare fuse (T2.0A, 250 V, T: Time lag fuse)
  : 1 pc. (Use this spare fuse for this product only)
  Hexagonal wrenche: 2 pcs. (one each of 1.5 mm and 3 mm nominal sizes)

## 2.3 Storage Precautions

If the instrument is to be stored for a long period of time after delivery, observe the following points.

- The instrument should be stored in its original packing condition in the storage location.
- Select a storage location that fulfils the following conditions:
  - A place where it will not be exposed to rain or water
  - A place subject to minimal vibrations or shocks
  - Temperature and humidity levels should be as follows:
    Temperature: -30 to 70°C
    Humidity: 5 to 80% RH (no condensation)
    The preferred ambient temperature and humidity levels are 25°C and approximately 65% RH.
- If the AXF magnetic flowmeter is transferred to the installation site and stored without being installed, its performance may be impaired due to the infiltration of rainwater and so forth. Be sure to install and wire the AXF magnetic flowmeter as soon as possible after transferring it to the installation location.

## 2.4 Installation Location Precautions

Select the installation location with consideration to the following items to ensure long-term stable operation of the instrument.

■ **Ambient Temperature:**
Avoid installing the instrument in locations with constantly fluctuating temperatures. If the location is subject to radiant heat from the plant, provide heat insulation or improve ventilation.

■ **Atmospheric Condition:**
Avoid installing the instrument in a corrosive atmosphere. In situations where this is unavoidable, consider ways to improve ventilation and to prevent rainwater from entering and being retained in the conduit pipes.

■ **Vibrations or Shocks:**
Avoid installing the instrument in a place subject to shocks or vibrations.

■ **Explosion protected type:**
Explosion protect types can be installed in hazardous areas according to the types of gases for which they are certified. See the description in Chapter 8 "EXPLOSION PROTECTED TYPE INSTRUMENT" and "INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAME PROOF EQUIPMENT" in this user's manual.

# 3. INSTALLATION

## 3.1 Piping Design Precautions

**WARNING**

Installation of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to installation.

**IMPORTANT**

Design piping correctly, referring to the following to prevent damage to flowtubes and to assure accurate measuring.

**NOTE**

This chapter describes the remote flowtube as an example. The same attention must be paid to the integral flowmeter.

### (1) Location

**IMPORTANT**

Install the flowmeter in a location where it is not exposed to direct sunlight. The minimum ambient temperature is limited by the minimum fluid temperature of the flowtube (the lining). For more information, refer to Chapter 6 "OUTLINE". The flowmeter may be used in an ambient humidity where the relative humidity ranges from 0 to 100%. However, avoid long-term continuous operation at relative humidity above 95%.

### (2) Noise Avoidance

**IMPORTANT**

The flowmeter should be installed away from electrical motors, transformers, and other power sources in order to avoid interference with measurement.

### (3) Required Lengths of Straight Runs

To maintain accurate measurement, see JIS B7554 "Electro Magnetic Flowmeters" which explains the requirements for upstream piping conditions of magnetic flowmeters.

The piping conditions we recommend to our customers as shown in Figure 3.1.1 are based on JIS B7554 and on our piping condition test data.

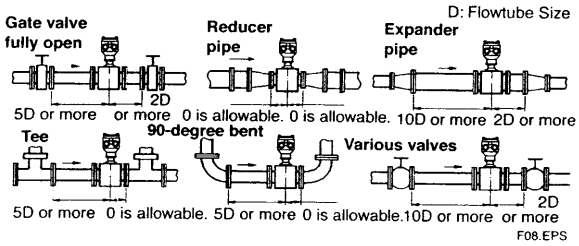



**Figure 3.1.1 Required Lengths of Straight Runs**

*1: Do not install anything in the vicinity that may interfere with the magnetic field, induced signal voltages, or flow velocity distributions of the flowmeter.

*2: A straight run may not be required on the downstream side of the flowmeter. However, if a downstream valve or other fitting causes irregularity or deviation in flows, provide a straight run of 2D to 3D on the downstream side.

*3: Highly recommend to mount valves on the downstream side so that deviated flows do not occur in the flowtube and to avoid startup from an empty condition.

### (4) Maintaining Stable Fluid Conductivity

**IMPORTANT**

Do not install the flowmeter where fluid conductivity tends to become uneven. If chemicals are fed near the upstream side of a magnetic flowmeter, they may affect the flow rate's indications. To avoid this situation, it is recommended that the chemical feed ports be located on the downstream side of the flowmeter. If it is unavoidable that chemicals must be fed on the upstream side, provide a sufficient length of straight run (approximately 50D) to ensure the proper mixture of fluids.



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19.1.2

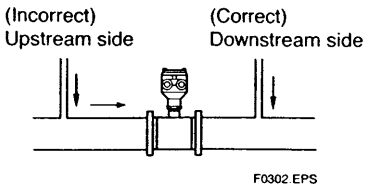


**Figure 3.1.2 Chemical Injection**

### (5) Precautions for Use of Liquid Sealing Compounds

**IMPORTANT**

Care must be taken in using liquid sealing compounds on the piping, as it may have a negative influence on the flow indications by flowing out and covering the surfaces of an electrode or grounding ring. In particular, care must be taken if a liquid sealing compound is used in the case of vertical piping.

### (6) Service Area

Select locations where there is adequate space to service installing, wiring, overhauling, etc.

### (7) Bypass Line

It is recommended to install a bypass line to facilitate maintenance and zero adjustment.

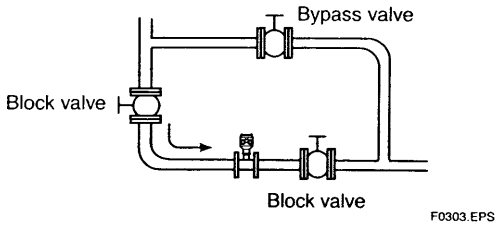


**Figure 3.1.3 Bypass Line**

### (8) Supporting the Flowmeter

**CAUTION**

Do not secure the flowmeter separately to prevent the vibrations, shocks, and expansion and contraction forces of the piping from affecting it. Fix the pipes first, then support the flowmeter with the pipes. With extra small-sized flowmeters (2.5-10 mm), in particular, fix the flowmeter in parallel with the piping on a mounting base.

### (9) Mounting Positions

**• Pipes must be fully filled with liquids.**

**IMPORTANT**

It is essential that pipes remain fully filled at all times, otherwise flow rate indications may be affected and measurement errors may be caused.

Piping shall be designed so as to maintain the interior of the flowtube filled with fluids.

Vertical mounting is effective in such cases as when fluids tend to separate or solid matter may be precipitated. When employing vertical mounting, direct the fluids from the bottom to the top to ensure that the pipes remain fully filled.

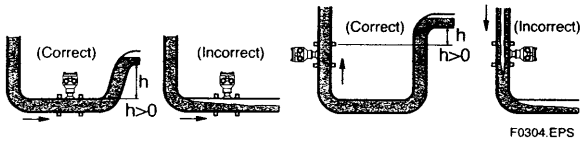


**Figure 3.1.4 Mounting Positions**

**• Avoid air bubbles.**

**IMPORTANT**

If air bubbles enter a measurement pipe, flow rate indications may be affected and measurement errors may be caused.

In cases where fluids contain air bubbles, piping must be designed to prevent them from accumulating in the measurement pipe of a flowtube.

If a valve exists near the flowmeter, try to mount the flowmeter on the valve's upstream side in order to prevent a possible reduction of pressure inside the pipe, thereby avoiding the possibility of air bubbles.

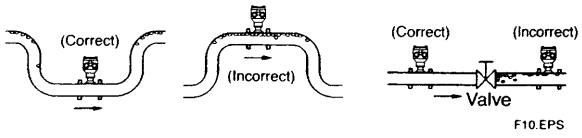


**Figure 3.1.5 Avoiding Air Bubbles**

· **Mounting orientation**

**IMPORTANT**

If electrodes are perpendicular to the ground, air bubbles near the top or precipitates at the bottom may cause measurement errors. Ensure that the terminal box of a remote flowtube and converter of an integral flowmeter are mounted above the piping to prevent water from entering them.

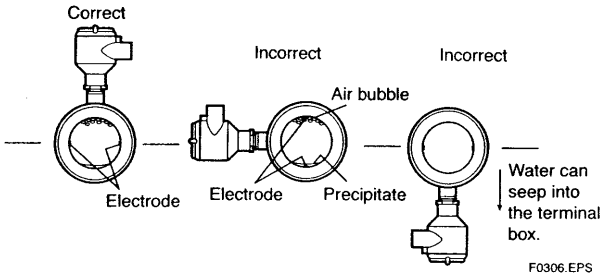


**Figure 3.1.6 Mounting Orientation**

# 3.2 Handling Precautions

**WARNING**

The magnetic flowmeter is a heavy instrument. Be careful that no damage is caused to personnel through accidentally dropping it, or by exerting excessive force on the magnetic flowmeter. When moving the magnetic flowmeter, always use a trolley and have at least two people carry it.

**NOTE**

This chapter describes the remote flowtube as an example. The same attention must be paid to the integral flowmeter.

## 3.2.1 General Precautions

### (1) Precaution during Transportation

The magnetic flowmeter is packed tightly. When it is unpacked, pay attention to prevent damaging the flowmeter. To prevent accidents while it is being transported to the installing location, transport it to the site in its original packing.

**CAUTION**

· In order to lift a magnetic flowmeter that is fitted with eyebolts, proceed as in Figure 3.2.1. Never lift it using a bar passed through the flowtube as this damages the liner severely.

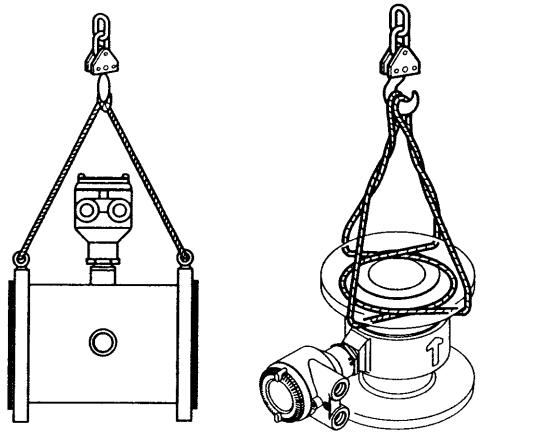


**Figure 3.2.1 Lifting Flowmeter**

### (2) Avoiding Shocks from Impact

**CAUTION**

Care should be taken not to drop the flowmeter or expose it to excessive shock. In particular, be careful not to subject the flange surface to shock. This may lead to liner damage which will result in inaccurate readings.

### (3) Flange Protection Covers

**IMPORTANT**

Keep the protective covering (i.e. the corrugated cardboard or other cushioning material) in place over the flange except when mounting the flowmeter to the pipe.



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19.1.2

### (4) Terminal Box Cover

**IMPORTANT**

As it is possible that the insulation will deteriorate, do not open the terminal box cover until it is time to wire it.

### (5) Long-term Non-use

**IMPORTANT**

It is not desirable to leave the flowmeter unused for a long term after installation. If this situation is unavoidable, take care of the flowmeter by observing the following.

**• Confirmation of sealing conditions for the flowmeter**

Confirm that the terminal box screw and wiring ports are well sealed. Equip the conduit piping with drain plugs or waterproof glands to prevent moisture or water from penetrating into the flowmeter through the conduit.

**• Regular inspections**

Inspect the sealing conditions as mentioned above, and the inside of the terminal box at least once a year. Also, due to rain, etc. when it is suspected that water may have penetrated into the inside flowmeter perform supplementary inspections.

## 3.2.2 Flowmeter Piping

**CAUTION**

Misaligned or slanted piping can lead to leakage and damage to the flanges.

(1) Correct any misaligned or slanted piping, and any gaps that may exist between mounting flanges before installing the flowmeter (refer to Figure 3.2.2).

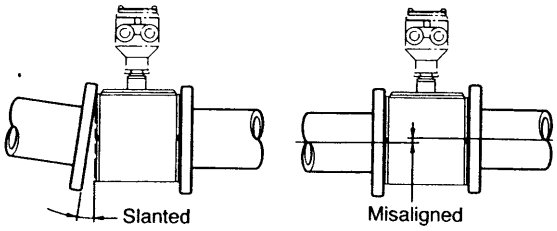



**Figure 3.2.2 Slanted and Misaligned Flowmeter Piping**

(2) Inside a newly installed pipeline, there may be some foreign substances such as residue from welding or wood chips. Remove them by flushing the piping before mounting the flowmeter. This prevents the lining from being damaged, as well as the occurrence of erroneous measured signals resulting from foreign substances passing through the flowtube during measurement.

# 3.3 Mounting Procedures

**NOTE**

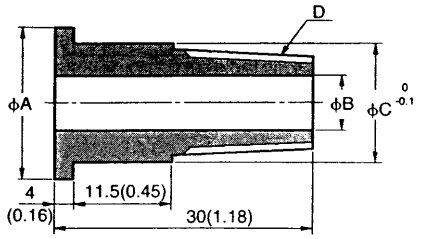
- The tightening torque value to which gaskets must be tightened varies depending on the type and external dimensions of the lining and the gasket. In this section, the tables indicating tightening torque values include the corresponding gasket types. The internal diameters of the gaskets are close to those of the grounding rings.
- For fluids capable of potentially permeating PFA linings (such as nitric acid, hydrofluoric acid, or sodium hydrate at high temperatures), different tightening torque values must be applied. The tables of these torque values is indicated in this section.
- For replacement models for the earlier ADMAG or ADMAG AE, the tightening torque values in the tables can be applied if their process connections, the lining types, and the nominal sizes are the same.

## 3.3.1 Nominal Diameter 2.5 mm (0.1 in.) to 10 mm (0.4 in.), Union Joint Type

Ceramics linings with diameters of 2.5 (0.1), 5 (0.2), or 10 mm (0.4 in.) are connected using union joints. Weld or screw the connecting fittings in Table 3.3.1 onto the piping. The external dimensions of the fittings are shown in the table.

**Table 3.3.1 Fitting Dimensions**

**Union joint (process connection codes: GUR and GUN)**




| Size mm(inch) | Code | A | B | C | D |
|---|---|---|---|---|---|
| 2.5 (0.1) | GUR | 22 (0.87) | 8 (0.31) | 18.5 (0.73) | R1/4(PT1/4) |
| | GUN | 22 (0.87) | 8 (0.31) | 18.5 (0.73) | NPT1/4 |
| 5 (0.2) | GUR | 22 (0.87) | 8 (0.31) | 18.5 (0.73) | R1/4(PT1/4) |
| | GUN | 22 (0.87) | 8 (0.31) | 18.5 (0.73) | NPT1/4 |
| 10 (0.4) | GUR | 25 (0.98) | 10 (0.39) | 22.5 (0.89) | R3/8(PT3/8) |
| | GUN | 25 (0.98) | 10 (0.39) | 22.5 (0.89) | NPT3/8 |

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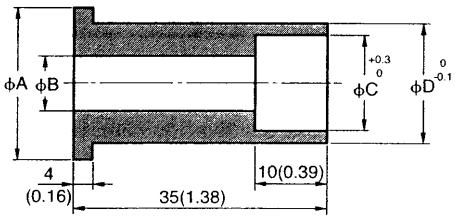
**Welded joint (process connection code: GUW)**




| Size mm(inch) | Code | A | B | C | D |
|---|---|---|---|---|---|
| 2.5 (0.1) | GUW | 22(0.87) | 8(0.31) | 14.3(0.56) | 18.5(0.73) |
| 5 (0.2) | GUW | 22(0.87) | 8(0.31) | 14.3(0.56) | 18.5(0.73) |
| 10 (0.4) | GUW | 25(0.98) | 10(0.39) | 17.8(0.70) | 22.5(0.89) |

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### (1) Mounting Direction

Mount the flowmeter so that the flow direction of the fluid to be measured is in line with the direction of the arrow mark on the flowmeter.

**IMPORTANT**

If it is impossible to match the direction of the arrow mark, the direction of the electrical connection can be changed. Refer to Section 5.1 to do this properly.
In case the fluid being measured flows against the arrow direction, refer to the parameter **J20: Flow Direction** in the user's manual of the AXFA11 Magnetic Flowmeter Remote Converter (IM 01E20C01-01E) or the AXFA14 Magnetic Flowmeter Remote Converter/AXF Integral Flowmeter [Software Edition] (IM 01E20C02-01E).

### (2) Connecting Process Piping

Weld or screw the connection fittings to the process piping.

**IMPORTANT**

- Be sure to pass the connection fittings through the union joint nuts in advance.
- When welding the fittings, pay attention to the edge preparation, level differences between the fittings and the piping, and the welding current to avoid deforming the piping or causing stagnation portion of the fluid.

### (3) Positioning the Flowmeter

Install the flowmeter on a mounting base and position it so that the center axis of the flowtube is aligned with that of the process piping. Then screw the union joint nuts to the connecting ports of the flowmeter.

**CAUTION**

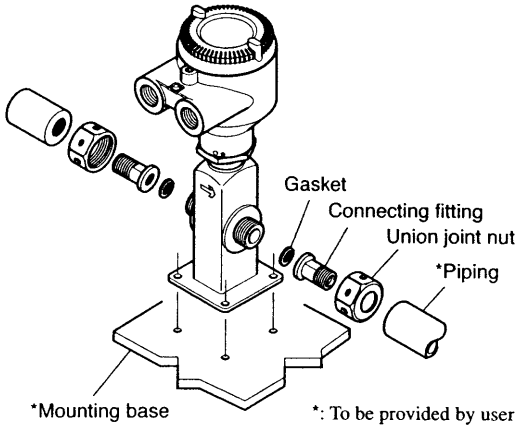
Ceramics pipes may be damaged if the nuts are tightened when the center axes are not properly aligned.

### (4) Tightening Nuts

Use a torque wrench to tighten the union joint nuts.

**CAUTION**

Tighten the union joint nuts according to the tightening torque values in Table 3.3.2. For permeable fluid (such as nitric acid, hydrofluoric acid or sodium hydrate at high temperature), tighten the nuts according to the torque values in Table 3.3.3.
As the gasket material is fluorocarbon PTFE, it is possible that the nuts may loosen as time passes. Retighten the nuts if this is the case. Be sure to use the gasket (thickness is 1.5 mm) which comes with the flowmeter.

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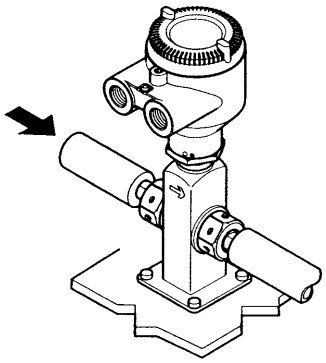
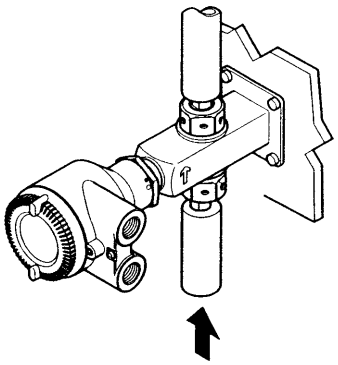


Horizontal mounting

F0309b.EPS



Vertical mounting

F0309c.EPS

**Figure 3.3.1 Mounting Procedure for Union Joint Type**

**Table 3.3.2 Tightening torque values for Union Joint Type**

Apply these tightening torque values when the gaskets are Valqua #7020 (standard) or alkali-resistant gaskets for the metal piping (optional code GF).

| Size mm (inch) | Torque (N-m / {kgf-cm} / [in-lbf]) |
|---|---|
| 2.5 (0.1) | 9 to 12 / {91.77 to 122.4} / [79.66 to 106.2] |
| 5 (0.2) | 9 to 12 / {91.77 to 122.4} / [79.66 to 106.2] |
| 10 (0.4) | 14 to 18 / {142.8 to 183.5} / [123.9 to 159.3] |

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**Table 3.3.3 Tightening torque values for Union Joint Type and Permeable Fluids**

| Size mm (inch) | Torque (N-m / {kgf-cm} / [in-lbf]) |
|---|---|
| 2.5 (0.1) | 11 to 15 / {112.2 to 153} / [97.36 to 132.8] |
| 5 (0.2) | 11 to 15 / {112.2 to 153} / [97.36 to 132.8] |
| 10 (0.4) | 17 to 23 / {173.4 to 234.5} / [150.5 to 203.6] |

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## 3.3.2 Nominal Diameter 2.5 mm (0.1 in.) to 40 mm (1.5 in.), Wafer Type

**IMPORTANT**

Use bolts and nuts in compliance with the flange ratings. When stud-type through-bolts are used, be sure the outside diameter of the shank is smaller than that of the thread ridge. Be sure to choose a gasket with an inner diameter that does not protrude inside the piping (refer to Table 3.3.13). If the inner diameter of the gasket is too large, however, fluid leakage may result.

### (1) Mounting Direction

Mount the flowmeter so that the flow direction of the fluid to be measured is in line with the direction of the arrow mark on the flowmeter.

**IMPORTANT**

If it is impossible to match the direction of the arrow mark, the direction of the electrical connection can be changed. Refer to Section 5.1 to do this properly.
In case the fluid being measured flows against the arrow direction, refer to the parameter **J20: Flow Direction** in the user's manual of the AXFA11 Magnetic Flowmeter Remote Converter (IM 01E20C01-01E) or the AXFA14 Magnetic Flowmeter Remote Converter/AXF Integral Flowmeter [Software Edition] (IM 01E20C02-01E).

### (2) Mounting Centering Devices

To maintain concentricity of the flowmeter with the pipes, install centering devices on the Mini-flanges of the flowmeter. Use the appropriate centering devices according to the nominal diameter and the flange ratings.

### (3) Positioning the Flowmeter

Pass two through-bolts through the adjacent holes of both flanges and position the flowmeter so that the Mini-flanges and the centering devices come in close contact with each other. Pass the other through-bolts through the other holes (refer to Figures 3.3.2 and 3.3.3). In case stud-type through-bolts are used, position them in such a way that the centering devices come in contact with the bolt threads.

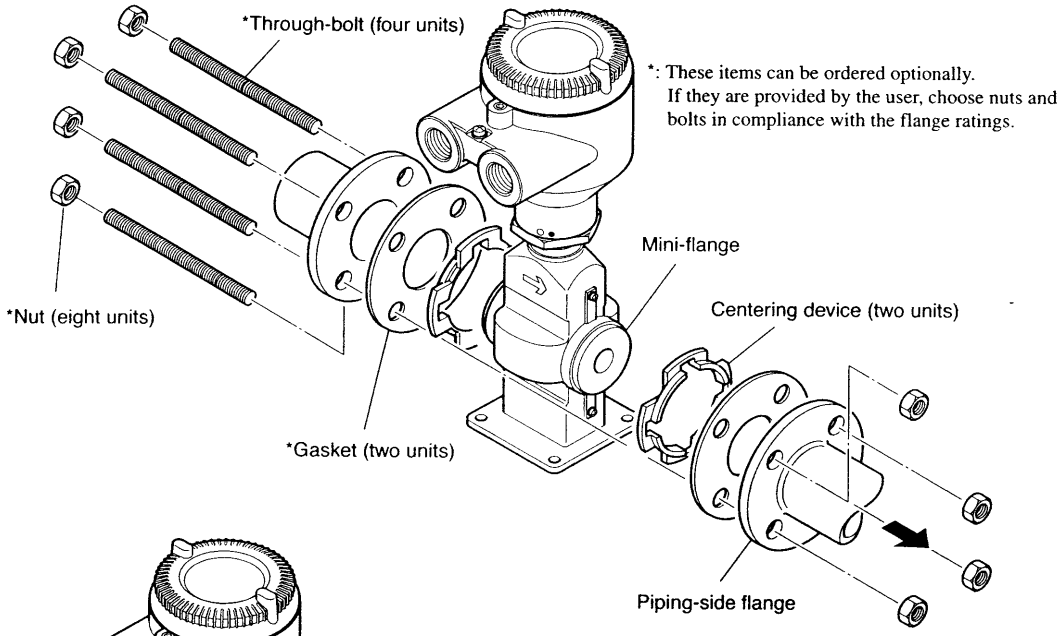
### (4) Tightening Nuts

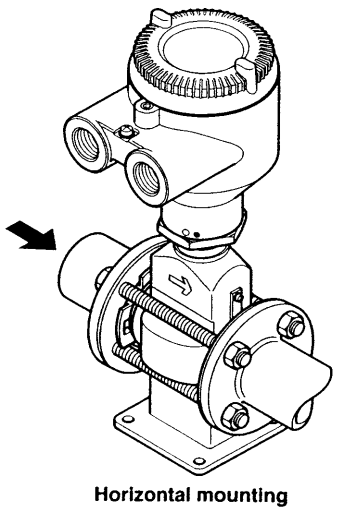
Tighten the nuts according to the torque values for metal piping in Table 3.3.4. For PVC piping, select an option code of /GA, /GC, or /GD, use rubber gaskets and tighten the nuts to the torque values for PVC piping in Table 3.3.5.

For permeable fluids (such as nitric acid, hydrofluoric acid, or sodium hydrate at high temperatures), tighten the nuts according to the torque values in Table 3.3.6.

**⚠ CAUTION**

For a flowmeter with fluorocarbon PFA lining, it is possible that the nuts may loosen as time passes, so tighten them regularly. Be sure to tighten the nuts according to the prescribed torque values. Tighten them diagonally with the same torque values, step by step up to the prescribed torque value.



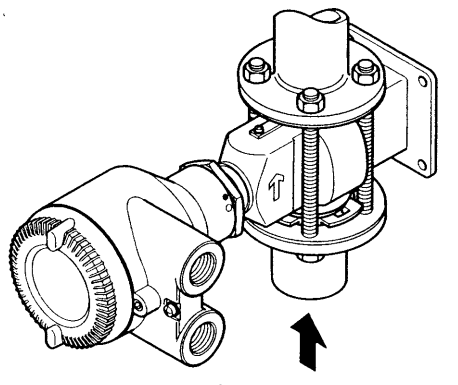




**Figure 3.3.2 Mounting Procedure for Wafer Type (size: 2.5 (0.1) to 15 mm (0.5 in.))**

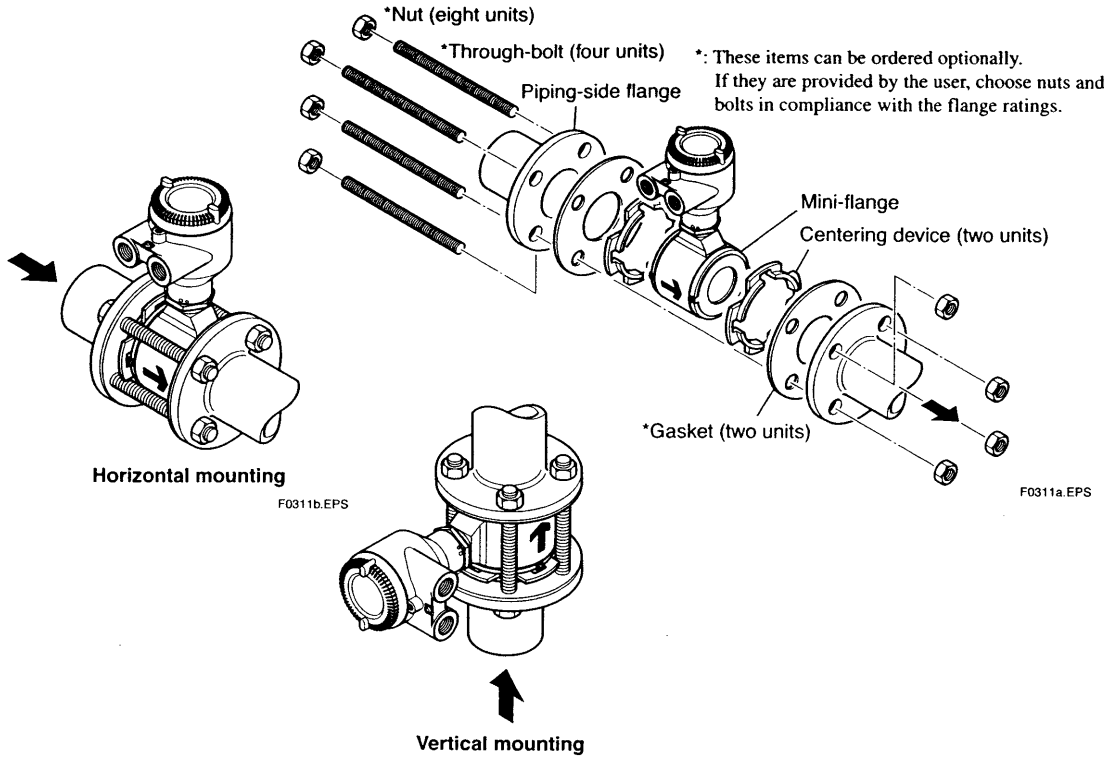



**Figure 3.3.3 Mounting Procedure for Wafer Type (size: 25 (1.0), 32 (1.25), and 40 mm (1.5 in.))**

**Table 3.3.4 Wafer Type Tightening Torque Values for Metal Piping**

| | Tightening torque values for PFA/Polyurethane Rubber lining type (N-m / {kgf-cm} / [in-lbf]) | | |
|---|---|---|---|
| Gasket types within flowtube | No gasket (standard) | | |
| Gasket types for user's flange | Non-asbestos fiber gasket, PTFE-sheathed non-asbestos gasket (optional codes BCF and BSF), or the equivalent in hardness | | |
| Flange ratings / Size mm (inch) | JIS 10K, ANSI Class 150, and DIN PN10 | JIS 20K, ANSI Class 300, and DIN PN16 | DIN PN40 |
| 2.5 (0.1) | 7.2 to 8.4 / {73.42 to 85.66} / [63.72 to 74.35] | 7.3 to 8.4 / {74.44 to 85.66} / [64.61 to 74.35] | 7.6 to 8.4 / {77.5 to 85.66} / [67.26 to 74.35] |
| 5 (0.2) | 7.2 to 8.4 / {73.42 to 85.66} / [63.72 to 74.35] | 7.3 to 8.4 / {74.44 to 85.66} / [64.61 to 74.35] | 7.6 to 8.4 / {77.5 to 85.66} / [67.26 to 74.35] |
| 10 (0.4) | 7.2 to 8.4 / {73.42 to 85.66} / [63.72 to 74.35] | 7.3 to 8.4 / {74.44 to 85.66} / [64.61 to 74.35] | 7.6 to 8.4 / {77.5 to 85.66} / [67.26 to 74.35] |
| 15 (0.5) | 7.2 to 8.4 / {73.42 to 85.66} / [63.72 to 74.35] | 7.3 to 8.4 / {74.44 to 85.66} / [64.61 to 74.35] | 7.6 to 8.4 / {77.5 to 85.66} / [67.26 to 74.35] |
| 25 (1.0) | 23.5 to 27.3 / {239.6 to 278.4} / [208 to 241.6] | 23.7 to 27.3 / {241.7 to 278.4} / [209.8 to 241.6] | 22.3 to 27.3 / {227.4 to 278.4} / [197.4 to 241.6] |
| 32 (1.25) | 26.2 to 30.5 / {267.2 to 311} / [231.9 to 269.9] | 26.6 to 30.5 / {271.2 to 311} / [235.4 to 269.9] | 28.0 to 30.5 / {285.5 to 311} / [247.8 to 269.9] |
| 40 (1.5) | 36.2 to 42.4 / {369.1 to 432.4} / [320.4 to 375.3] | 36.9 to 42.4 / {376.3 to 432.4} / [326.6 to 375.3] | 39.1 to 42.4 / {398.7 to 432.4} / [346.1 to 375.3] |

| | Tightening torque values for Ceramics lining type (N-m / {kgf-cm} / [in-lbf]) | | |
|---|---|---|---|
| Gasket types within flowtube | Fluororesin with ceramic fillers (Valqua #7020) (standard) gasket, or fluororesin with carbon gasket (optional code GF) | | |
| Gasket types for user's flange | Non-asbestos gasket, PTFE-sheathed non-asbestos gasket (optional codes BCF and BSF), or the equivalent in hardness | | |
| Flange ratings / Size mm (inch) | JIS 10K, ANSI Class 150, and DIN PN10 | JIS 20K, ANSI Class 300, and DIN PN16 | DIN PN40 |
| 15 (0.5) | 2.9 to 4.8 / {29.57 to 48.95} / [25.67 to 42.48] | 2.9 to 4.8 / {29.57 to 48.95} / [25.67 to 42.48] | 3.0 to 5.0 / {30.59 to 50.99} / [26.55 to 44.25] |
| 25 (1.0) | 8.2 to 13.6 / {83.62 to 138.7} / [72.57 to 120.4] | 8.2 to 13.7 / {83.62 to 139.7} / [72.57 to 121.3] | 7.9 to 13.1 / {80.56 to 133.6} / [69.92 to 115.9] |
| 40 (1.5) | 14.1 to 23.6 / {143.8 to 240.7} / [124.8 to 208.9] | 14.4 to 24.1 / {146.8 to 245.8} / [127.4 to 213.3] | 15.5 to 25.8 / {158.1 to 263.1} / [137.2 to 228.3] |

T0305.EPS

**Table 3.3.5 Wafer Type Tightening Torque Values for PVC Piping**

| Tightening torque values for PFA lining type (N-m / {kgf-cm} / [in-lbf]) | | | |
|---|---|---|---|
| Gasket types within flowtube | Fluororubber gasket (optional codes GA, GC, and GD) | | |
| Gasket types for user's flange | Fluororubber gasket, chloroprene rubber gasket (optional codes BSC and BCC), or the equivalent in hardness | | |
| Flange ratings / Size mm (inch) | JIS 10K, ANSI Class 150, and DIN PN10 | JIS 20K, ANSI Class 300, and DIN PN16 | DIN PN40 |
| 2.5 (0.1) | 1.5 to 2.5 / {15.3 to 25.49} / [13.28 to 22.13] | 1.5 to 2.5 / {15.3 to 25.49} / [13.28 to 22.13] | 1.5 to 2.4 / {15.3 to 24.47} / [13.28 to 21.24] |
| 5 (0.2) | 1.5 to 2.5 / {15.3 to 25.49} / [13.28 to 22.13] | 1.5 to 2.5 / {15.3 to 25.49} / [13.28 to 22.13] | 1.5 to 2.4 / {15.3 to 24.47} / [13.28 to 21.24] |
| 10 (0.4) | 1.5 to 2.5 / {15.3 to 25.49} / [13.28 to 22.13] | 1.5 to 2.5 / {15.3 to 25.49} / [13.28 to 22.13] | 1.5 to 2.4 / {15.3 to 24.47} / [13.28 to 21.24] |
| 15 (0.5) | 1.5 to 2.5 / {15.3 to 25.49} / [13.28 to 22.13] | 1.5 to 2.5 / {15.3 to 25.49} / [13.28 to 22.13] | 1.5 to 2.4 / {15.3 to 24.47} / [13.28 to 21.24] |
| 25 (1.0) | 4.9 to 8.1 / {49.97 to 82.6} / [43.37 to 71.69] | 5.0 to 8.3 / {50.99 to84.64 } / [44.25 to 73.46] | 4.3 to 7.2 / {43.85 to 73.42} / [38.06 to 63.72] |
| 32 (1.25) | 5.5 to 9.2 / {56.08 to 93.81} / [48.68 to 81.43] | 5.7 to 9.5 / {58.12 to 96.87} / [50.45 to 84.08] | 5.4 to 8.9 / {55.06 to 90.75} / [47.79 to 78.77] |
| 40 (1.5) | 7.7 to 12.9 / {78.52 to 131.5} / [68.15 to 114.2] | 8.1 to 13.4 / {82.6 to 136.6} / [71.69 to 118.6] | 7.5 to 12.5 / {76.48 to 127.5} / [66.38 to 110.6] |

| Tightening torque values for Ceramics lining type (N-m / {kgf-cm} / [in-lbf]) | | | |
|---|---|---|---|
| Gasket types within flowtube | Fluororubber gasket (optional codes GA, GC, and GD) | | |
| Gasket types for user's flange | Fluororubber gasket, chloroprene rubber gasket (optional codes BSC and BCC), or the equivalent in hardness | | |
| Flange ratings / Size mm (inch) | JIS 10K, ANSI Class 150, and DIN PN10 | JIS 20K, ANSI Class 300, and DIN PN16 | DIN PN40 |
| 15 (0.5) | 0.6 to 1.0 / {6.118 to 10.2} / [5.31 to 8.85] | 0.6 to 1.0 / {6.118 to 10.2} / [5.31 to 8.85] | 0.6 to 1.0 / {6.118 to 10.2} / [5.31 to 8.85] |
| 25 (1.0) | 1.7 to 2.8 / {17.34 to 28.55} / [15.05 to 24.78] | 1.7 to 2.8 / {17.34 to 28.55} / [15.05 to 24.78] | 1.5 to 2.5 / {15.3 to 25.49} / [13.28 to 22.13] |
| 40 (1.5) | 3.0 to 5.0 / {30.59 to 50.99} / [26.55 to 44.25] | 3.1 to 5.2 / {31.61 to 53.03} / [27.44 to 46.02] | 2.9 to 4.8 / {29.57 to 48.95} / [25.67 to 42.48] |

T0306.EPS

**Table 3.3.6 Wafer Type Tightening Torque Values for Metal Piping and Permeable Fluids**

| Tightening torque values for PFA lining type (N-m / {kgf-cm} / [in-lbf]) | | | |
|---|---|---|---|
| Gasket types within flowtube | No gasket (standard) | | |
| Gasket types for user's flange | PTFE-sheathed non-asbestos gasket (optional codes BCF and BSF), or the equivalent in hardness | | |
| Flange ratings / Size mm (inch) | JIS 10K, ANSI Class 150, and DIN PN10 | JIS 20K, ANSI Class 300, and DIN PN16 | DIN PN40 |
| 2.5 (0.1) | 10.8 to 12.4 / {110.1 to 126.4} / [95.59 to 109.7] | 10.8 to 12.4 / {110.1 to 126.4} / [95.59 to 109.7] | 11.1 to 12.4 / {113.2 to 126.4} / [98.24 to 109.7] |
| 5 (0.2) | 10.8 to 12.4 / {110.1 to 126.4} / [95.59 to 109.7] | 10.8 to 12.4 / {110.1 to 126.4} / [95.59 to 109.7] | 11.1 to 12.4 / {113.2 to 126.4} / [98.24 to 109.7] |
| 10 (0.4) | 10.8 to 12.4 / {110.1 to 126.4} / [95.59 to 109.7] | 10.8 to 12.4 / {110.1 to 126.4} / [95.59 to 109.7] | 11.1 to 12.4 / {113.2 to 126.4} / [98.24 to 109.7] |
| 15 (0.5) | 10.8 to 12.4 / {110.1 to 126.4} / [95.59 to 109.7] | 10.8 to 12.4 / {110.1 to 126.4} / [95.59 to 109.7] | 11.1 to 12.4 / {113.2 to 126.4} / [98.24 to 109.7] |
| 25 (1.0) | 34.9 to 40.1 / {355.9 to 408.9} / [308.9 to 354.9] | 35.2 to 40.1 / {358.9 to 408.9} / [311.5 to 354.9] | 32.3 to 37.1 / {329.4 to 378.3} / [285.9 to 328.4] |
| 32 (1.25) | 38.8 to 44.6 / {395.6 to 454.8} / [343.4 to 394.7] | 39.2 to 44.6 / {399.7 to 454.8} / [346.9 to 394.7] | 40.6 to 46.7 / {414.0 to 476.2} / [359.3 to 413.3] |
| 40 (1.5) | 53.5 to 61.5 / {545.5 to 627.1} / [473.5 to 544.3] | 54.2 to 61.5 / {552.7 to 627.1} / [479.7 to 544.3] | 56.4 to 61.5 / {575.1 to 627.1} / [499.2 to 544.3] |

| Tightening torque values for Ceramics lining type (N-m / {kgf-cm} / [in-lbf]) | | | |
|---|---|---|---|
| Gasket types within flowtube | Fluororesin with ceramic fillers (Valqua #7020) gasket (standard), or fluororesin with carbon gasket (optional code GF) | | |
| Gasket types for user's flange | PTFE-sheathed non-asbestos gasket (optional codes BCF and BSF), or the equivalent in hardness | | |
| Flange ratings / Size mm (inch) | JIS 10K, ANSI Class 150, and DIN PN10 | JIS 20K, ANSI Class 300, and DIN PN16 | DIN PN40 |
| 15 (0.5) | 4.2 to 7.1 / {42.83 to 72.4} / [37.17 to 62.84] | 4.3 to 7.1 / {43.85 to 72.4} / [38.06 to 62.84] | 4.4 to 7.3 / {44.87 to 74.44} / [38.94 to 64.61] |
| 25 (1.0) | 12.1 to 20.2 / {123.4 to 206.0} / [107.1 to 178.8] | 12.2 to 20.3 / {124.4 to 207.0} / [108.0 to 179.7] | 11.3 to 18.9 / {115.2 to 192.7} / [100.0 to 167.3] |
| 40 (1.5) | 20.8 to 34.7 / {212.1 to 353.8} / [184.1 to 307.1] | 21.1 to 35.2 / {215.2 to 358.9} / [186.7 to 311.5] | 22.2 to 37.0 / {226.4 to 377.3} / [196.5 to 327.5] |

T0307.EPS

### 3.3.3 Nominal Diameter 50 mm (2.0 in.) to 300 mm (12.0 in.), Wafer Type

**IMPORTANT**

Use bolts and nuts in compliance with the flange ratings. When stud-type through-bolts are used, be sure the outside diameter of the shank is smaller than that of the thread ridge. Be sure to choose a gasket with an inner diameter that does not protrude inside the piping (refer to Table 3.3.13). If the inner diameter of the gasket is too large, however, fluid leakage may result.

#### (1) Mounting Direction

Mount the flowmeter so that the flow direction of the fluid to be measured is in line with the direction of the arrow mark on the flowmeter.

**IMPORTANT**

If it is impossible to match the direction of the arrow mark, the direction of the electrical connection can be changed. Refer to Section 5.1 to do this properly.
In case the fluid being measured flows against the arrow direction, refer to the parameter **J20: Flow Direction** in the user's manual of the AXFA11 Magnetic Flowmeter Remote Converter (IM 01E20C01-01E) or the AXFA14 Magnetic Flowmeter Remote Converter/AXF Integral Flowmeter [Software Edition] (IM 01E20C02-01E).

#### (2) Mounting Centering Devices

To maintain concentricity of the flowmeter with the pipes, install centering devices. From the process piping side, pass two through-bolts through the four centering devices (two for each bolt) and the adjacent two holes (the lower two holes for horizontal mounting) of both of the flanges (refer to Figure 3.3.4). Use the appropriate centering devices according to the nominal diameter and the flange ratings. The centering devices are engraved with an identifying character. Use the appropriate ones which meet the required specifications by referring to Tables 3.3.10 and 3.3.11 (AXF standard models) and Table 3.3.12 (replacement models for the earlier ADMAG or ADMAG AE).

#### (3) Positioning the Flowmeter

Position the flowmeter so that the Mini-flanges and the centering devices come in close contact with each other. Be careful to prevent the four centering devices from coming into contact with the housing. If stud-type through-bolts are used, position them in such a way that the four centering devices come in contact with the bolt threads (refer to Figure 3.3.4). Pass the other through-bolts through from the process piping side.

**NOTE**

**Precautions for size 125 mm (5 in.), 150 mm (6 in.), replaceable electrode type**
When installing this type of flowmeter with JIS F12 (JIS 75M) flanges, turn the flowmeter slightly because the cover of the electrode chambers will interfere with the bolts.

#### (4) Tightening Nuts

Tighten the nuts according to the torque values for metal piping in Table 3.3.7. For PVC piping, select an optional code of GA, GC, or GD, use rubber gaskets and tighten the nuts to the torque values for PVC piping in Table 3.3.8.
For permeable fluids (such as nitric acid, hydrofluoric acid, or sodium hydrate at high temperatures), tighten the nuts according to the torque values in Table 3.3.9.

**CAUTION**

For a flowmeter with fluorocarbon PFA lining, it is possible that the nuts may loosen as time passes, so tighten them regularly. Be sure to tighten the nuts according to the prescribed torque values. Tighten them diagonally with the same torque values, step by step up to the prescribed torque value.

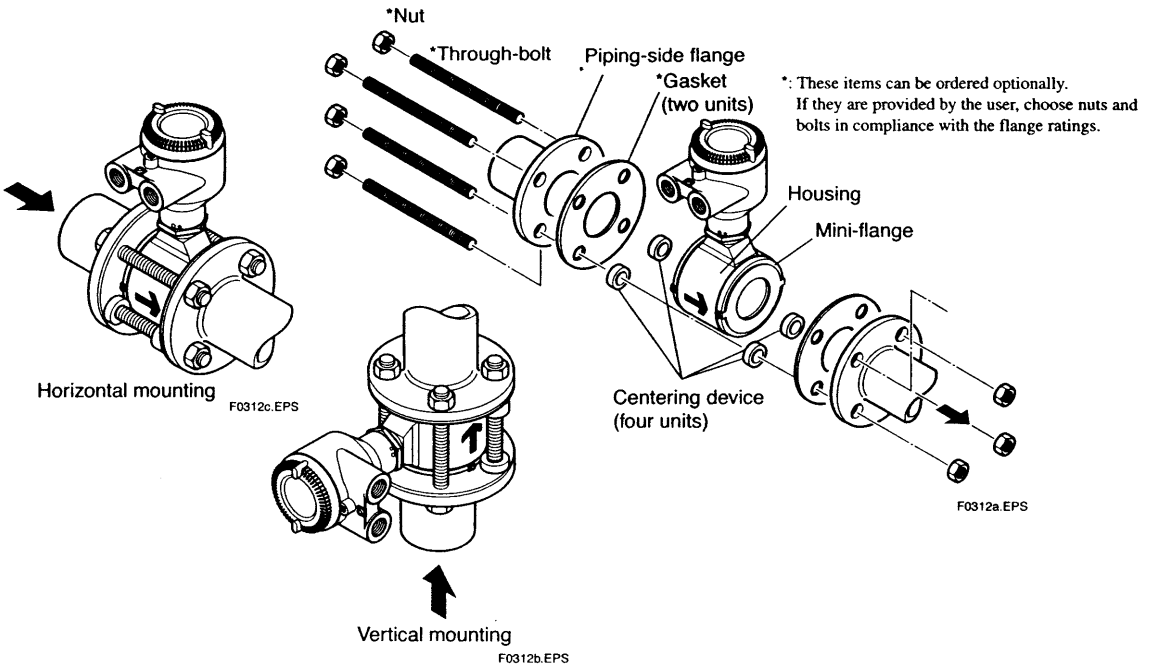



**Figure 3.3.4 Mounting Procedure for Wafer Type (size: 50 mm (2 in.) to 300 mm (12 in.))**

**Table 3.3.7 Wafer Type Tightening Torque Values for Metal Piping**

| Tightening torque values for PFA/Polyurethane Rubber/Natural Soft Rubber/EPDM Rubber lining type (N-m / {kgf-cm} / [in-lbf]) | | | | |
|---|---|---|---|---|
| Gasket types within flowtube | No gasket (standard) | | | |
| Gasket types for user's flange | Non-asbestos fiber gasket, PTFE-sheathed non-asbestos gasket (optional codes BCF and BSF), or the equivalent in hardness | | | |
| Flange ratings / Size mm (inch) | JIS 10K, ANSI Class 150, and DIN PN10 | JIS 20K, ANSI Class 300, and DIN PN16 | DIN PN40 | JIS F12 (JIS 75M) |
| 50 (2.0) | 45.0 to 56.8 / {458.9 to 579.2} / [398.3 to 502.7] | 22.5 to 25.9 / {229.4 to 264.1} / [199.1 to 229.2] | 50.0 to 57.5 / {509.9 to 586.3} / [442.5 to 508.9] | — |
| 65 (2.5) | 61.3 to 70.5 / {625.1 to 718.9} / [542.5 to 624.0] | 30.8 to 35.4 / {3141.1 to 361.0} / [272.6 to 313.3] | — | — |
| 80 (3.0) | 35.0 to 40.3 / {356.9 to 410.9} / [309.8 to 356.7] | 39.9 to 45.9 / {406.9 to 468.0} / [353.1 to 406.2] | — | 68.4 to 78.7 / {697.5 to 802.5} / [605.4 to 696.5] |
| 100 (4.0) | 46.1 to 53.0 / {470.1 to 540.4} / [408.0 to 469.1] | 52.9 to 60.8 / {539.4 to 620.0} / [468.2 to 538.1] | — | 88.6 to 101.9 / {903.5 to 1039} / [784.2 to 901.9] |
| 125 (5.0) | 73.7 to 84.8 / {751.5 to 864.7} / [652.3 to 750.5] | 80.5 to 92.6 / {820.9 to 944.3} / [712.5 to 819.6] | — | 75.1 to 86.4 / {765.8 to 881.0} / [664.7 to 764.7] |
| 150 (6.0) | 85.4 to 98.2 / {870.8 to 1001.0} / [755.8 to 869.1] | 61.0 to 70.2 / {622.0 to 715.8} / [539.9 to 621.3] | — | 86.3 to 99.2 / {880.0 to 1012} / [763.8 to 878.0] |
| 200 (8.0) | 78.8 to 90.6 / {803.5 to 923.9} / [697.4 to 801.9] | 87.5 to 100.6 / {892.3 to 1026} / [774.4 to 890.4] | — | 88.6 to 101.9 / {903.5 to 1039} / [784.2 to 901.9] |
| 250 (10) | 119.4 to 137.3 / {1218 to 1400} / [1057 to 1215] | — | — | 158.1 to 181.8 / {1612 to 1854} / [1399 to 1609] |
| 300 (12) | 105.2 to 121.0 / {1073 to 1234} / [931.1 to 1071] | — | — | 146.6 to 168.6 / {1495 to 1719} / [1297 to 1492] |

| Tightening torque values for Ceramics lining type (N-m / {kgf-cm} / [in-lbf]) | | | | |
|---|---|---|---|---|
| Gasket types within flowtube | Fluororesin with ceramic fillers (Valqua #7020) gasket (standard), or fluororesin with carbon gasket (optional code GF) | | | |
| Gasket types for user's flange | Non-asbestos gasket, PTFE-sheathed non-asbestos gasket (optional codes BCF and BSF), or the equivalent in hardness | | | |
| Flange ratings / Size mm (inch) | JIS 10K, ANSI Class 150, and DIN PN10 | JIS 20K, ANSI Class 300, and DIN PN16 | DIN PN40 | JIS F12 (JIS 75M) |
| 50 (2.0) | 29.9 to 49.8 / {304.9 to 507.8} / [264.6 to 440.8] | 30.5 to 50.9 / {311.0 to 519.0} / [269.9 to 450.5] | 32.7 to 54.5 / {333.4 to 555.7} / [289.4 to 482.4] | — |
| 80 (3.0) | 37.1 to 61.8 / {378.3 to 630.2} / [328.4 to 547.0] | 37.6 to 62.7 / {383.4 to 639.4} / [332.8 to 554.9] | — | 56.3 to 93.8 / {574.1 to 956.5} / [498.3 to 830.2] |
| 100 (4.0) | 48.9 to 81.5 / {498.6 to 831.1} / [432.8 to 721.3] | 49.9 to 83.1 / {508.8 to 847.4} / [441.6 to 735.5] | — | 74.2 to 123.7 / {756.6 to 1261} / [656.7 to 1095] |
| 150 (6.0) | 101.4 to 169.0 / {1034 to 1723} / [897.5 to 1496] | 104.4 to 174.0 / {1065 to 1774} / [924.0 to 1540] | — | 82.2 to 137.0 / {838.2 to 1397} / [727.5 to 1213] |
| 200 (8.0) | 142.3 to 237.2 / {1451 to 2419} / [1259 to2099] | 98.5 to 164.2 / {1004 to 1674} / [871.8 to 1453] | — | 86.7 to 144.6 / {884.1 to 1475} / [767.3 to 1280] |

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**Table 3.3.8 Wafer Type Tightening Torque Values for PVC Piping**

| Tightening torque values for PFA lining type (N-m / {kgf-cm} / [in-lbf]) | | | | |
|---|---|---|---|---|
| Gasket types within flowtube | Fluororubber gasket (optional codes GA, GC, and GD) | | | |
| Gasket types for user's flange | Fluororubber gasket, chloroprene rubber gasket (optional codes BSC and BCC), or the equivalent in hardness | | | |
| Flange ratings / Size mm (inch) | JIS 10K, ANSI Class 150, and DIN PN10 | JIS 20K, ANSI Class 300, and DIN PN16 | DIN PN40 | JIS F12 (JIS 75M) |
| 50 (2.0) | 9.9 to 16.5 / {101.0 to 168.3} / [87.62 to 146.0] | 10.6 to 17.6 / {108.1 to 179.5} / [93.82 to 155.8] | 9.5 to 15.9 / {96.87 to 162.1} / [84.08 to 140.7] | — |
| 65 (2.5) | 14.2 to 23.7 / {144.8 to 241.7} / [125.7 to 209.8] | 15.5 to 25.9 / {158.1 to 264.1} / [137.2 to 229.2] | — | — |
| 80 (3.0) | 8.0 to 13.3 / {81.58 to 135.6} / [70.8 to 117.7] | 9.7 to 16.1 / {98.91 to 164.2} / [85.85 to 142.5] | — | 15.4 to 25.6 / {157.0 to 261.0} / [136.3 to 226.6] |
| 100 (4.0) | 11.3 to 18.8 / {115.2 to 191.7} / [100.0 to 166.4] | 14.2 to 23.6 / {144.8 to 240.7} / [125.7 to 208.9] | — | 21.1 to 35.1 / {215.2 to 357.9} / [186.7 to 310.7] |
| 125 (5.0) | 18.8 to 31.3 / {191.7 to 319.2} / [166.4 to 277.0] | 22.3 to 37.2 / {227.4 to 379.3} / [197.4 to 329.2] | — | 18.5 to 30.8 / {188.6 to 314.1} / [163.7 to 272.6] |
| 150 (6.0) | 22.5 to 37.6 / {229.4 to 383.4} / [199.1 to 332.8] | 27.2 to 45.3 / {277.4 to 461.9} / [240.7 to 400.9] | — | 21.8 to 36.3 / {222.3 to 370.2} / [192.9 to 321.3] |
| 200 (8.0) | 22.1 to 36.9 / {225.4 to 376.3} / [195.6 to 326.6] | 27.3 to 45.3 / {278.4 to 461.9} / [241.6 to 400.9] | — | 23.8 to 39.6 / {242.7 to 403.8} / [210.6 to 350.5] |

| Tightening torque values for Ceramics lining type (N-m / {kgf-cm} / [in-lbf]) | | | | |
|---|---|---|---|---|
| Gasket types within flowtube | Fluororubber gasket (optional codes GA, GC, and GD) | | | |
| Gasket types for user's flange | Fluororubber gasket, chloroprene rubber gasket (optional codes BSC and BCC), or the equivalent in hardness | | | |
| Flange ratings / Size mm (inch) | JIS 10K, ANSI Class 150, and DIN PN10 | JIS 20K, ANSI Class 300, and DIN PN16 | DIN PN40 | JIS F12 (JIS 75M) |
| 50 (2.0) | 4.5 to 7.4 / {45.89 to 75.46} / [39.83 to 65.49] | 4.8 to 7.9 / {48.95 to 80.56} / [42.48 to 69.92] | 4.3 to 7.1 / {43.85 to 72.4} / [38.06 to 62.84] | — |
| 80 (3.0) | 4.4 to 7.3 / {44.87 to 74.44} / [38.94 to 64.61] | 4.8 to 7.9 / {48.95 to 80.56} / [42.48 to 69.92] | — | 8.6 to 14.4 / {87.7 to 146.8} / [76.12 to 127.4] |
| 100 (4.0) | 6.4 to 10.7 / {65.26 to 109.1} / [56.64 to 94.7] | 7.2 to 11.9 / {73.42 to 121.3} / [63.72 to 105.3] | — | 12.2 to 20.3 / {124.4 to 207.0} / [108.0 to 179.7] |
| 150 (6.0) | 15.1 to 25.2 / {154.0 to 257.0} / [133.6 to 223.0] | 17.6 to 29.3 / {179.5 to 298.8} / [155.8 to 259.3] | — | 14.9 to 24.8 / {151.9 to 252.9} / [131.9 to 219.5] |
| 200 (8.0) | 23.4 to 39.0 / {238.6 to 397.7} / [207.1 to 345.2] | 18.6 to 31.6 / {189.7 to 322.2} / [164.6 to 279.7] | — | 17.1 to 28.6 / {174.4 to 291.6} / [151.3 to 253.1] |

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**Table 3.3.9 Wafer Type Tightening Torque Values for Metal Piping and Permeable Fluids**

| Tightening torque values for PFA lining type (N-m / {kgf-cm} / [in-lbf]) | | | | |
|---|---|---|---|---|
| Gasket types within flowtube | No gasket (standard) | | | |
| Gasket types for user's flange | PTFE-sheathed non-asbestos gasket (optional codes BCF and BSF), or the equivalent in hardness | | | |
| Flange ratings / Size mm (inch) | JIS 10K, ANSI Class 150, and DIN PN10 | JIS 20K, ANSI Class 300, and DIN PN16 | DIN PN40 | JIS F12 (JIS 75M) |
| 50 (2.0) | 66.2 to 76.1 / {675.0 to 776.0} / [585.9 to 673.5] | 33.1 to 38.0 / {337.5 to 387.5} / [293.0 to 336.3] | 71.2 to 118.6 / {726.0 to 1209} / [630.2 to 1050] | — |
| 65 (2.5) | 89.5 to 102.9 / {912.6 to 1049} / [792.1 to 910.7] | 44.9 to 51.6 / {457.9 to 526.2} / [397.4 to 456.7] | — | — |
| 80 (3.0) | 51.3 to 59.0 / {523.1 to 601.6} / [454.0 to 522.2] | 58.1 to 66.8 / {592.5 to 681.2} / [514.2 to 591.2] | — | 100.8 to 115.9 / {1028 to 1182} / [892.1 to 1026] |
| 100 (4.0) | 66.7 to 76.7 / {680.2 to 782.1} / [590.3 to 678.8] | 76.1 to 87.5 / {776.0 to 892.3} / [673.5 to 774.4] | — | 129.8 to 149.3 / {1324 to 1522} / {1149 to 1321} |
| 125 (5.0) | 106.1 to 122.0 / {1082 to 1244} / [939.0 to 1080] | 114.5 to 131.7 / {1168 to 1343} / [1013 to 1166] | — | 109.6 to 126.0 / {1118 to 1285} / [970.0 to 1115] |
| 150 (6.0) | 122.2 to 140.5 / {1246 to 1433} / [1082 to 1244] | 86.8 to 99.8 / {885.1 to 1018} / [768.2 to 883.3] | — | 125.6 to 144.4 / {1281 to 1472} / [1112 to 1278] |
| 200 (8.0) | 111.6 to 128.3 / {1138 to 1308} / [987.7 to 1136] | 122.0 to 140.3 / {1244 to 1431} / {1080 to 1242] | — | 128.0 to 147.2 / {1305 to 1501} / [1133 to 1303] |
| 250 (10) | 167.7 to 192.9 / {1710 to 1967} / [1484 to 1707] | — | — | 227.6 to 261.7 / {2321 to 2669} / [2014 to 2316] |
| 300 (12) | 146.0 to 167.9 / {1489 to 1712} / [1292 to 1486] | — | — | 209.1 to 240.5 / {2132 to2452 } / [1851 to 2129] |

| Tightening torque values for Ceramics lining type (N-m / {kgf-cm} / [in-lbf]) | | | | |
|---|---|---|---|---|
| Gasket types within flowtube | Fluororesin with ceramic fillers (Valqua #7020) gasket (standard), or fluororesin with carbon gasket (optional code GF) | | | |
| Gasket types for user's flange | PTFE-sheathed non-asbestos gasket (optional codes BCF and BSF), or the equivalent in hardness | | | |
| Flange ratings / Size mm (inch) | JIS 10K, ANSI Class 150, and DIN PN10 | JIS 20K, ANSI Class 300, and DIN PN16 | DIN PN40 | JIS F12 (JIS 75M) |
| 50 (2.0) | 29.9 to 49.8 / {304.9 to 507.8} / [264.6 to 440.8] | 30.5 to 50.9 / {311.0 to 519.0} / [269.9 to 450.5] | 32.7 to 54.5 / {333.4 to 555.7} / [289.4 to 482.4] | — |
| 80 (3.0) | 48.5 to 80.8 / {494.6 to 823.9} / [429.3 to 715.1] | 46.6 to 77.6 / {475.2 to 791.3} / [412.4 to 686.8] | — | 56.3 to 93.8 / {574.1 to 956.5} / [498.3 to 830.2] |
| 100 (4.0) | 60.5 to 100.9 / {616.9 to 1029} / [535.5 to 893.0] | 61.5 to 102.5 / {627.1 to 1045} / {544.3 to 907.2] | — | 74.2 to 123.7 / {756.6 to 1261} / [656.7 to 1095] |
| 150 (6.0) | 125.0 to 208.3 / {1275 to 2124} / [1106 to 1844] | 128.0 to 213.3 / {1305 to 2175} / {1133 to 1888] | — | 82.2 to 137.0 / {838.2 to 1397} / [727.5 to 1213] |
| 200 (8.0) | 174.7 to 291.2 / {1781 to 2969} / [1546 to2577 ] | 120.1 to 200.2 / {1225 to 2041} / [1063 to 1772] | — | 86.7 to 144.6 / {884.1 to 1475} / [767.3 to 1280] |

T0310.EPS

**Table 3.3.10 Centering Device Identification (AXF Standard Models, PFA/Polyurethane Rubber/Natural Soft Rubber/EPDM Rubber lining)**

| Flange ratings / Size mm (inch) | JIS | | | ANSI | | DIN | | |
|---|---|---|---|---|---|---|---|---|
| | 10K | 20K | F12 (75M) | 150 | 300 | PN10 | PN16 | PN40 |
| 50 (2.0) | B | B | — | B | F | — | — | F |
| 65 (2.5) | B | B | — | B | G | — | F | — |
| 80 (3.0) | B | F | H | F | C | — | G | — |
| 100 (4.0) | B | F | H | C | H | — | F | — |
| 125 (5.0) | B | C | C | G | D | — | F | — |
| 150 (6.0) | C | D | D | C | E | — | C | — |
| 200 (8.0) | C | D | D | D | E | C | C | — |
| 250 (10) | C | — | D | N | — | C | C | — |
| 300 (12) | C | — | D | P | — | C | C | — |

*: Each centering device is engraved with a character as identification.

T0311.EPS

**Table 3.3.11 Centering Device Identification (AXF Standard Models, Ceramics lining)**

| Flange ratings / Size mm (inch) | JIS | | | ANSI | | DIN | | |
|---|---|---|---|---|---|---|---|---|
| | 10K | 20K | F12(75M) | 150 | 300 | PN10 | PN16 | PN40 |
| 50 (2.0) | B | B | — | B | F | — | — | F |
| 80 (3.0) | B | F | H | F | C | — | G | — |
| 100 (4.0) | B | F | H | C | H | — | F | — |
| 150 (6.0) | B | C | G | B | D | — | B | — |
| 200 (8.0) | B | C | C | G | J | B | B | — |

*: Each centering device is engraved with a character as identification.

T0312-1.EPS



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19.1.12

**Table 3.3.12 Centering Device Identification (Replacement Models, PFA/Polyurethane Rubber lining)**

| Size mm (inch) \ Flange ratings | JIS | | | ANSI | | DIN | | |
|---|---|---|---|---|---|---|---|---|
| | 10K | 20K | F12(75M) | 150 | 300 | PN10 | PN16 | PN40 |
| 50 (2.0) | B | B | — | B | F | — | — | F |
| 80 (3.0) | B | F | H | F | C | — | G | — |
| 100 (4.0) | B | F | H | C | H | — | F | — |
| 150 (6.0) | C | D | D | C | E | — | C | — |
| 200 (8.0) | C | D | D | D | E | C | C | — |

*: Each centering device is engraved with a character as identification.

T0312-2.EPS

**Table 3.3.13 Inner Diameters of Grounding Ring**

Unit: mm (inch)

| Size mm (inch) \ Lining | AXF Standard Models | | | Replacement Models for earlier ADMAG or ADMAG AE |
|---|---|---|---|---|
| | PFA/Polyurethane Rubber/ Natural Soft Rubber/EPDM Rubber | | Ceramics | PFA/Polyurethane Rubber |
| | Wafer | Flange | | |
| 2.5 (0.1) | 15 (0.59) (*1) | | — | 15 (0.59) |
| 5 (0.2) | 15 (0.59) (*1) | | — | 15 (0.59) |
| 10 (0.4) | 15 (0.59) (*1) | | — | 15 (0.59) |
| 15 (0.5) | 15 (0.59) (*1) | | 15 (0.59) | 15 (0.59) |
| 25 (1.0) | 28 (1.10) | | 27 (1.06) | 27 (1.06) |
| 32 (1.25) | 34 (1.34) | | — | — |
| 40 (1.5) | 41 (1.61) | | 40 (1.57) | 40 (1.57) |
| 50 (2.0) | 53 (2.09) | | 52 (2.05) | 52 (2.05) |
| 65 (2.5) | 66 (2.60) | | — | — |
| 80 (3.0) | 77 (3.03) | | 81 (3.19) | 81 (3.19) |
| 100 (4.0) | 102 (4.02) | | 98 (3.86) | 98 (3.86) |
| 125 (5.0) | 128 (5.04) | | — | — |
| 150 (6.0) | 146.1 (5.75) | | 144 (5.67) | 140.7 (5.6) |
| 200 (8.0) | 193.6 (7.62) | | 192 (7.56) | 188.9 (7.5) |
| 250 (10) | 243.7 (9.60) | 243 (9.57) | — | 239.1 (9.41) |
| 300 (12) | 294.7 (11.60) | 291.3 (11.47) | — | — |
| 350 (14) | — | 323.4 (12.73) | — | — |
| 400 (16) | — | 373.5 (14.70) | — | — |

*1: The inner diameter of the process connection code: DD4, DJ1, DJ2 is 12 mm (0.47 in.)

Note: Be sure that inner diameter of the piping-side gasket does not protrude into the inner diameter of the grounding ring. (This dimension is also applied when no grounding ring is used.) If the inner diameter of the gasket is too large, however, fluid leakage may result.

T0313.EPS

Unit : mm (in.)

| Size mm (inch) \ Lining | AXF Standard Models |
|---|---|
| | Polyurethane Rubber |
| 500 (20) | 468 (18.42) [485 (19.09)]*1 |
| 600 (24) | 563 (22.16) [589 (23.18)]*1 |
| 700 (28) | 665 (26.18) [689 (27.12)]*1 |
| 800 (32) | 765 (30.11) [788 (31.02)]*1 |
| 900 (36) | 855 (33.66) [888 (34.96)]*1 |
| 1000 (40) | 942 (37.08) [990 (38.97)]*1 |
| 1100 (44) | 1085 (42.71) |
| 1200 (48) | 1185 (46.65) |
| 1350 (54) | 1335 (52.55) |
| 1500 (60) | 1485 (58.46) |
| 1600 (64) | 1585 (62.40) |
| 1800 (72) | 1785 (70.27) |
| 2000 (80) | 1985 (78.14) |
| 2200 (88) | 2185 (86.02) |
| 2400 (96) | 2385 (93.89) |
| 2600 (104) | 2585 (101.77) |

*1: Values in brackets [ ] indicate a process connection code CG1.

T16-2.EPS

### 3.3.4 Nominal Diameter 2.5 mm (0.1 in.) to 400 mm (16 in.), Flange Type

**IMPORTANT**

Use bolts and nuts in compliance with the flange ratings. Be sure to choose a gasket with an inner diameter that does not protrude inside the piping (refer to Table 3.3.13). If the inner diameter of the gasket is too large, however, fluid leakage may result.

#### (1) Mounting Direction

Mount the flowmeter so that the flow direction of the fluid to be measured is in line with the direction of the arrow mark on the flowmeter.

**IMPORTANT**

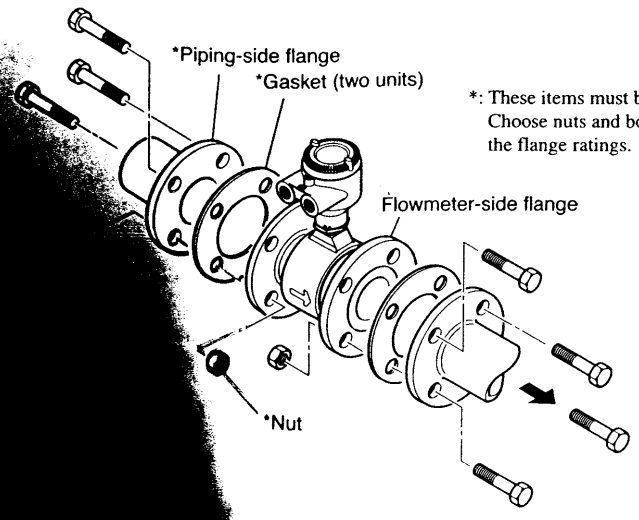
If it is impossible to match the direction of the arrow mark, the direction of the electrical connection can be changed. Refer to Section 5.1 to do this properly.
In case the fluid being measured flows against the arrow direction, refer to the parameter **J20: Flow Direction** in the user's manual of the AXFA11 Magnetic Flowmeter Remote Converter (IM 01E20C01-01E) or the AXFA14 Magnetic Flowmeter Remote Converter/AXF Integral Flowmeter [Software Edition] (IM 01E20C02-01E).

#### (2) Tightening Nuts

Tighten the bolts according to the torque values for the metal piping in Table 3.3.14. For PVC piping, select an optional code of GA, GC, or GD, use rubber gaskets and tighten the nuts to the torque values for the PVC piping in Table 3.3.15.
For permeable fluids (such as nitric acid, hydrofluoric acid, or sodium hydrate at high temperatures), tighten the nuts according to the torque values in Table 3.3.16.

**CAUTION**

For a flowmeter with fluorocarbon PFA lining, it is possible that the nuts may loosen as time passes, so tighten them regularly. Be sure to tighten the nuts according to the prescribed torque values. Tighten them diagonally with the same torque values, step by step up to the prescribed torque value.




**...ure for Flange Type (size: 2.5 mm (0.1 in.) to 400 mm (16 in.))**



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19.1.2

**Table 3.3.14 Flange Type Tightening Torque Values for Metal Piping**

| Tightening torque values for PFA/Polyurethane Rubber/Natural Soft Rubber/EPDM Rubber lining type (N-m / {kgf-cm} / [in-lbf]) | | | | |
|---|---|---|---|---|
| Gasket types within flowtube | No gasket (standard) | | | |
| Gasket types for user's flange | Non-asbestos gasket, PTFE-sheathed non-asbestos gasket, or the equivalent in hardness | | | |
| Flange ratings / Size mm (inch) | JIS 10K, ANSI Class 150, and DIN PN10 | JIS 20K, ANSI Class 300, and DIN PN16 | DIN PN40 | JIS F12 (JIS 75M) |
| 25 (0.1) (with 10-mm flanges) | 3.8 to 6.3 / {38.75 to 64.24} / [33.63 to 55.76] | 3.8 to 6.3 / {38.75 to 64.24} / [33.63 to 55.76] | 3.8 to 6.4 / {38.75 to 65.26} / [33.63 to 56.64] | — |
| 25 (0.1) (with 15-mm flanges) | 4.6 to 7.7 / {46.91 to 78.52} / [40.71 to 68.15] | 4.7 to 7.8 / {47.93 to 79.54} / [41.6 to 69.03] | 4.7 to 7.9 / {47.93 to 80.56} / [41.6 to 69.92] | — |
| 5 (0.2) (with 10-mm flanges) | 3.8 to 6.3 / {38.75 to 64.24} / [33.63 to 55.76] | 3.8 to 6.3 / {38.75 to 64.24} / [33.63 to 55.76] | 3.8 to 6.4 / {38.75 to 65.26} / [33.63 to 56.64] | — |
| 5 (0.2) (with 15-mm flanges) | 4.6 to 7.7 / {46.91 to 78.52} / [40.71 to 68.15] | 4.7 to 7.8 / {47.93 to 79.54} / [41.6 to 69.03] | 4.7 to 7.9 / {47.93 to 80.56} / [41.6 to 69.92] | — |
| 10 (0.4) (with 10-mm flanges) | 3.8 to 6.3 / {38.75 to 64.24} / [33.63 to 55.76] | 3.8 to 6.3 / {38.75 to 64.24} / [33.63 to 55.76] | 3.8 to 6.4 / {38.75 to 65.26} / [33.63 to 56.64] | — |
| 10 (0.4) (with 15-mm flanges) | 4.6 to 7.7 / {46.91 to 78.52} / [40.71 to 68.15] | 4.7 to 7.8 / {47.93 to 79.54} / [41.6 to 69.03] | 4.7 to 7.9 / {47.93 to 80.56} / [41.6 to 69.92] | — |
| 15 (0.5) | 4.6 to 7.7 / {46.91 to 78.52} / [40.71 to 68.15] | 4.7 to 7.8 / {47.93 to 79.54} / [41.6 to 69.03] | 4.7 to 7.9 / {47.93 to 80.56} / [41.6 to 69.92] | — |
| 25 (1.0) | 13.1 to 15.1 / {133.6 to 154.0} / [115.9 to 133.6] | 13.2 to 15.2 / {134.6 to 155.0} / [116.8 to 134.5] | 11.9 to 13.7 / {121.3 to 139.7} / [105.3 to 121.3] | — |
| 32 (1.25) | 14.4 to 15.6 / {146.8 to 159.1} / [127.4 to138.1] | 14.6 to 16.8 / {148.9 to 171.3} / [129.2 to 148.7] | 15.0 to 17.3 / {153.0 to 176.4} / [132.8 to 153.1] | — |
| 40 (1.5) | 21.9 to 25.2 / {223.3 to 257.0} / [193.8 to 223.0] | 22.2 to 25.5 / {226.4 to 260.0} / [196.5 to 225.7] | 23.2 to 26.7 / {236.6 to 272.3} / [205.3 to 236.3] | — |
| 50 (2.0) | 28.0 to 32.2 / {285.5 to 328.3} / [247.8 to 285.0] | 27.8 to 32.0 / {283.5 to 326.3} / [246.0 to 283.2] | 28.8 to 33.1 / {293.7 to 337.5} / [254.9 to 293.0] | — |
| 65 (2.5) | 41.6 to 47.8 / {424.2 to 487.4} / [368.2 to 423.1] | 41.4 to 47.6 / {422.2 to 485.4} / [366.4 to 421.3] | — | — |
| 80 (3.0) | 23.2 to 26.7 / {236.6 to 272.3} / [205.3 to 236.3] | 26.1 to 30.0 / {266.1 to 305.9} / [231.0 to265.5 ] | — | 46.0 to 52.9 / {469.1 to 539.4} / [407.1 to 468.2] |
| 100 (4.0) | 30.9 to 35.5 / {315.1 to 362.0} / [273.5 to 314.2] | 34.8 to 40.0 / {354.9 to 407.9} / [308.0 to 354.0] | — | 60.9 to 70.0 / {621.0 to 713.8} / [539.0 to 619.5] |
| 125 (5.0) | 45.6 to 52.4 / {465.0 to 534.3} / [403.6 to 463.8] | 48.6 to 55.9 / {495.6 to 570.0} / [430.1 to 494.7] | — | 48.1 to 55.3 / {489.5 to 563.9} / [424.8 to 489.4] |
| 150 (6.0) | 64.5 to 74.2 / {657.7 to 756.6} / [570.9 to 656.7] | 44.8 to 51.5 / {456.8 to 525.2} / [396.5 to 455.8] | — | 67.5 to 77.6 / {688.3 to 791.3} / [597.4 to 686.8] |
| 200 (8.0) | 59.2 to 68.1 / {603.7 to 694.4} / [524.0 to 602.7] | 63.6 to 73.1 / {648.5 to 745.4} / [562.9 to 647.0] | — | 69.9 to 80.4 / {712.8 to 819.9} / [618.7 to 711.6] |
| 250 (10) | 144.0 to 165.6 / {1468 to 1689} / [1274 to 1466] | 156.3 to 179.7 / {1594 to 1832} / [1383 to 1590] | — | 190.5 to 219.1 / {1943 to 2234} / [1686 to 1939] |
| 300 (12) | 119.3 to 137.2 / {1217 to 1399} / [1056 to 1214] | 173.3 to 199.3 / {1767 to 2032} / [1534 to 1764] | — | 168.0 to 193.2 / {1713 to 1970} / [1487 to 1710] |
| 350 (14) | 164.7 to 189.4 / {1679 to 1931} / [1458 to 1676] | 238.3 to 274.0 / {2430 to 2794} / [2109 to 2425] | — | 238.6 to 274.4 / {2433 to 2798} / [2112 to 2429] |
| 400 (16) | 225.2 to 258.9 / {2296 to 2640} / [1993 to 2291] | 315.1 to 362.4 / {3213 to 3695} / [2789 to 3207] | — | 305.8 to 351.7 / {3118 to 3586} / [2707 to 3113] |

T0314.EPS

**Table 3.3.15 Flange Type Tightening Torque Values for PVC Piping**

| Tightening torque values for PFA lining type (N-m / {kgf-cm} / [in-lbf]) | | | | |
|---|---|---|---|---|
| Gasket types within flowtube | Fluororubber gasket (optional codes GA, GC, and GD) | | | |
| Gasket types for user's flange | Fluororubber gasket, chloroprene rubber gasket, or the equivalent in hardness | | | |
| Flange ratings / Size mm (inch) | JIS 10K, ANSI Class 150, and DIN PN10 | JIS 20K, ANSI Class 300, and DIN PN16 | DIN PN40 | JIS F12 (JIS 75M) |
| 25 (0.1) (with 10-mm flanges) | 0.8 to 1.3 / {8.158 to 13.26} / [7.08 to 11.51] | 0.8 to 1.3 / {8.158 to 13.26} / [7.08 to 11.51] | 0.8 to 1.3 / {8.158 to 13.26} / [7.08 to 11.51] | — |
| 25 (0.1) (with 15-mm flanges) | 0.9 to 1.6 / {9.177 to 16.32} / [7.966 to 14.16] | 0.9 to 1.6 / {9.177 to 16.32} / [7.966 to 14.16] | 0.9 to 1.6 / {9.177 to 16.32} / [7.966 to 14.16] | — |
| 5 (0.2) (with 10-mm flanges) | 0.8 to 1.3 / {8.158 to 13.26} / [7.08 to 11.51] | 0.8 to 1.3 / {8.158 to 13.26} / [7.08 to 11.51] | 0.8 to 1.3 / {8.158 to 13.26} / [7.08 to 11.51] | — |
| 5 (0.2) (with 15-mm flanges) | 0.9 to 1.6 / {9.177 to 16.32} / [7.966 to 14.16] | 0.9 to 1.6 / {9.177 to 16.32} / [7.966 to 14.16] | 0.9 to 1.6 / {9.177 to 16.32} / [7.966 to 14.16] | — |
| 10 (0.4) (with 10-mm flanges) | 0.8 to 1.3 / {8.158 to 13.26} / [7.08 to 11.51] | 0.8 to 1.3 / {8.158 to 13.26} / [7.08 to 11.51] | 0.8 to 1.3 / {8.158 to 13.26} / [7.08 to 11.51] | — |
| 10 (0.4) (with 15-mm flanges) | 0.9 to 1.6 / {9.177 to 16.32} / [7.966 to 14.16] | 0.9 to 1.6 / {9.177 to 16.32} / [7.966 to 14.16] | 0.9 to 1.6 / {9.177 to 16.32} / [7.966 to 14.16] | — |
| 15 (0.5) | 0.9 to 1.6 / {9.177 to 16.32} / [7.966 to 14.16] | 0.9 to 1.6 / {9.177 to 16.32} / [7.966 to 14.16] | 0.9 to 1.6 / {9.177 to 16.32} / [7.966 to 14.16] | — |
| 25 (1.0) | 2.7 to 4.5 / {27.53 to 45.89} / [23.9 to 39.83] | 2.7 to 4.5 / {27.53 to 45.89} / [23.9 to 39.83] | 2.3 to 3.9 / {23.45 to 39.77} / [20.36 to 34.52] | — |
| 32 (1.25) | 3.0 to 4.9 / {30.59 to 49.97} / [26.55 to 43.37] | 3.0 to 5.0 / {30.59 to 50.99} / [26.55 to 44.25] | 2.9 to 4.9 / {29.57 to 49.97} / [25.67 to 43.37] | — |
| 40 (1.5) | 4.5 to 7.6 / {45.89 to 77.5} / [39.83 to 67.26] | 4.7 to 7.8 / {47.93 to 79.54} / [41.6 to 69.03] | 4.4 to 7.4 / {44.87 to 75.46} / [38.94 to 65.49] | — |
| 50 (2.0) | 5.9 to 9.8 / {60.16 to 99.93} / [52.22 to 86.74] | 2.9 to 4.8 / {29.57 to 48.95 } / [25.67 to 42.48] | 5.5 to 9.2 / {56.08 to 93.81 } / [48.68 to 81.43] | — |
| 65 (2.5) | 9.0 to 15.0 / {91.77 to 153.0} / [79.66 to 132.8] | 4.4 to 7.3 / {44.87 to 74.44} / [38.94 to 64.61] | — | — |
| 80 (3.0) | 4.9 to 8.1 / {49.97 to 82.6} / [43.37 to 71.69] | 5.5 to 9.1 / {56.08 to 92.79} / [48.68 to 80.54] | — | 9.7 to 12.2 / {98.91 to 124.4} / [85.85 to 108.0] |
| 100 (4.0) | 6.7 to 11.2 / {68.32 to 114.2} / [59.3 to 99.13] | 7.5 to 12.6 / {76.48 to 128.5} / [66.38 to 111.5] | — | 13.3 to 22.2 / {135.6 to 226.4} / [117.7 to 196.5] |
| 125 (5.0) | 9.9 to 16.5 / {101.0 to 168.3} / [87.62 to 146.0] | 10.7 to 17.8 / {109.1 to 181.5} / [94.7 to 157.5] | — | 10.5 to 17.6 / {107.1 to 179.5} / [92.93 to 155.8] |
| 150 (6.0) | 14.4 to 24.0 / {146.8 to 244.7} / [127.4 to 212.4] | 9.8 to 16.3 / {99.93 to 166.2} / [86.74 to 144.3] | — | 15.2 to 25.3 / {155.0 to 258.0} / [134.5 to 223.9] |
| 200 (8.0) | 13.4 to 22.3 / {136.6 to 227.4} / [118.6 to 197.4] | 14.6 to 24.3 / {148.9 to 247.8} / [129.2 to 215.1] | — | 16.1 to 26.9 / {164.2 to 274.3} / [142.5 to 238.1] |

T0315.EPS

**Table 3.3.16 Flange Type Tightening Torque Values for Metal Piping and Permeable Fluids**

| Tightening torque values for PFA lining type (N-m / {kgf-cm} / [in-lbf]) | | | | |
|---|---|---|---|---|
| Gasket types within flowtube | No gasket (standard) | | | |
| Gasket types for user's flange | Non-asbestos gasket, PTFE-sheathed non-asbestos gasket, or the equivalent in hardness | | | |
| Flange ratings / Size mm (inch) | JIS 10K, ANSI Class 150, and DIN PN10 | JIS 20K, ANSI Class 300, and DIN PN16 | DIN PN40 | JIS F12 (JIS 75M) |
| 25 (0.1) (with 10-mm flanges) | 5.7 to 6.6 / {58.12 to 67.3} / [50.45 to 58.41] | 5.7 to 6.6 / {58.12 to 67.3} / [50.45 to 58.41] | 5.7 to 6.6 / {58.12 to 67.3} / [50.45 to 58.41] | — |
| 25 (0.1) (with 15-mm flanges) | 6.9 to 7.9 / {70.36 to 80.56} / [61.07 to 69.92] | 7.0 to 8.1 / {71.38 to 82.6} / [61.95 to 71.69] | 7.0 to 8.1 / {71.38 to 82.6} / [61.95 to 71.69] | — |
| 5 (0.2) (with 10-mm flanges) | 5.7 to 6.6 / {58.12 to 67.3} / [50.45 to 58.41] | 5.7 to 6.6 / {58.12 to 67.3} / [50.45 to 58.41] | 5.7 to 6.6 / {58.12 to 67.3} / [50.45 to 58.41] | — |
| 5 (0.2) (with 15-mm flanges) | 6.9 to 7.9 / {70.36 to 80.56} / [61.07 to 69.92] | 7.0 to 8.1 / {71.38 to 82.6} / [61.95 to 71.69] | 7.0 to 8.1 / {71.38 to 82.6} / [61.95 to 71.69] | — |
| 10 (0.4) (with 10-mm flanges) | 5.7 to 6.6 / {58.12 to 67.3} / [50.45 to 58.41] | 5.7 to 6.6 / {58.12 to 67.3} / [50.45 to 58.41] | 5.7 to 6.6 / {58.12 to 67.3} / [50.45 to 58.41] | — |
| 10 (0.4) (with 15-mm flanges) | 6.9 to 7.9 / {70.36 to 80.56} / [61.07 to 69.92] | 7.0 to 8.1 / {71.38 to 82.6} / [61.95 to 71.69] | 7.0 to 8.1 / {71.38 to 82.6} / [61.95 to 71.69] | — |
| 15 (0.5) | 6.9 to 7.9 / {70.36 to 80.56} / [61.07 to 69.92] | 7.0 to 8.1 / {71.38 to 82.6} / [61.95 to 71.69] | 7.0 to 8.1 / {71.38 to 82.6} / [61.95 to 71.69] | — |
| 25 (1.0) | 19.6 to 22.5 / {199.9 to 229.4} / [173.5 to 199.1] | 19.7 to 22.7 / {200.9 to 231.5} / [174.4 to 200.9] | 17.5 to 20.1 / {178.5 to 205.0} / [154.9 to 177.9] | — |
| 32 (1.25) | 21.5 to 24.7 / {219.2 to 251.9} / [190.3 to 218.6] | 21.6 to 24.8 / {220.3 to 252.9} / [191.2 to 219.5] | 22.1 to 25.4 / {225.4 to 259.0} / [195.6 to 224.8] | — |
| 40 (1.5) | 32.5 to 37.4 / {331.4 to 381.4} / [287.6 to 331.0] | 32.8 to 37.7 / {334.5 to 384.4} / [290.3 to 333.7] | 33.8 to 38.9 / {344.7 to 396.7} / [229.2 to 344.3] | — |
| 50 (2.0) | 41.3 to 47.5 / {421.1 to 484.4} / [365.5 to 420.4] | 20.6 to 23.7 / {210.1 to 241.7} / [182.3 to 209.8] | 42.2 to 48.5 / {430.3 to 494.6} / [373.5 to 429.3] | — |
| 65 (2.5) | 61.2 to 70.4 / {624.1 to 717.9} / [541.7 to 623.1] | 30.5 to 35.1 / {311.0 to 357.9} / [269.9 to 310.7] | — | — |
| 80 (3.0) | 34.2 to 39.3 / {348.7 to 400.7} / [302.7 to 347.8] | 38.5 to 44.3 / {392.6 to 451.7} / [340.7 to 392.1] | — | 68.1 to 78.3 / {694.4 to 798.4} / [602.7 to 693.0] |
| 100 (4.0) | 45.2 to 52.0 / {460.9 to 530.3} / [400.0 to 460.2] | 51.0 to 58.7 / {520.1 to 598.6} / [451.4 to 519.5] | — | 89.6 to 103.0 / {913.7 to 1050} / [793.0 to 911.6] |
| 125 (5.0) | 66.8 to 76.8 / {681.2 to 783.1} / [591.2 to 679.7] | 70.8 to 81.4 / {722.0 to 830.0} / [626.6 to 720.4] | — | 70.7 to 81.3 / {720.9 to 829.0} / [625.7 to 719.6] |
| 150 (6.0) | 93.9 to 108.8 / {957.5 to 1109} / [831.1 to 962.9] | 65.4 to 75.2 / {666.9 to 766.8} / [578.8 to 665.6] | — | 98.8 to 113.6 / {1007 to 1158} / [874.4 to 1005] |
| 200 (8.0) | 85.8 to 98.7 / {874.9 to 1006} / [759.4 to 873.6] | 91.5 to 105.2 / {933.0 to 1073} / [809.8 to 931.1] | — | 101.8 to 117.1 / {1038 to 1194} / [901.0 to 1036] |
| 250 (10) | 207.8 to 239.0 / {2119 to 2437} / [1839 to 2115] | 222.9 to 256.3 / {2273 to 2614} / [1973 to 2268] | — | 277.9 to 319.6 / {2834 to 3259} / [2460 to 2829] |
| 300 (12) | 171.0 to 196.7 / {1744 to 2006} / [1513 to 1741] | 184.1 to 211.7 / {1877 to 2159} / [1629 to 1874] | — | 243.8 to 280.4 / {2486 to 2859} / [2158 to 2482] |
| 350 (14) | 234.7 to 269.9 / {2393 to 2752} / [2077 to 2389] | 261.3 to 300.5 / {2665 to 3064} / [2313 to 2660] | — | 350.6 to 403.2 / {3575 to 4111} / [3103 to 3569] |
| 400 (16) | 320.0 to 368.0 / {3263 to 3753} / [2832 to 3257] | 343.2 to 394.7 / {3500 to 4025} / [3038 to 3493] | — | 448.3 to 515.5 / {4571 to 5257} / [3968 to 4562] |

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### 3.3.5 Nominal Diameter 500 mm (20 in.) to 2600 mm (104 in.), Flange Type

**IMPORTANT**

Use bolts and nuts in compliance with the flange ratings. Be sure to choose a gasket with an inner diameter that does not protrude inside the piping (refer to Table 3.3.13). If the inner diameter of the gasket is too large, however, fluid leakage may result.

#### (1) Mounting Direction

Mount the flowmeter so that the flow direction of the fluid to be measured is in line with the direction of the arrow mark on the flowmeter. It may be especially difficult to move large size flowtubes after bringing them into the pit. Check directions before bringing.

**IMPORTANT**

If it is impossible to match the direction of the arrow mark, the direction of the electrical connection can be changed (only for size 500 mm to 1000 mm). Refer to Section 5.1 to do this properly.
In case the fluid being measured flows against the arrow direction, refer to the parameter **J20: Flow Direction** in the user's manual of the AXFA11 Magnetic Flowmeter Remote Converter (IM 01E20C01-01E).

#### (2) Carrying Flowtube

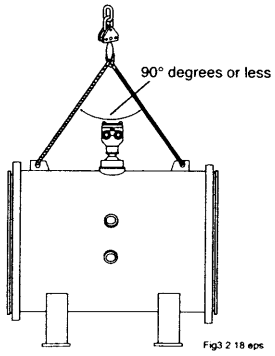



**Figure 3.3.6 Lifting Flowtube**

**CAUTION**

- When lifting the flowtube, use the lifting rings (eye bolts or shackle).
- To assure safety, keep lifting angle less than 90 degrees as shown in Figure 3.3.6
- If the size is 1600 mm (64 in.) or larger, use the eye bolts or eye nuts at all four of the locations simultaneously and lift the flowtube. Avoid lifting it from only one location or use only two locations and lift it at 45 degrees.
- Do not shock the installation foundation bracket when installing the flowmeter as the bracket may be damaged.

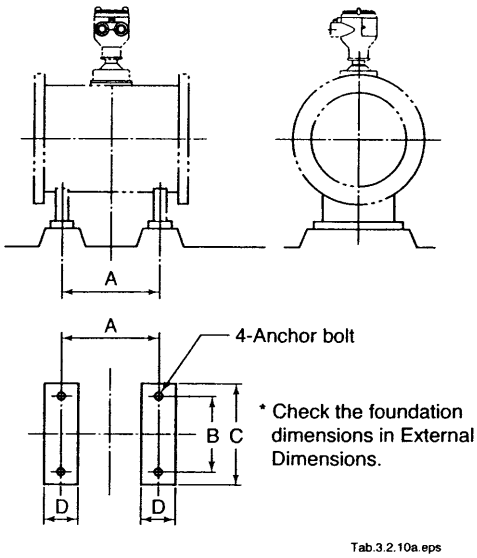
#### (3) Positioning Flowtube

Bring in the flowtube, place it in the bracket and use a jack to correct position it for height.

**IMPORTANT**

Apply the jack to near the flowtube support and insert a steel liner between the bracket and flowtube support. Never use wooden liner.
In addition, adjust any misalignment when the flowtube is brought in, as the jack can adjust vertical misalignments, but not horizontal ones.

#### (4) Installation Foundation Dimensions (Size 500 mm (20 in.) to 1000 mm (40 in.))



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19.1.2

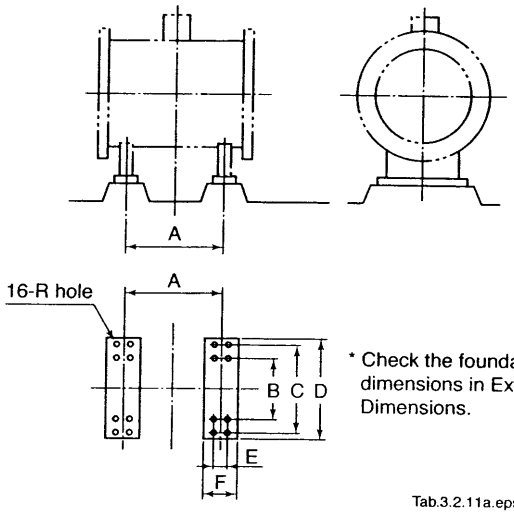
**Table 3.3.17 Installation Foundation Dimensions (Size 500 mm (20 in.) to 1000 mm (40 in.)).**

Unit: mm(approx. inch)

| Location / Size mm(inch) | A | B | C | D |
|---|---|---|---|---|
| 500 (20) | 350(13.8) | 350(13.8) | 420(16.5) | 125(4.9) |
| 600 (24) | 400(15.7) | 400(15.7) | 470(18.5) | 125(4.9) |
| 700 (28) | 450(17.7) | 500(19.7) | 570(22.4) | 125(4.9) |
| 800 (32) | 550(21.7) | 550(21.7) | 620(24.4) | 125(4.9) |
| 900 (36) | 700(27.6) | 650(25.6) | 720(28.3) | 125(4.9) |
| 1000 (40) | 800(31.5) | 700(27.6) | 770(30.3) | 125(4.9) |

Tab3.2.10b.eps

### (5) Installation Foundation Dimensions(Size 1100 mm (44 in.) to 2600 mm (104 in.))




* Check the foundation dimensions in External Dimensions.

Tab.3.2.11a.eps

**Table 3.3.18 Installation Foundation Dimensions (Size 1100 mm (44 in.) to 2600 mm (104 in.))**

Unit: mm(approx. inch)

| Location / Size mm (inch) | Dimensions | | | | | | |
|---|---|---|---|---|---|---|---|
| | A | $B^{\pm 2}$ | $C^{\pm 3}$ | D | E | F | R |
| 1100(44) | 1,211(47.7) | 720(28.3) | 1,100(43.3) | 1,280(50.4) | 130 (5.12) | 200 (7.87) | 19 (0.75) |
| 1200(48) | 1,261(49.6) | 780(30.7) | 1,200(47.2) | 1,380(54.3) | | | |
| 1350(54) | 1,366(53.8) | 880(34.6) | 1,350(53.1) | 1,540(60.6) | | | |
| 1500(60) | 1,490(58.7) | 980(38.6) | 1,500(59.1) | 1,700(66.9) | | | |
| 1600(64) | 1,698(66.9) | 1,080(42.5) | 1,650(65.0) | 1,850(72.8) | 170 (6.69) | 250 (9.84) | 22 (0.87) |
| 1800(72) | 1,864(73.4) | 1,180(46.5) | 1,800(70.9) | 2,000(78.7) | | | |
| 2000(80) | 2,010(79.1) | 1,300(51.2) | 2,000(78.7) | 2,220(87.4) | | | |
| 2200(88) | 2,172(85.5) | 1,430(56.3) | 2,200(86.6) | 2,420(95.3) | 200 (7.87) | 300 (11.81) | |
| 2400(96) | 2,218(87.3) | 1,560(61.4) | 2,400(94.5) | 2,620(103.1) | | | |
| 2600(104) | 2,300(90.6) | 1,700(66.9) | 2,600(102.4) | 2,820(111.0) | | | |

Tab3.2.11b.eps

### (6) Tightening Nuts

Pass the bolts from pipe line side, not flowtube side, and tighten the bolts according to the torque values for the metal piping in Table 3.3.19

Finish a brackets part with mortar.

**⚠ CAUTION**

- Be sure to tighten the nuts according to the prescribed toeque values. Tighten them diagonally with the same torque values, step by up to the prescribed torque value.
- Completely cover the brackets and liners with mortar.

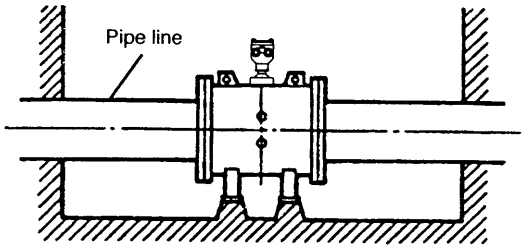



**Figure 3.3.7 Mounting Flowtube**

**Figure 3.3.19 Flange Type Tightening Torque Values for Material Piping**

| | Tightening torque values for Polyurethane Rubber lining (N-m / {kgf-cm} / [in-lbf]) | | | |
|---|---|---|---|---|
| Gasket types within | Size 500 to 1000 mm: No gasket<br>Size 1100 to 2600 mm: Butadiene-styrene-rubber+Natural rubber | | | |
| Gasket types for user's | Rubber gasket, or the equivalent in hardness | | | |
| Flange ratings / Size mm (inch) | JIS 10K | ANSI Class150 | DIN PIN10 | JIS F12 (JIS 75M) |
| 500 (20) | 43 to 72 / {438.5 to 734.2}/[380.6 to 637.2] | 51 to 85 / {520.1 to 866.8}/[451.4 to 752.3] | 43 to 71 / {438.5 to 724.0}/[380.6 to 628.4] | 61 to 102 / {622.0 to 1040}/[539.9 to 902.7] |
| 600 (24) | 52 to 87 / {530.3 to 887.2}/[460.2 to 770.0] | 82 to 137 / {836.2 to 1397}/[725.7 to 1213] | 64 to 107 / {652.6 to 1091}/[566.4 to 947.0] | 65 to 108 / {662.8 to 1101}/[575.3 to 955.8] |
| 700 (28) | 69 to 116 / {703.6 to 1183}/[610.7 to 1027] | — | 71 to 118 / {724.0 to 1203}/[628.4 to 1044] | 84 to 141 / {856.6 to 1438}/[743.4 to 1248] |
| 800 (32) | 71 to 119 / {724.0 to 1213}/[628.4 to 1053] | — | 94 to 157 / {958.5 to 1601}/[831.9 to 1390] | 81 to 136 / {826.0 to 1387}/[716.9 to 1204] |
| 900 (36) | 93 to 155 / {948.3 to 1581}/[823.1 to 1372] | — | 101 to 168 / {1030 to 1713}/[893.9 to 1487] | 98 to 163 / {999.3 to 1662}/[867.3 to 1443] |
| 1000 (40) | 150 to 249 / {1530 to 2539}/[1328 to 2204] | — | 147 to 245 / {1499 to 2498}/[1301 to 2168] | 117 to 195 / {1193 to 1988}/[1035 to 1076] |
| 1100 (44) | — | — | — | 180 to 300 / {1835 to 3059}/[1593 to 2655] |
| 1200 (48) | — | — | — | 177 to 294 / {1805 to 2998}/[1567 to 2602] |
| 1350 (54) | — | — | — | 254 to 423 / {2590 to 4313}/[2248 to 3744] |
| 1500 (60) | — | — | — | 277 to 462 / {2825 to 4711}/[2542 to 4089] |
| 1600 (64) | — | — | — | 268 to 446 / {2733 to 4548}/[2372 to 3947] |
| 1800 (72) | — | — | — | 243 to 406 / {2478 to 4140}/[2151 to 3593] |
| 2000 (80) | — | — | — | 331 to 551 / {3375 to 5619}/[2929 to 4877] |
| 2200 (88) | — | — | — | 376 to 626 / {3834 to 6383}/[3328 to 5540] |
| 2400 (96) | — | — | — | 406 to 677 / {4140 to 6904}/[3593 to 5992] |
| 2600 (104) | — | — | — | 542 to 903 / {5527 to 9208}/[4797 to 7992] |

Tab.3.3.19.EPS

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19.1.12

## 3.3.6 Sanitary Type

The sanitary type can be mounted to the piping using a clamp, a union, or a welded joint.

**NOTE**

This section describes the remote flowtube as an example. The same procedure also applies to the integral flowmeter.

### (1) Mounting Direction

Mount the flowmeter so that the flow direction of the fluid to be measured is in line with the direction of the arrow mark on the flowmeter.

**IMPORTANT**

If it is impossible to match the direction of the arrow mark, the direction of the electrical connection can be changed. Refer to Section 5.1 to do this properly.
In case the fluid being measured flows against the arrow direction, refer to the parameter **J20: Flow Direction** in the user's manual of the AXFA11 Magnetic Flowmeter Remote Converter (IM 01E20C01-01E) or the AXFA14 Magnetic Flowmeter Remote Converter/AXF Integral Flowmeter [Software Edition] (IM 01E20C02-01E).

### (2) Mounting Procedure

#### (a). Clamp type

(process connection codes: HAB, HDB, and HKB)

**1) Welding ferrule**

Weld a ferrule to the piping.

**IMPORTANT**

When welding the ferrule, pay attention to the edge preparation, level differences between the ferrule and the piping, and the welding current to avoid deforming the piping or causing stagnation portion of the fluid.

**2) Installing gasket**

Install a gasket for clamp to fit in the groove on the ferrule.

**3) Positioning flowmeter**

Position the flowmeter between the two ferrules.

**4) Tightening clamp**

Install a clamp to cover the tapered parts of the flowmeter-side adapter and the ferrule, and tighten the clamp screw.

**NOTE**

The ferrule, clamp, and gasket are not provided with the flowmeter, and must be provided by the user.

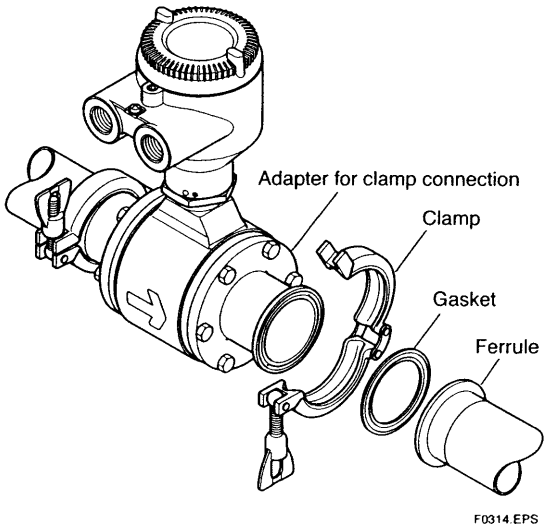


**Figure 3.3.8 Mounting Procedure for Clamp Connection Type**

### (b) Union type

(process connection codes: JDB, JKB, and JSB)

#### 1) Welding sleeve

Pass the piping through a nut and then weld a sleeve to the piping.

**IMPORTANT**

- Be sure to weld the sleeve after passing the piping through the nut.
- When welding the sleeve, pay attention to the edge preparation, level differences between the sleeve and the piping, and the welding current to avoid deforming the piping or causing stagnation of some of the fluid.

#### 2) Installing gasket

Install a gasket for union to fit in the groove on the sleeve.

#### 3) Positioning flowmeter

Move the nut closer to the piping temporarily and position the flowmeter between the two sleeves.

#### 4) Tightening nut

Install the nut to cover the tapered parts of the flowmeter-side adapter and the sleeve, and tighten it using a wrench.

**NOTE**

The sleeve, nut, and gasket are not provided with the flowmeter, and must be provided by the user.

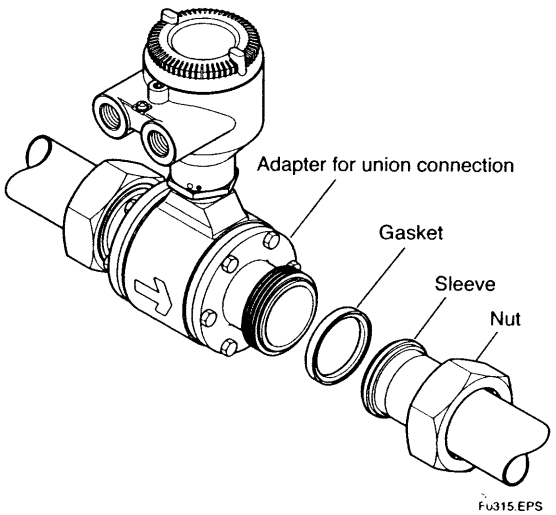


**Figure 3.3.9 Mounting Procedure for Union Connection Type**

### (c) Butt weld adapter type

(process connection codes: KDB and KKB)

#### 1) Removing adapter

Remove the butt weld adapter by loosening the mounting screws.

#### 2) Welding ferrule or sleeve

Weld a ferrule, a sleeve, or an alternative (provided by the user) to the butt weld adapter.

**IMPORTANT**

- Be sure to weld the ferrule, the sleeve, or the alternative after removing the butt weld adapter from the flowmeter itself.
- When welding the ferrule, the sleeve, or the alternative, pay attention to the edge preparation, level differences between them and the piping, and the welding current to avoid deforming the piping or causing stagnation portion of the fluid.

#### 3) Installing butt weld adapter

Install a gasket to fit in the groove of the butt weld adapter, and tighten the mounting screws.

**CAUTION**

- In case of standard gasket (EPDM rubber), tighten the adapter mounting screw according to the torque values in Table 3.3.20.
- In case that optional code GH (Silicon rubber) is selected, tighten the adapter mounting screw according to the torque values in Table 3.3.21.
- Tighten the adapter mounting screw in diagonal order step by step.
- After tightening of screw, confirm that gaskets protrude inside adapter. Protruding of gasket is necessary to keep the sanitary requirements.

**Table 3.3.20 Tightening Torque Values of adapter for EPDM rubber gasket**

| Tightening torque values (N-m / {kgf-cm} / [in-lbf]) | |
|---|---|
| Size mm (inch) \ Gasket type | EPDM rubber (standard) |
| 15 (0.5), 25 (1.0), 32 (1.25), 40 (1.5) | 3.0 to 3.5 / {30.59 to 35.69} / [26.55 to 30.98] |
| 50 (2.0), 65 (2.5) | 4.5 to 5.0 / {45.89 to 50.99} / [39.83 to 44.25] |
| 80 (3.0) | 8.0 to 9.0 / {81.58 to 91.78} / [70.81 to 79.65] |
| 100 (4.0), 125 (5.0) | 10 to 11 / {102.0 to 112.2} / [88.50 to 97.35] |

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19.1.12

**Table 3.3.21 Tightening Torque Values of adapter for silicon rubber gasket**

| Tightening torque values (N-m / {kgf-cm} / [in-lbf]) | |
|---|---|
| Size mm (inch) \ Gasket type | Silicon rubber (optional code GH) |
| 15 (0.5), 25 (1.0), 32 (1.25), 40 (1.5) | 2.0 to 2.5 / {20.39 to 25.49} / [17.70 to 22.13] |
| 50 (2.0), 65 (2.5), 80 (3.0) | 4.0 to 4.5 / {40.79 to 45.89} / [35.40 to 39.83] |
| 100 (4.0), 125 (5.0) | 6.0 to 6.5 / {61.18 to 66.28} / [53.10 to 57.53] |

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### 4) Mounting flowmeter to piping

Connect the flowmeter to the piping in a manner appropriate to the ferrule, the sleeve, or the alternative that has been welded to the adapter.

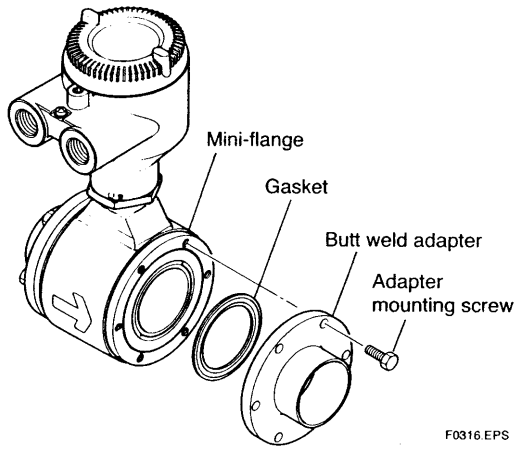


**Figure 3.3.10 Mounting Procedure for Weld Joint Adapter Type**

## (3) Maintenance of Sanitary Type

Refer to Section 5.3

# 4. WIRING

## 4.1 Wiring the Integral Flowmeter

This section describes the wiring of the integral flowmeter.

**⚠ WARNING**

The wiring of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.

**⚠ CAUTION**

Once all wiring is complete, check the connections before applying power to the instrument. Improper arrangements or wiring may cause a unit malfunction or damage.

### 4.1.1 Wiring Precautions

Be sure to observe the following precautions when wiring:

**⚠ CAUTION**

- In cases where the ambient temperature exceeds 50°C (122°F), use external heat-resistant wiring with a maximum allowable temperature of 70°C (158°F) or above.
- Do not connect cables outdoors in wet weather in order to prevent damage from condensation and to protect the insulation, e.g. inside the terminal box of the flowmeter.
- All the cable ends must be provided with round crimp-on terminals and be securely wired.
- The signal cables must be routed in separate steel conduit tubes 16 (JIS C 8305) or flexible conduit tubes 15 (JIS C 8309).
- Always route the power and output signal cables in separate steel conduit tubes, except when the power supply voltage is 24 V and four-core cables are used for wiring. Keep conduits or flexible tubes watertight using sealing tape.
- When waterproof glands or union equipped waterproof glands are used, avoid tightening the glands with an excessive torque.
- In case of 24 V power supply version, it comes with a plug. Use this plug to cover the unused wiring port when wiring the instrument with only one, four-core cable.
- Be sure to turn the power off before opening the terminal box cover.
- Before turning the power on, tighten the terminal box cover securely.
- The terminal box cover is locked by the special screw. In case of opening the terminal box cover, use the hexagonal wrench attached. For handling the locking screw, refer to Figure 4.1.5.
- Be sure to lock the cover by the special screw using the hexagonal wrench attached after installing the cover. For handling the locking screw, refer to Figure 4.1.15.
- Explosion protected types must be wired in accordance with specific requirement (and, in certain countries, legal regulations) in order to preserve the effectiveness of their explosion protected features.

### 4.1.2 Power Cable/Output Cable

Use polyvinyl chloride insulated and sheathed control cables (JIS C 3401) or polyvinyl chloride insulated and sheathed portable power cables (JIS C 3312) or the equivalent.

Outer Diameter: 6.5 to 12 mm (0.26 to 0.47 in.)
10.5 or 11.5 mm (0.41 to 0.45 in.) for optional code EG, EU and EW.
6 to 12 mm (0.24 to 0.47 in.) for optional code EP.
Nominal Cross Section (Single wire): 0.5 to 2.5 $mm^2$
Nominal Cross Section (Stranded wire): 0.5 to 1.5 $mm^2$

In case of power cable, Green/Yellow covered conductor shall be used only for connection to PROTECTIVE CONDUCTOR TERMINALS. Conform to IEC227, IEC245 or equivalent national authorization.

**NOTE**

- For power cables, always use a crimp terminal with an insulation cover.
- Use crimp tools from the manufacturer of the crimp terminal you want to use to connect the crimp terminal and cable.
- Use crimp tools that are appropriate for the diameter of the cable to be connected.

## 4.1.3 Wiring Ports

This instrument is of watertight construction as stipulated in JIS C0920-1982. (Tests to prove protection against ingress of water and degrees of protection against ingress of solid objects for electrical equipment.) It is shipped with a wiring bracket (waterproof gland or waterproof gland with union) or a plastic gland attached, only in cases where an optional specification is selected for the wiring port.
In case of the explosion proof type, refer to Chapter 8.

### (1) When there are no particular optional specifications

The wiring port is sealed with a cap (not water-proof) that must be removed before wiring. At this time, handle the wiring port in accordance with the JIS C0920-1982 mentioned above.

### (2) Wiring using waterproof glands

**IMPORTANT**

To prevent water or condensation from entering the converter housing, waterproof glands are recommended. Do not over-tighten the glands or damage to the cables may result. Tightness of the gland can be checked by confirming that the cable is held firmly in place.

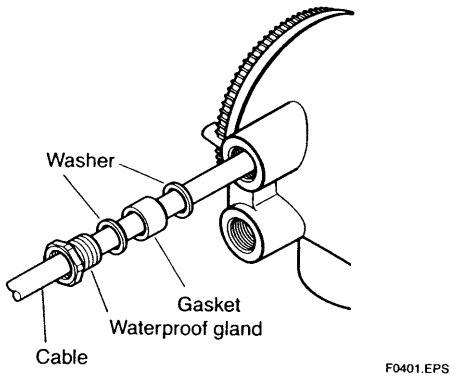


**Figure 4.1.1 Waterproof Gland (Optional code EG)**

For working on the electric wire tubes or the flexible tubes (PF1/2), remove the waterproof gland and attach them directly to the wiring port.

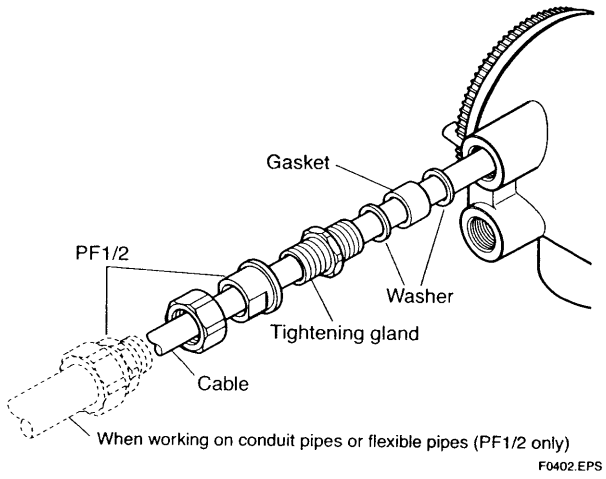


**Figure 4.1.2 Waterproof Gland with Union Joint (Optional code EU)**

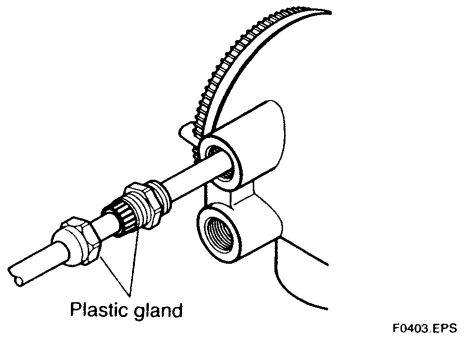


**Figure 4.1.3 Plastic Gland (Optional code EP)**

### (3) Conduit Wiring

When wiring the conduits, pass the conduit through the wiring connection port, and utilize the waterproof gland to prevent water from flowing in. Place the conduit pipe on an angle as shown in Figure 4.1.4. Install a drain valve at the low end of the vertical pipe, and open the valve regularly.

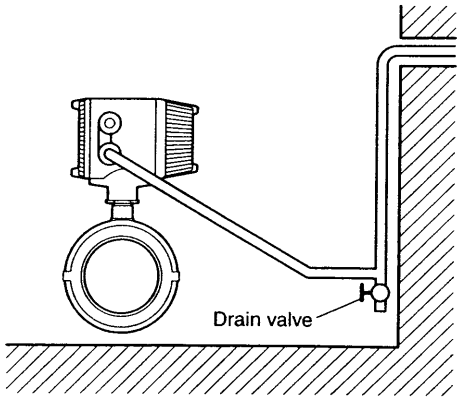


**Figure 4.1.4 Conduit Wiring**

## 4.1.4 Wiring Connections

### (1) Removing Cover

Loosen cover locking screw 2 clockwise using a hexagonal wrench (nominal size 3 mm) to unlock the cover. (Upon shipment from the manufacturing plant, the cover is unlocked.) Hold the flowmeter with your hand and remove the cover by turning it in the direction of the arrow as shown below.

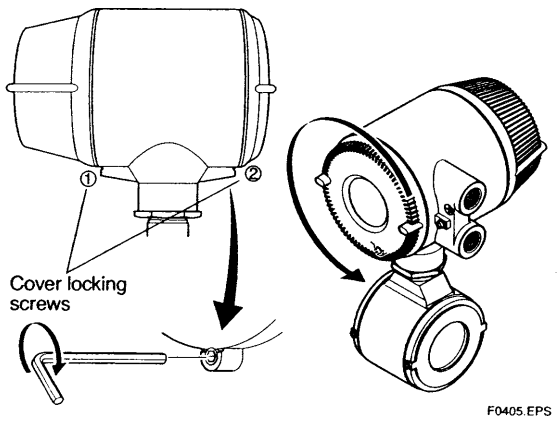


**Figure 4.1.5 Removing the Terminal Box Cover**

### (2) Terminal Configuration

When the cover is removed, the connection terminals will be visible.

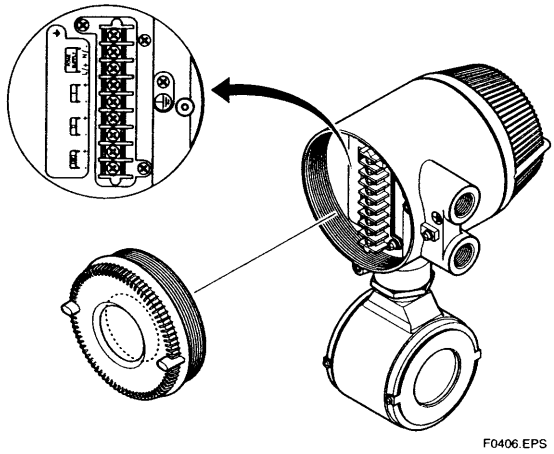


**Figure 4.1.6 Terminal Configuration**

The description of the terminal symbols is shown in Table 4.1.1.

**Table 4.1.1 Terminal Symbols**

| Terminal Symbols | Description |
|---|---|
| ⏚ | Functional grounding |
| N/- L/+ | Power supply |
| I+ I- | Current output 4 to 20mA DC |
| DO+ DO- | Pulse output/Alarm output/ Status output |
| DIO+ DIO- | Alarm output/Status output Status input |
| ⊕ | Protective grounding (Outside of the terminal) |

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### (3) Precautions for Wiring of Power Supply Cables

When connecting to the power supply, observe the points below. Failure to comply with these warnings may result in an electric shock or damage to the instrument.

**⚠ WARNING**

- Ensure that the power supply is OFF in order to prevent electric shocks.
- Ensure the protective grounding terminal is grounded before turning the power on.
- Use insulating sleeve crimp terminals (for 4-mm screws) for the power supply wiring and protective grounding wiring.
- Install an external switch or circuit breaker as a means to turn the power off (capacitance; 15A, conforming to IEC947-1 and IEC947-3). Locate this switch either near the instrument or in other

places facilitating easy operation. Affix a "Power Off Equipment" label to this external switch or circuit breaker.

### Wiring Procedure

1. Turn the instrument's power off.
2. Wire the power supply cable and the functional grounding cable to the power supply terminals.

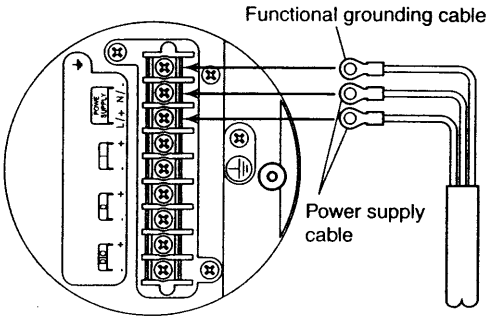



**Figure 4.1.7 Electric Cable Wiring**

### (4) DC Power Connection

When using DC power as the power supply for the converter, give attention to the following points.

#### 1) Connecting Power Supply

**IMPORTANT**

Do not connect power supply with reversed polarities.

L/+ terminal: connect +

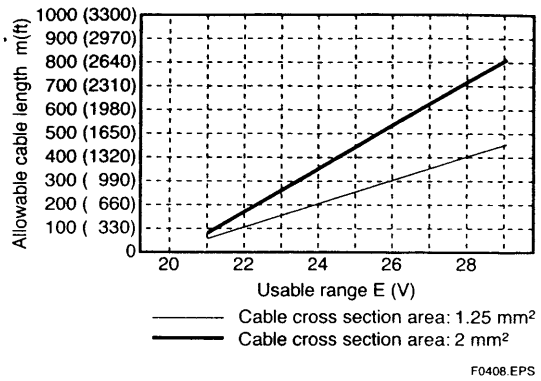
N/– terminal: connect –

#### 2) Required Power Supply Voltages

**IMPORTANT**

When using a 24 V power supply, the specification for the supply voltage is 24 V (–15% to +20%), but the input voltage of the converter drops due to cable resistance therefore it must be used within the following ranges.

**Supply Voltage and Cable Length**




#### 3) Setting Power Supply Frequency

**IMPORTANT**

Set the local commercial power frequency in order to eliminate the effect of induction noise from the power supply.
Refer to "Chapter 6: Parameter Description" in the user's manual of the AXF Integral Flowmeter [Software Edition] (IM 01E20C02-01E).
Parameter No.: **J30** and **J31**

### (5) Grounding

**CAUTION**

Be sure to connect the protective grounding of the AXF integral flowmeter with a cable of 2mm² or larger cross section in order to avoid electrical shock to the operators and maintenance engineers and to prevent the influence of external noise.
Connect the grounding wire to the ⏚ mark.
The grounding should satisfy Class D requirements (ground resistance, 100 Ω or less).
In case of TIIS Flame proof type, the grounding should satisfy Class C requirements (ground resistance, 10 Ω or less) or class A requirements (ground resistance, 10 Ω or less).
For explosion proof type except TIIS, follow the domestic electrical requirements as regulated in each country.

**IMPORTANT**

When optional code A (lighting protector) is selected, the ground should satisfy Class C requirements (grounding resistance, 10 Ω or less).

- The protective grounding terminals ⏚ are located on the inside and outside of the terminal area. Either terminal may be used.
- Use 600 V vinyl insulation wires as the grounding wires.

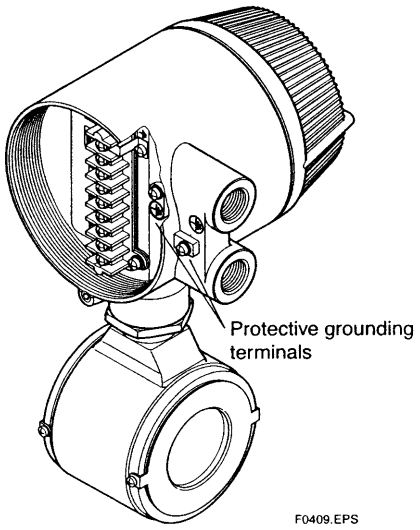



**Figure 4.1.8 Protective Grounding Terminal Location**

**IMPORTANT**

Improper grounding can have an adverse effect on the flow measurement. Ensure that the instrument is properly grounded.

The electromotive force of the magnetic flowmeter is minute and it is easily affected by noise, and the reference electric potential is the same as that of the measuring fluid. Therefore, the reference electric potential (terminal potential) of the flowtube and converter also need to be the same as that of the measuring fluid. Moreover, the potential must be the same as the ground. The magnetic flowmeter is equipped with an grounding ring that makes a connection with the charge of the measured fluid for grounding and protects the lining. Be sure to ground the flowmeter according to Figure 4.1.9.

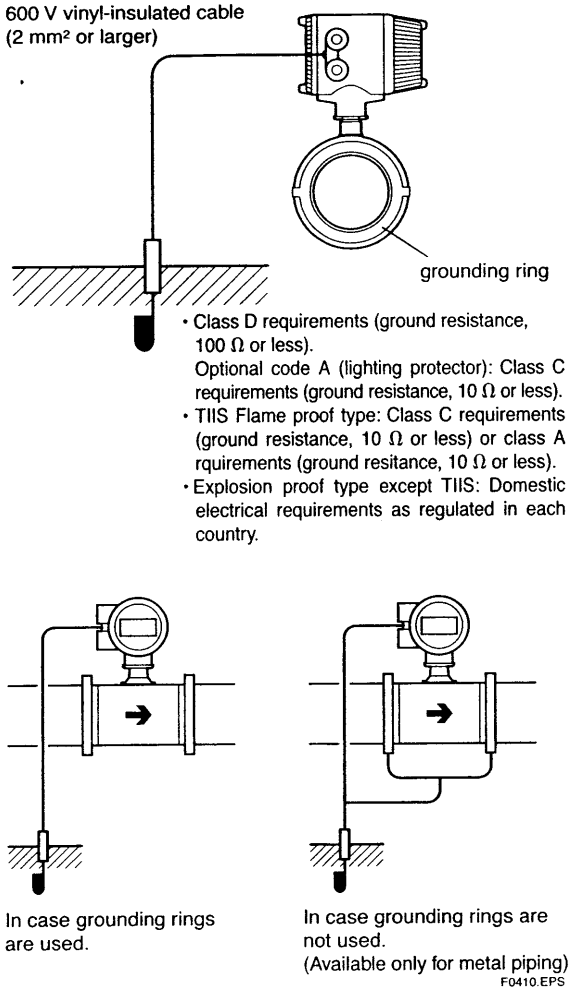



**Figure 4.1.9 Grounding**

### (6) Connecting to External Instruments

**WARNING**

Before wiring with external instruments, be sure to turn off the magnetic flowmeter and any external instruments.

Connect the AXF integral flowmeter terminal to external instruments, giving attention to the following points.

## ● 4 to 20 mA DC Current Output

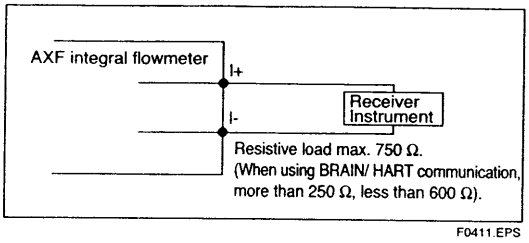



**Figure 4.1.10 4 to 20 mA DC Output Connection**

## ● Pulse Output

### IMPORTANT

- As this is a transistor contact (insulated type), give attention to proper voltage and polarity when wiring.
- Do not apply a voltage larger than 30V DC or a current larger than 0.2A in order to prevent damage to the instrument.
- When input filter constant of the electronic counter is large in relation to the pulse width, the signal will decrease and the count will not be accurate.
- If the input impedance of the electronic counter is large, an induction noise from the power supply may result in inaccurate counts. Use a shield cable or sufficiently reduce the input impedance of the electronic counter within the electromagnetic flowmeter pulse output specification range.
- The active pulse output (Optional code EM) cannot be used in conjunction with the standard pulse output.
- When the active pulse output (Optional code EM) is selected, do not be short-circuit between the DO+ and DO– terminals to avoid damaging the instrument.
- To avoid communication (BRAIN/ HART) failure, it is recommended to use the shield cable.

### NOTE

For pulse output from the DO terminals, parameters must be set. Refer to "Parameter Description" in the user's manual of the AXF Integral Flowmeter [Software Edition] (IM 01E20C02-01E).

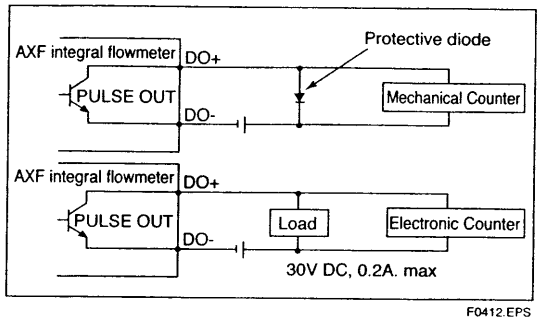



**Figure 4.1.11 Pulse Output Connection**

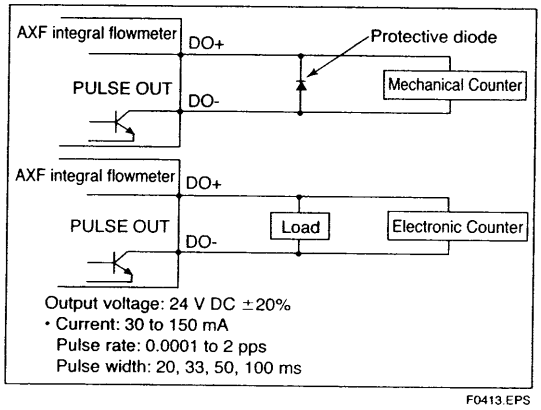



**Figure 4.1.12 Active Pulse Output (Optional code EM)**

## ● Status Input

**IMPORTANT**

Status inputs are designed for use with no-voltage (dry) contacts. Be careful not to connect the status to any signal source carrying voltage. Applying voltage may damage the input circuit.

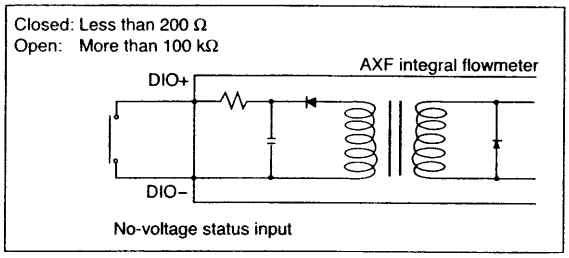



**Figure 4.1.13 Status Input Connection**

**NOTE**

For status input to the DIO terminals, parameters must be set. Refer to "Parameter Description" in the user's manual of the AXF Integral Flowmeter [Software Edition] (IM 01E20C02-01E).

## ● Status Output/ Alarm Output

**IMPORTANT**

Since this is an isolated transistor output, be careful of voltage and polarity when wiring. Do not apply a voltage larger than 30V DC or a current larger than 0.2A in order to prevent damage to the instrument.
This output cannot switch an AC load. To switch an AC load, an intermediate relay must be inserted as shown in Figure 4.1.14.
*The alarm output operates from open (normal) to closed (alarm occurrence) in the default value (as setup upon plant shipment). Changes can be made via the parameter settings.

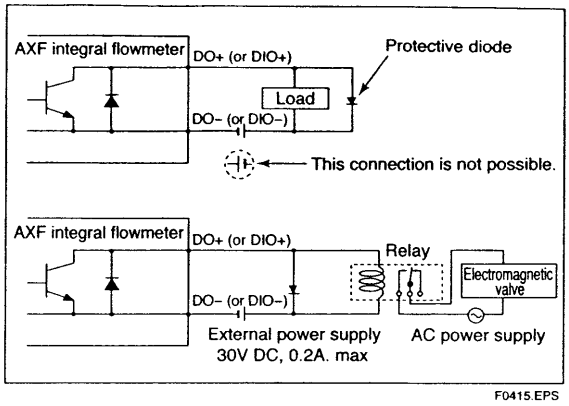



**Figure 4.1.14 Status Output/Alarm Output Connection**

**NOTE**

For status and alarm outputs from the DO or DIO terminals, parameters must be set. Refer to "Parameter Description" in the user's manual of the AXF Integral Flowmeter [Software Edition] (IM 01E20C02-01E).

### (7) Installing the Cover

Install the cover to the flowmeter by turning it in the direction of the arrow as shown below. Tighten cover locking screw 2 counterclockwise using a hexagonal wrench (nominal size 3 mm) to lock the cover.

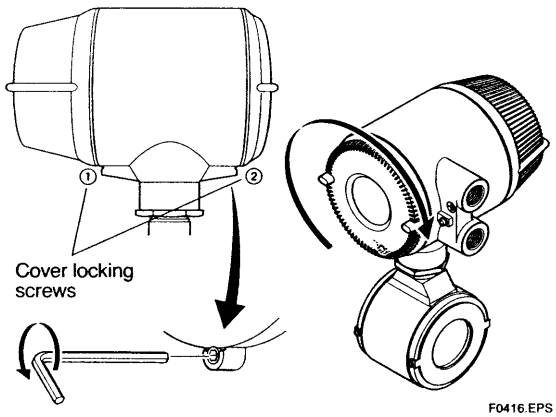



**Figure 4.1.15 Installing the Terminal Box Cover**

# 4.2 Wiring the Remote Flowtube

This section describes the wiring of the remote flowtube only. For information relating to the wiring of the converter, refer to the user's manual of the AXFA11 Magnetic Flowmeter Remote Converter (IM 01E20C01-01E) or the AXFA14 Magnetic Flowmeter Remote Converter (IM 01E20C02-01E).

**⚠ WARNING**

The wiring of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.

**⚠ CAUTION**

Once all wiring is complete, check the connections before applying power to the instrument. Improper arrangements or wiring may cause a unit malfunction or damage.

## 4.2.1 Wiring Precautions

Be sure to observe the following precautions when wiring:

**⚠ CAUTION**

- In cases where the ambient temperature exceeds 50°C (122°F), use external heat-resistant wiring with a maximum allowable temperature of 70°C (158°F) or above.
- Do not connect cables outdoors in wet weather in order to prevent damage from condensation and to protect the insulation, e.g. inside the terminal box of the flowtube.
- Do not splice the cable between the flowtube terminal and the converter if it is too short. Replace the short cable with a cable that is the appropriate length.
- All the cable ends must be provided with round crimp-on terminals and be securely wired.
- The signal cables must be routed in separate steel conduit tubes 16 (JIS C 8305) or flexible conduit tubes 15 (JIS C 8309).
- Keep conduits or flexible tubes watertight using sealing tape.
- Ground the remote flowtube and the converter separately.
- Cover each shield of the signal cable with vinyl tube or vinyl tape to avoid contact between two shields or between a shield and a case.
- When waterproof glands or union equipped waterproof glands are used, avoid tightening the glands with an excessive torque.
- Be sure to turn the power off before opening the terminal box cover.
- Before turning the power on, tighten the terminal box cover securely.
- The terminal box cover of size 2.5 mm to 1000 mm is locked by the special screw. In case of opening the terminal box cover, use the hexagonal wrench attached. For handling the locking screw, refer to Figure 4.2.8.
- Be sure to lock the cover of size 2.5 mm to 1000 mm by the special screw using the hexagonal wrench attached after installing the cover. For handling the locking screw, refer to Figure 4.2.20.
- Explosion protected types must be wired in accordance with specific requirement (and, in certain countries, legal regulations) in order to preserve the effectiveness of their explosion protected features.
- When submersible type or optional code DHC is selected, waterproof glands, signal and excitation cables are attached.
  In order to preserve the effectiveness of waterproof features, the terminal box cover and waterproof grounds must not be detached from flowmeter.

## 4.2.2 Cables

### (1) Dedicated Signal Cable (AXFC)

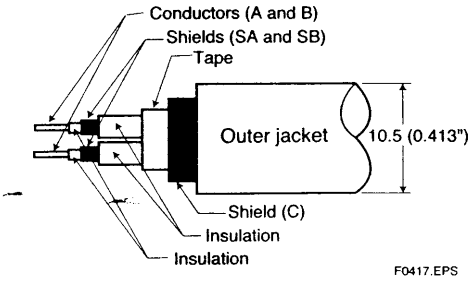



**Figure 4.2.1 Dedicated Signal Cable AXFC**

The flow signal is transmitted via this dedicated cable. The cable is constructed with double shielding over the two conductors, and heat-resistant vinyl is used for the outer jacket material.

Finished diameter: 10.5 mm (0.413")
Maximum length:
Combination with the AXFA11 converter:
200 m (660 ft)
Combination with the AXFA14 converter:
100 m (330 ft)
Maximum temperature: 80°C (176°F)

**IMPORTANT**

If the cable is longer than required, cut off any extra length rather than coiling it up, and terminate the conductors as shown in Figure 4.2.2. Avoid using junction terminal boards to extend the cable length, as this will interrupt the shielding.

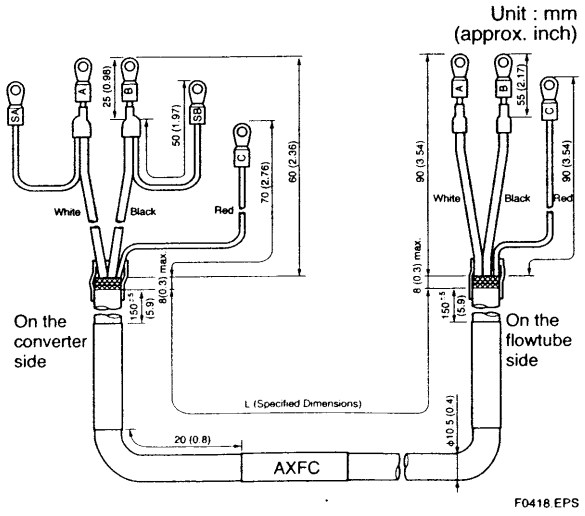



**Figure 4.2.2 Treatment of Dedicated Signal Cables**

**CAUTION**

- As crimp terminals A, B, SA, SB and C have their own electrical potentials, securely insulate them so as not to come in contact with one another.
- To prevent a shield from coming in contact with another shield or the case, cover each shield with a vinyl tube or wrap it in vinyl tape.

**NOTE**

Conductors A and B carry the signal from the electrodes, and C is at the potential of the liquid (signal common). Shields SA and SB are kept at the same potentials as the individual electrodes (these are actively driven shields.) This is done to reduce the effect of the distributed capacitance of the cable at long cable length. Note that, since the signals from the individual electrodes are impedance converted inside the converter, errors will result if they come in contact with any other component. Great care must be taken in the cable end treatment.

### (2) Excitation Cable

Use polyvinyl chloride insulated and sheathed control cables (JIS C 3401) or polyvinyl chloride insulated and sheathed portable power cables (JIS C 3312) or the equivalent.

Outer Diameter: 6.5 to 12 mm (0.26 to 0.47 in.)
10.5 or 11.5 mm (0.41 to 0.45 in.) for optional code EG, EU and EW.
6 to 12 mm (0.24 to 0.47 in.) for optional code EP.
Nominal Cross Section (Single wire): 0.5 to 2.5 mm²
Nominal Cross Section (Stranded wire): 0.5 to 1.5 mm²

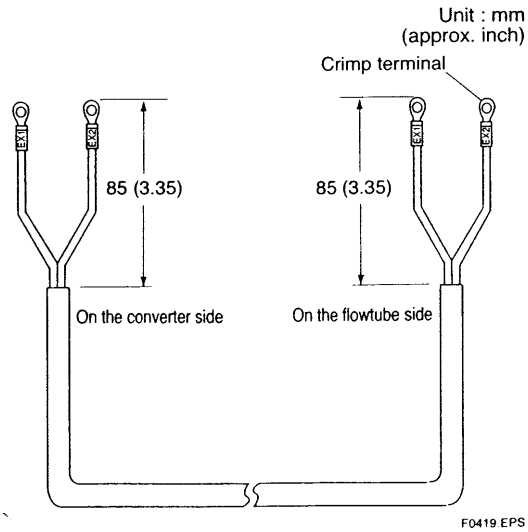



**Figure 4.2.3 End Treatment of Excitation Cable**

**NOTE**

- For excitation cables, always use a crimp terminal with an insulation cover.
- Use crimp tools from the manufacturer of the crimp terminal you want to use to connect the crimp terminal and cable.
- Use crimp tools that are appropriate for the diameter of the cable to be connected.

## 4.2.3 Wiring Ports

This instrument is of watertight construction as stipulated in JIS C0920-1982. (Tests to prove protection against ingress of water and degrees of protection against ingress of solid objects for electrical equipment.) It is shipped with a wiring bracket (waterproof gland or waterproof gland with union) or a plastic gland attached, only in cases where an optional specification is selected for the wiring port.
In case of the explosion proof type, refer to chapter 8.

### (1) When there are no particular optional specifications

The wiring port is sealed with a cap (not water-proof) that must be removed before wiring. At this time, handle the wiring port in accordance with the JIS C0920-1982 mentioned above.

### (2) Wiring using waterproof glands

**IMPORTANT**

To prevent water or condensation from entering the converter housing, waterproof glands are recommended. Do not over-tighten the glands or damage to the cables may result. Tightness of the gland can be checked by confirming that the cable is held firmly in place.

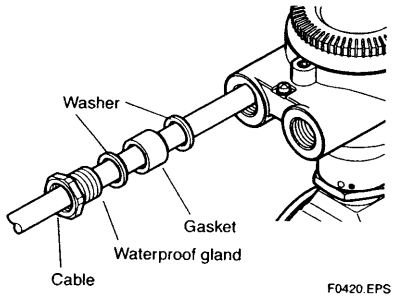



**Figure 4.2.4 Waterproof Gland (Optional code EG)**

For working on the electric wire tubes or the flexible tubes (PF1/2), remove the waterproof gland and attach them directly to the wiring port.

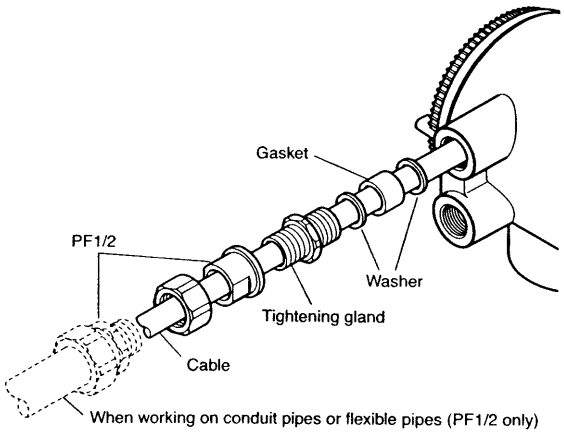



**Figure 4.2.5 Waterproof Gland with Union Joint (Optional code EU)**

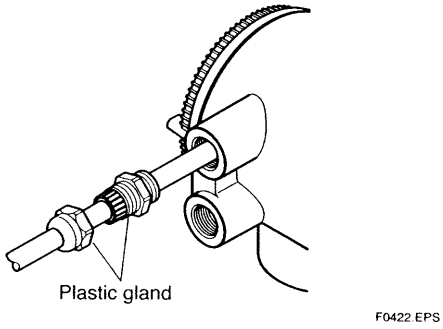



**Figure 4.2.6 Plastic Gland (Optional code EP)**

### (3) Conduit Wiring

When wiring the conduits, pass the conduit through the wiring connection port, and utilize the waterproof gland to prevent water from flowing in. Place the conduit pipe on an angle as shown in Figure 4.2.7. Install a drain valve at the low end of the vertical pipe, and open the valve regularly.

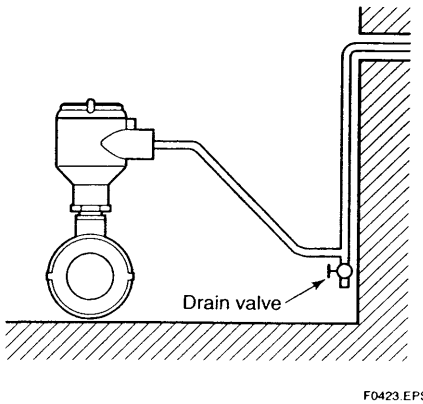



**Figure 4.2.7 Conduit Wiring**

## 4.2.4 Wiring Connections

**WARNING**

Before wiring, be sure that the power supply for AXFA11 or AXFA14 converter has been turned off to prevent an electrical shock.

### (1) Removing Cover (Size 2.5 to 1000 mm (0.1 to 40 in.))

Loosen the cover locking screw clockwise using a hexagonal wrench (nominal size 3 mm) to unlock the cover. (Upon shipment from the manufacturing plant, the cover is unlocked.) Hold the flowtube with your hand and remove the cover by turning it in the direction of the arrow as shown below.

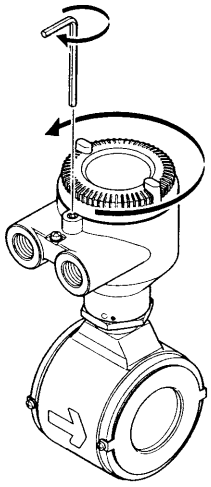
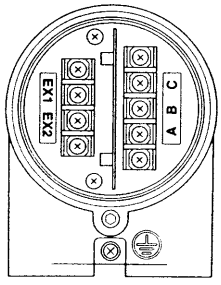



**Figure 4.2.8 Removing the Terminal Box Cover (Remote Flowtube)**

### (2) Terminal Configuration

When the cover is removed, the connection terminals will be visible.




| Terminal Symbols | Description |
|---|---|
| A<br>B<br>C | Flow signal output |
| EX1<br>EX2 | Excitation current input |
| ⏚ | Protective grounding (Outside of the terminal) |

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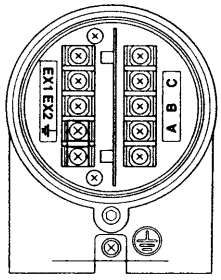
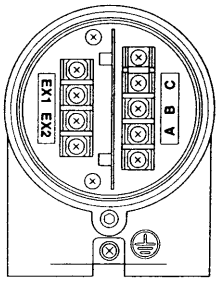
**Figure 4.2.9 Terminal Configuration (General-Purpose Use, Submersible Type, Sanitary Type, Size 2.5 to 400 mm (0.1 to 16 in.))**




| Terminal Symbols | Description |
|---|---|
| A<br>B<br>C | Flow signal output |
| EX1<br>EX2 | Excitation current input |
| ⏚ | Functional grounding (Only for explosion proof type) |
| ⏚ | Protective grounding (Oitside of the terminal) |

F042401.EPS

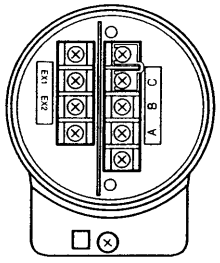
**Figure 4.2.10 Terminal Configuration (Explosion proof Type, Size 2.5 to 400 mm (0.1 to 16 in.))**




| Terminal Symbols | Description |
|---|---|
| A<br>B<br>C | Flow signal output |
| EX1<br>EX2 | Excitation current input |
| ⏚ | Protective grounding (Outside of the terminal) |

F040211.EPS

**Figure 4.2.11 Terminal Configuration (General-purpose Use, Submersible Type, Size 500 to 1000 mm (20 to 40 in.))**




| Terminal Symbols | Description |
|---|---|
| A<br>B<br>C | Flow signal output |
| EX1<br>EX2 | Excitation current input |
| ⏚ | Protective grounding (Outside of the terminal) |

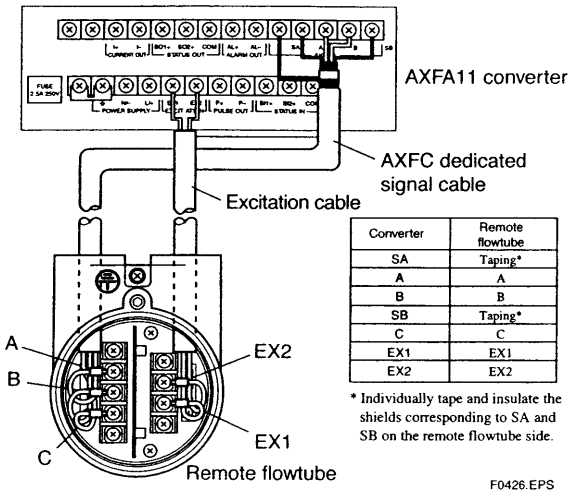
F040212.EPS

**Figure 4.2.12 Terminal Configuration (General-purpose Use, submersible Type, Size 1100 to 2600 mm (44 to 104 in.))**

### (3) Wiring the Remote Flowtube (General-Purpose Use, Submersible Type, Sanitary Type, Size 2.5 to 400 mm (0.1 to 16 in.)) with Converters

#### 1) Connection with the AXFA11 converter

Connect wiring as shown in the figure below.




| Converter | Remote flowtube |
|---|---|
| SA | Taping* |
| A | A |
| B | B |
| SB | Taping* |
| C | C |
| EX1 | EX1 |
| EX2 | EX2 |

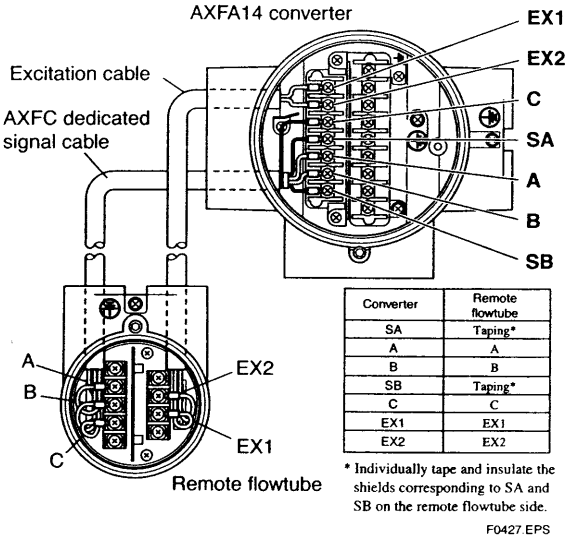
* Individually tape and insulate the shields corresponding to SA and SB on the remote flowtube side.

F0426.EPS

**Figure 4.2.13 Wiring Diagram**

#### 2) Connection with the AXFA14 converter

Connect wiring as shown in the figure below.




| Converter | Remote flowtube |
|---|---|
| SA | Taping* |
| A | A |
| B | B |
| SB | Taping* |
| C | C |
| EX1 | EX1 |
| EX2 | EX2 |

* Individually tape and insulate the shields corresponding to SA and SB on the remote flowtube side.

F0427.EPS

**Figure 4.2.14 Wiring Diagram**

### (4) Wiring the Remote Flowtube (Explosion Proof Type) with Converters

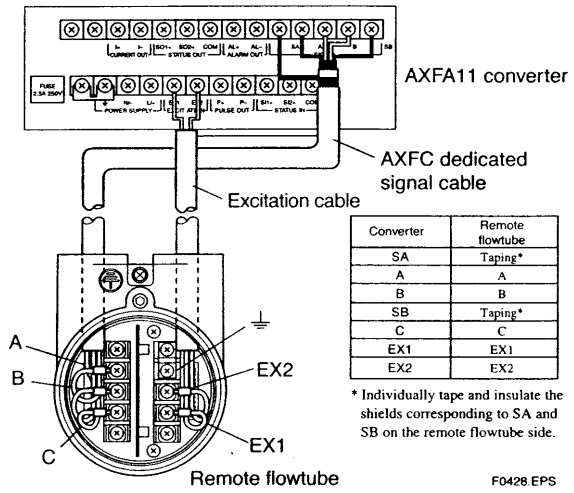
**IMPORTANT**

In case of TIIS Flame proof type, a remote flowtube is available for combined use with AXFA14 converter only.

#### 1) Connection with the AXFA11 converter

In case of explosion proof type for CENELEC ATEX, FM, and CSA certification, connect wiring as shown in the figure below.

In case of the explosion proof type, the protective grounding ⏚ of remote flowtube must be connected to a suitable IS grounding system. In that case, ⏚ (functional grounding terminal) need not be connected.




| Converter | Remote flowtube |
|---|---|
| SA | Taping* |
| A | A |
| B | B |
| SB | Taping* |
| C | C |
| EX1 | EX1 |
| EX2 | EX2 |

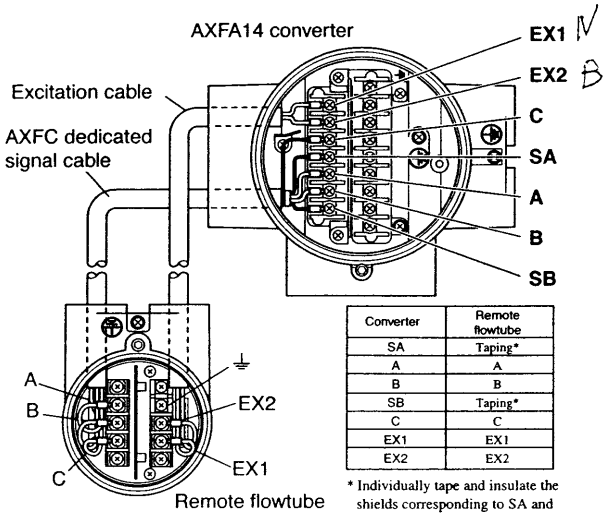
* Individually tape and insulate the shields corresponding to SA and SB on the remote flowtube side.

**Figure 4.2.15 Wiring Diagram**

#### 2) Connection with the AXFA14 converter

In case of explosion proof type for CENELEC ATEX, FM, CSA, and TIIS certification, connect wiring as shown in the figure below.

In case of the explosion proof type, the protective grounding ⏚ of remote flowtube must be connected to a suitable IS grounding system. In that case, ⏚ (functional grounding terminal) need not be connected.




| Converter | Remote flowtube |
|---|---|
| SA | Taping* |
| A | A |
| B | B |
| SB | Taping* |
| C | C |
| EX1 | EX1 |
| EX2 | EX2 |

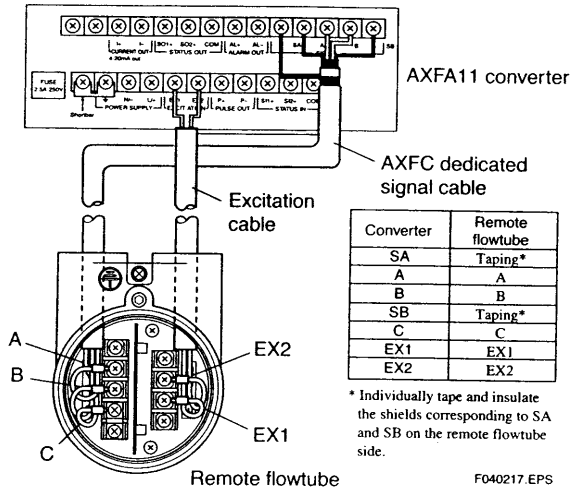
* Individually tape and insulate the shields corresponding to SA and SB on the remote flowtube side.

**Figure 4.2.16 Wiring Diagram**

### (5) Wiring the Remote Flowtube (General-Purpose Use, Submersible Type, Size 500 to 1000 mm (20 to 40 in.)) with Converters

#### 1) Connection with the AXFA11 converter

Connect wiring as shown in the figure below.




| Converter | Remote flowtube |
|---|---|
| SA | Taping* |
| A | A |
| B | B |
| SB | Taping* |
| C | C |
| EX1 | EX1 |
| EX2 | EX2 |

* Individually tape and insulate the shields corresponding to SA and SB on the remote flowtube side.

Figure 4.2.17 Wiring Diagram

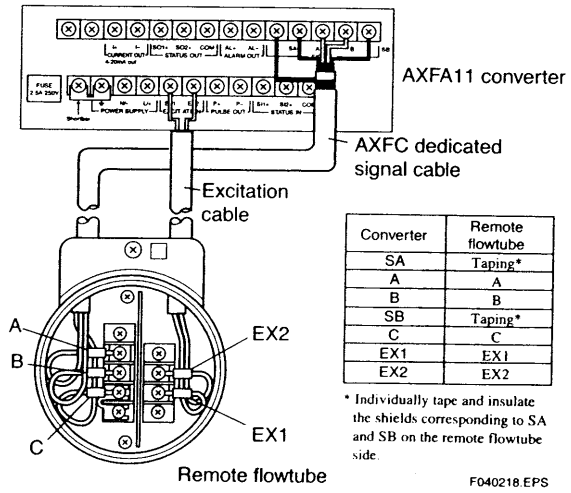
**IMPORTANT**

A remote flowtube (size 500 to 1000 mm) cannot be combined with AXFA14 converter.

### (6) Wiring the Remote Flowtube (General-Purpose Use, Submersible Type, Size 1100 to 2600 mm (44 to 104 in.)) with Converters

#### 1) Connection with the AXFA11 converter

Connect wiring as shown in the figure below.




| Converter | Remote flowtube |
|---|---|
| SA | Taping* |
| A | A |
| B | B |
| SB | Taping* |
| C | C |
| EX1 | EX1 |
| EX2 | EX2 |

* Individually tape and insulate the shields corresponding to SA and SB on the remote flowtube side.

Figure 4.2.18 Wiring Diagram

**IMPORTANT**

A remote flowtube (size 1100 to 2600 mm) cannot be combined with AXFA14 converter.

### (7) Grounding

**CAUTION**

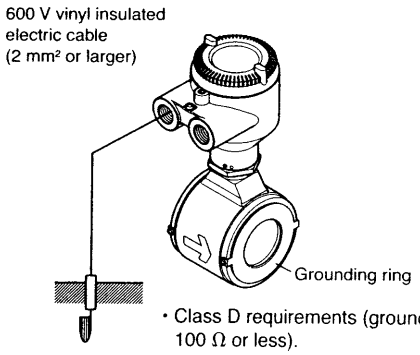
Be sure to connect the protective grounding of the AXF remote flowtube with a cable of 2mm² or larger cross section in order to avoid electrical shock to the operators and maintenance engineers and to prevent the influence of external noise.
Connect the grounding wire to the ⏚ mark.
The grounding should satisfy Class D requirements (ground resistance, 100 Ω or less).
In case of TIIS Flame proof type, the grounding should satisfy Class C requirements (ground resistance, 10 Ω or less) or class A requirements (ground resistance, 10 Ω or less).
For explosion proof type except TIIS, follow the domestic electrical requirements as regulated in each country.

**IMPORTANT**

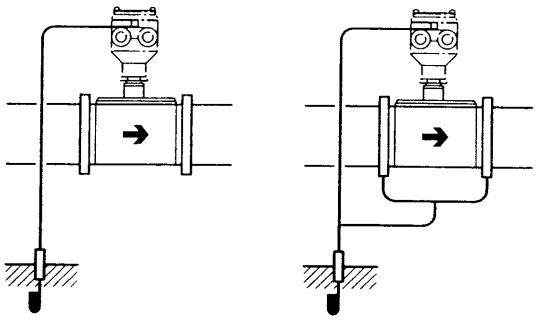
Improper grounding can have an adverse affect on the flow measurement. Ensure that the instrument is properly grounded.

The electromotive force of the magnetic flowmeter is minute and it is easy to be affected by noise. And also that reference electric potential is the same as the measuring fluid potential. Therefore, the reference electric potential (terminal potential) of the flowtube and the converter also need to be the same as the measuring fluid. Moreover, that the potential must be the same with ground. The magnetic flowmeter is equipped with an grounding ring that makes a connection with the charge of the measured fluid for grounding and protects the lining.

Be sure to ground according to Figure 4.2.19.




- Class D requirements (ground resistance. 100 Ω or less).
- TIIS Flame proof type: Class C requirements (ground resistance, 10 Ω or less) or Class A requirements (ground resistance, 10 Ω or less)
- Explosion proof type except TIIS: Domestic electrical requirements as regulated in each country.



In case grounding rings are used.

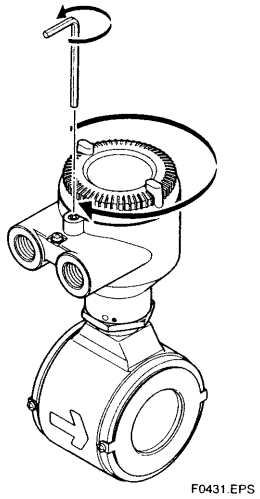
In case grounding rings are not used.
(Available only for metal piping)

F0430.EPS

**Figure 4.2.19 Protective Grounding Terminal Location**

### (8) Installing the Cover (Size 2.5 to 1000 mm (0.1 to 40 in.))

Install the cover to the flowtube by turning it in the direction of the arrow as shown below. Tighten the cover locking screw counterclockwise using a hexagonal wrench (nominal size 3 mm) to lock the cover.



F0431.EPS

**Figure 4.2.20 Installing the Terminal Box Cover (Remote Flowtube)**

53



19.1.2

# 5. MAINTENANCE

**WARNING**

- Maintenance work must be carried out by expert engineer or skilled personnel and not by operators.
- Before opening the cover, it is important to ensure that at least 10 minutes have passed since the power was turned off. Furthermore, opening of the cover must also be carried out by expert engineer or skilled personnel.

**CAUTION**

- Explosion protected type must be, as a rule, removed to a non-hazardous area for maintenance and be disassembled and reassembled to the original state.
- The cover is locked by the special screw. In case of opening the cover, use the hexagonal wrench attached.
- Be sure to lock the cover by the special screw using the hexagonal wrench attached after installing the cover.

## 5.1 Changing Direction of Electrical Connection

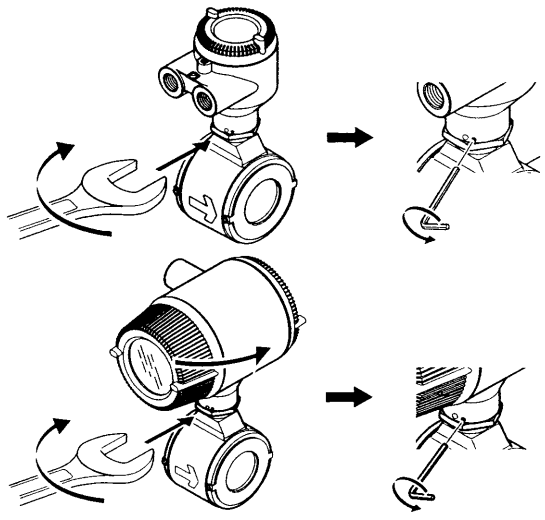
**IMPORTANT**

The following types can not be changed direction of electrical connection after delivery.
- Submersible Type.
- Optional code DHC (for district heating and cooling or condensation-proof).
- Size of 1100 mm (44 in.) or larger.

(1) The following tools are required to change the direction of the electrical connection:
- Hexagonal wrench (nominal size 1.5): Comes with the instrument.
- Wrench

(2) Turn off the power to the flowmeter.

(3) Using the wrench, loosen the hexagonal nut at the neck of the instrument.



F0501.EPS

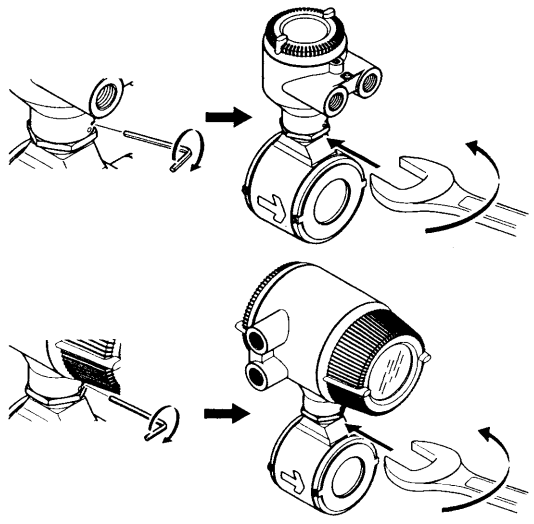
(4) Using the hexagonal wrench, loosen the screw in the neck.

(5) Turn the converter or the terminal box in the desired direction.

**NOTE**

The converter and the terminal box can be turned –140 degree to +180 degree from the arrow mark indicating the flow direction. Do not exceed these angle.

(6) Using the hexagonal wrench, retighten the neck screw.



F0502.EPS

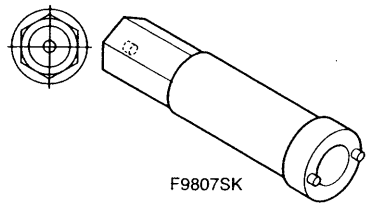
(7) Using the wrench, retighten the hexagonal nut at the neck.

# 5.2 Removing, Cleaning, and Installing Replaceable Electrodes (General-Purpose Use Type Only)

## 5.2.1 Removing Replaceable Electrodes

(1) The following tools are required to replace the electrodes:

- Special tool for removing and installing electrodes (F9807SK): Optional
- Torque wrench or torque driver (nominal size 12)
- Phillips screwdriver




F0503.EPS

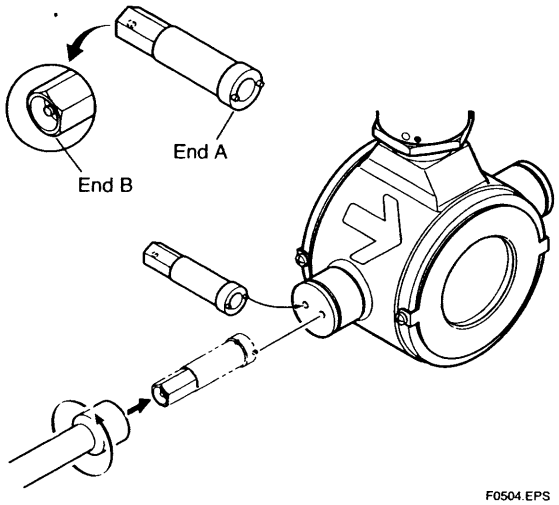
(2) Turn off the power to the flowmeter.

(3) Drain the fluid from the interior of the flowtube.

**WARNING**

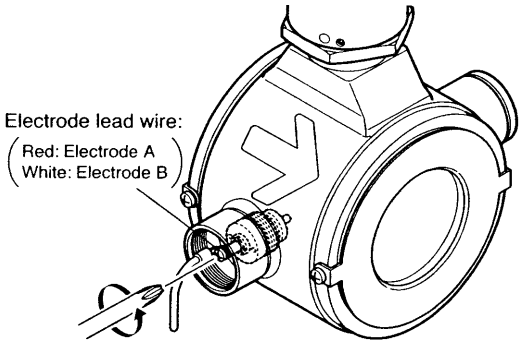
- Never fail to drain the fluid from the interior of the flowtube.
- If the fluid is at a high temperature, the instrument itself may also be hot. Be careful not to get burned when removing the electrodes.
- When the process fluid is hazardous to humans, exercise caution to avoid coming into contact with it, and avoid inhaling any residual gas.

(4) Using end A of the tool, open the electrode cover.




F0504.EPS

(5) Hold down the electrode lead wire and terminal lug and remove the mounting screw using the Phillips screwdriver.

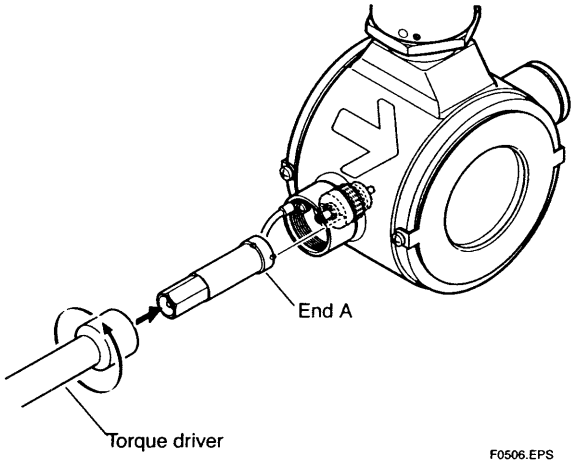



F0505.EPS

**NOTE**

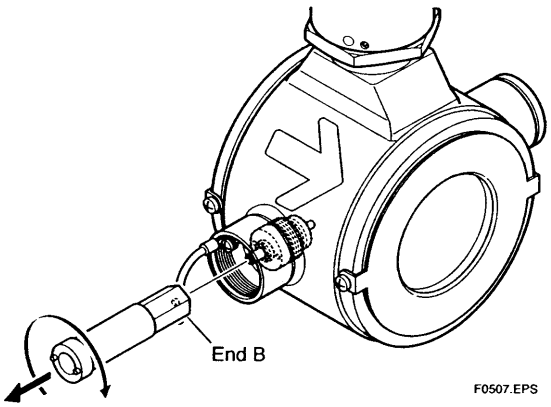
Always hold down the lead wire and terminal lug when removing the mounting screw.

(6) Move aside the electrode lead wire and avoiding the screw, insert end A of the tool to the electrode and loosen the electrode holder using the torque driver.




F0506.EPS

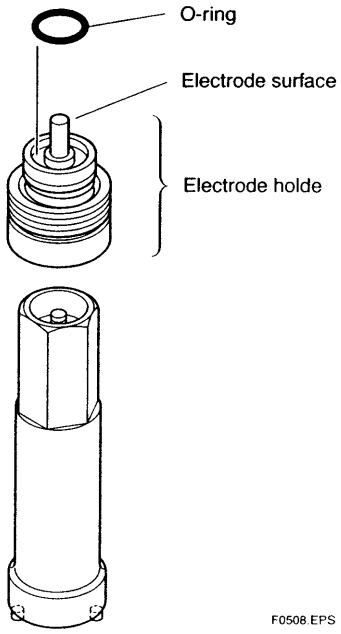
(7) Screw end B of the tool into the screw block of the electrode, and pull the tool straight out to remove the electrode holder.




F0507.EPS

## 5.2.2 Cleaning Replaceable Electrodes

(1) Clean the electrode surface (wetted part) with alcohol or other cleaning agents.

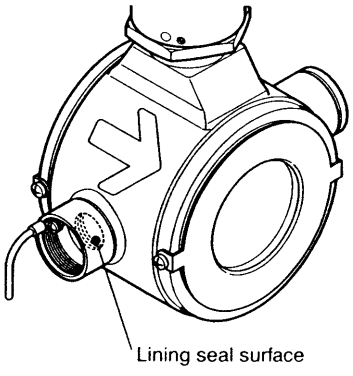



F0508.EPS

**NOTE**

The screw threads are coated with an anti-seizing compound. Do not let the compound come in contact with the electrode.

(2) Clean the surface of the lining seal with an alcohol moistened swab.




F0509.EPS

57



19.1.2

### 5.2.3 Installing Replaceable Electrodes

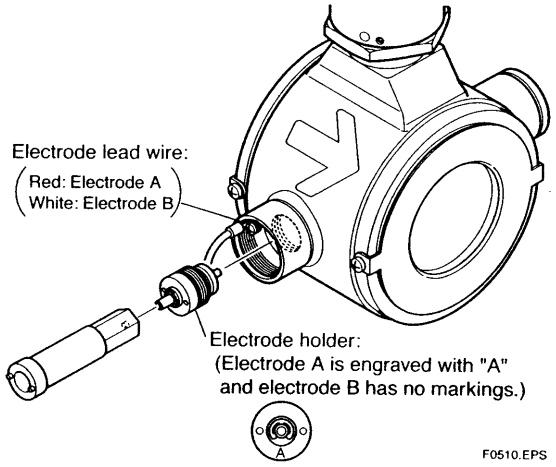
**NOTE**

It is recommended to replace the O-ring when reinstalling the replaceable electrode. Use the O-ring specified by Yokogawa (G9303SE: material is fluororubber).

**NOTE**

Precautions for storage of O-rings:
- Keep them in a cool, dark place.
- Wrap them well.
- Do not use O-rings after one year since their purchase.

(1) Push the electrode holder with end B of the tool screwed into it, straight into the flowtube.

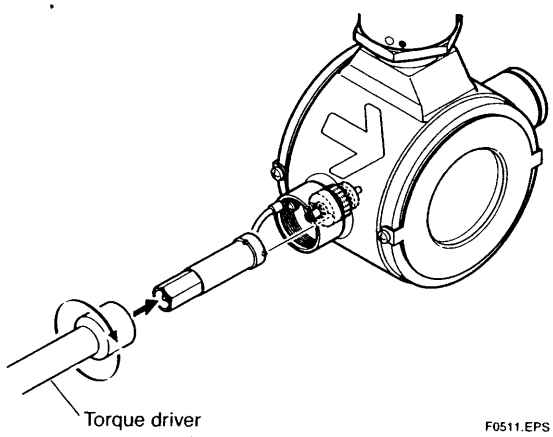



F0510.EPS

**NOTE**

- Check that the O-ring has not come off.
- Do not interchange electrodes A and B when installing them. Install electrode A to the electrode boss with the red lead wire and electrode B to the one with the white lead wire.

(2) Using end A of the tool, tighten the electrode holder.




F0511.EPS

**NOTE**

Using the torque wrench or torque driver, tighten the electrode holder to the following torque values:

PFA lining:
8.0 N·m ±1 N·m (80 kgf·cm ±10 kgf·cm)

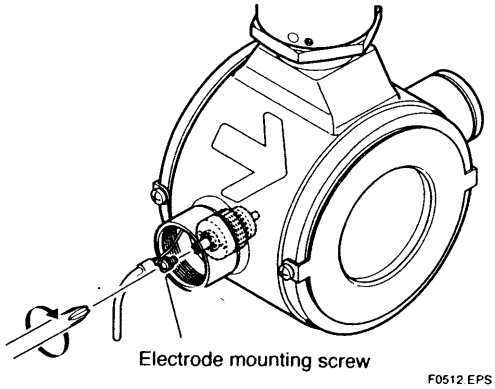
Polyurethane rubber lining:
3.0 N·m ±0.5 N·m (30 kgf·cm ±5 kgf·cm)

**WARNING**

If the electrode holder was not tightened to its specified torque value, fluid leakage from the electrode may result. Should fluid spill over the electrode block, wipe it dry and check that the O-ring has not come off.

(3) Fill the interior of the flowtube with the fluid and check that there is no leakage from the electrode.

(4) Hold down the lead wire and terminal lug and screw the mounting screw into the electrode using the Phillips screwdriver.

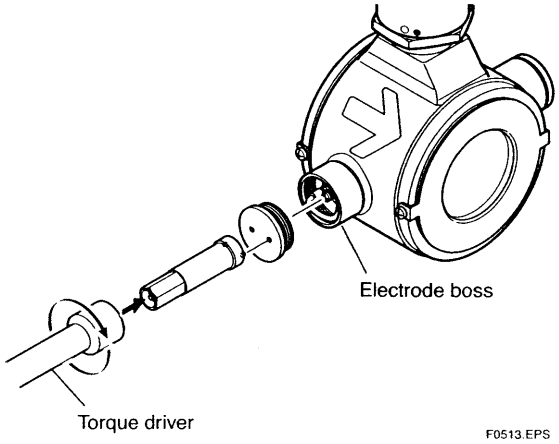



F0512.EPS

**NOTE**

Always hold down the lead wire and terminal lug when adjusting the mounting screw.

(5) Put the lead wire in the electrode boss, and install the electrode cover to the boss and tighten it using end A of the tool.




(6) Turn on the power to the flowmeter and start normal operation.

# 5.3 Removing and Installing Adapters for Sanitary Types

**CAUTION**

This section describes how to remove and install a butt weld adapter as an example. Apply the same procedure to clamp and union adapters.

### 1) Removing the butt weld adapter

Remove the butt weld adapter by loosening the mounting screws.

### 2) Installing the butt weld adapter

Install a gasket to fit in the groove of the butt weld adapter, and tighten in the adapter with the mounting screws.

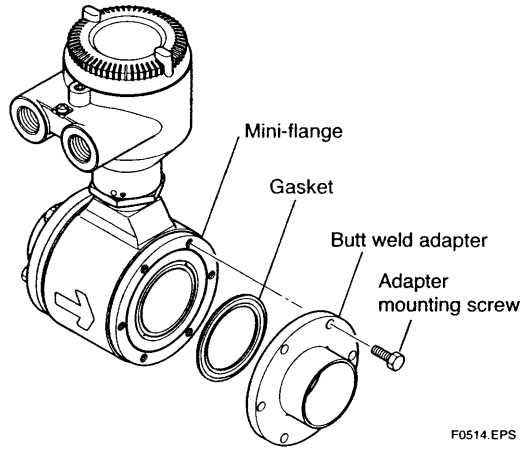



**Figure 5.3.1 Removing and Installing a Butt Weld Adapter**

**CAUTION**

- In case of standard gasket (EPDM rubber), tighten the adapter mounting screw according to the torque values in Table 5.3.1.
- In case that optional code GH (Silicon rubber) is selected, tighten the adapter mounting screw according to the torque values in Table 5.3.2.
- Tighten the adapter mounting screw in diagonal order step by step.
- After tightening of screw, confirm that gaskets protrude inside adapter. Protruding of gasket is necessary to keep the sanitary requirements.

**Table 5.3.1 Tightening Torque Values of adapter for EPDM rubber gasket**

| Tightening torque values (N-m / {kgf-cm} / [in-lbf]) | |
|---|---|
| Gasket type / Size mm (inch) | EPDM rubber (standard) |
| 15 (0.5), 25 (1.0), 32 (1.25), 40 (1.5) | 3.0 to 3.5 / {30.59 to 35.69} / [26.55 to 30.98] |
| 50 (2.0), 65 (2.5) | 4.5 to 5.0 / {45.89 to 50.99} / [39.83 to 44.25] |
| 80 (3.0) | 8.0 to 9.0 / {81.58 to 91.78} / [70.81 to 79.65] |
| 100 (4.0), 125 (5.0) | 10 to 11 / {102.0 to 112.2} / [88.50 to 97.35] |

T0502.EPS

**Table 5.3.2 Tightening Torque Values of adapter for silicon rubber gasket**

| Tightening torque values (N-m / {kgf-cm} / [in-lbf]) | |
|---|---|
| Gasket type / Size mm (inch) | Silicon rubber (optional code GH) |
| 15 (0.5), 25 (1.0), 32 (1.25), 40 (1.5) | 2.0 to 2.5 / {20.39 to 25.49} / [17.70 to 22.13] |
| 50 (2.0), 65 (2.5), 80 (3.0) | 4.0 to 4.5 / {40.79 to 45.89} / [35.40 to 39.83] |
| 100 (4.0), 125 (5.0) | 6.0 to 6.5 / {61.18 to 66.28} / [53.10 to 57.53] |

T0503.EPS

**⚠ CAUTION**

- The lining of sanitary type uses fluorocarbon PFA. For the property of fluorocarbon PFA, it is possible that the adapter mounting screws may loosen as time passes, so retighten them regularly.
- Be sure to retighten the adapter mounting screws according to the prescribed torque values in Table 5.3.1 or Table 5.3.2. Retighten them diagonally with the same torque values, step by step up to the prescribed torque value.
- In case of leakage from adapter connection point, retighten the adapter mounting screws. If leakage doesn't stop even if they are retightened, replace the gasket between mini-flange of flowmeter and adapter.
- It is recommended to replace the gasket periodically,
- It is necessary to decide the period between changes with consideration for the frequency of cleaning cycles, the cleaning temperature and the fluid temperature.
- Use the gasket specified by Yokogawa in Table 5.3.3

**Table 5.3.3 Parts number of gasket**

| Gasket type / Size mm (inch) | EPDM rubber (standard) | Silicon rubber (optional code GH) |
|---|---|---|
| 15 (0.5) | F9811QA | F9811QB |
| 25 (1.0) | B1002EG | B1010EG |
| 32 (1.25) | B1003EG | B1011EG |
| 40 (1.5) | B1004EG | B1012EG |
| 50 (2.0) | B1005EG | B1013EG |
| 65 (2.5) | B1006EG | B1014EG |
| 80 (3.0) | B1007EG | B1015EG |
| 100 (4.0) | B1008EG | B1016EG |
| 125 (5.0) | F9811QC | F9811QD |

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# 5.4 Components Replacement (Integral Flowmeter Only)

**WARNING**

- Component replacement and the associated operations must be carried out by expert engineer or skilled personnel and not by operators.
- Before opening the cover, it is important to ensure that at least 10 minutes have passed since the power was turned off. Furthermore, opening of the cover must also be carried out by expert engineer or skilled personnel.

**IMPORTANT**

- As a rule, maintenance of this flowmeter should be implemented in a maintenance service shop where the necessary tools are provided.
- The amplifier assembly contains sensitive parts that may be damaged by static electricity. Excercise care so as not to directly touch the electronic parts or circuit patterns on the board, for example, by preventing static electrification by using grounded wrist straps when handing the assembly. Also take precautions such as placing a removed amplifier assembly into a bag with an antistatic coating.

## 5.4.1 Fuse Replacement

**CAUTION**

Be sure to turn off the power before performing fuse replacement. Also be sure to use the spare fuse that was supplied with the product, or ones supplied by Yokogawa's sales or service offices.

The fuse holder is located on the farthest circuit board from the front.

(1) Remove the amplifier assembly by following the procedures shown in Section 5.4.3 "Amplifier Replacement."

(2) The fuse can be seen after step (1). Remove the fuse from the fuse holder.

(3) Push a new fuse into the holder until it clicks.

(4) Reinstall the amplifier assembly by following the procedures shown in Section 5.4.3.

Spare fuses are shipped with the instrument.

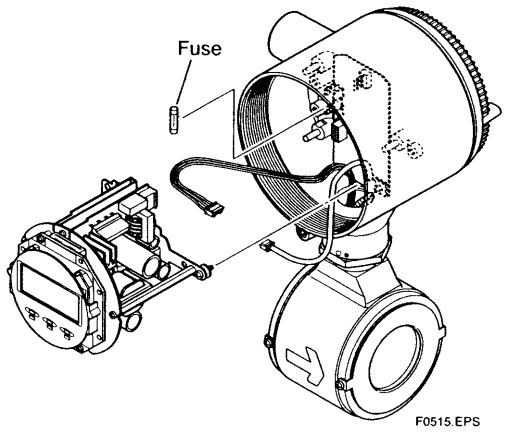


**Figure 5.4.1 Fuse Replacement**

## 5.4.2 Display Unit Replacement

### 5.4.2.1 Removing the Display Unit

(1) Turn off the power.

(2) Loosen cover locking screw 1 clockwise using a hexagonal wrench (nominal size 3) to unlock the cover. (Upon shipment from the manufacturing plant, the cover is locked.) Hold the flowmeter with your hand and remove the cover by turning it in the direction of the arrow as shown below.

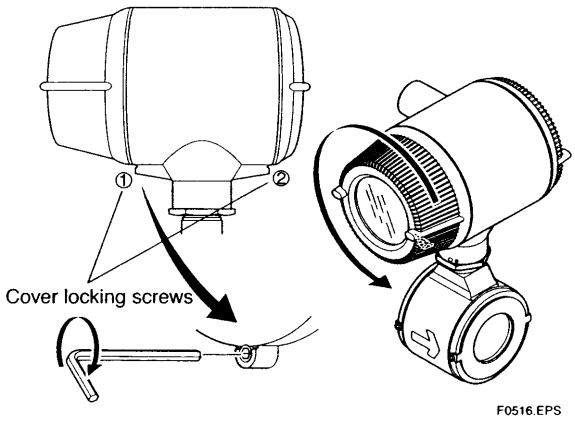


**Figure 5.4.2 Removing the Display Cover**

(3) Hold the display unit with your hand and remove the two mounting screws. Remove the connector of the display unit by pulling it to the left, taking care not to damage it (refer to Figure 5.4.3).

#### 5.4.2.2 Assembling the Display Unit

(1) Align the display unit with the protrusion of the connector facing the amplifier assembly and then make the required connection.

(2) Secure the display unit using its two mounting screws.

(3) Replace the cover by following the procedures used to remove it in the reverse order.

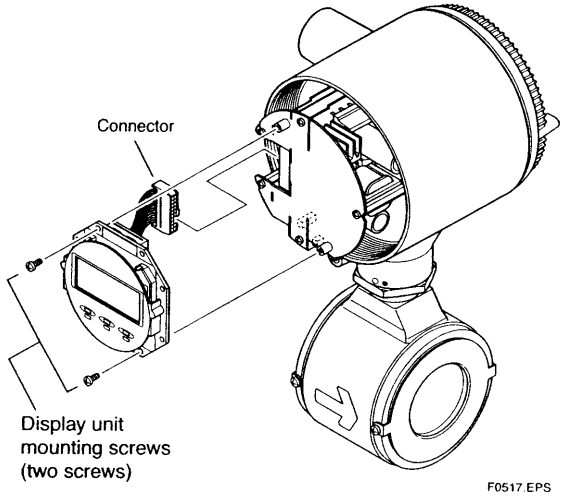


**Figure 5.4.3 Removing and Assembling the Display Unit**

#### 5.4.2.3 Changing the Display Unit Orientation 90 Degrees

(1) Hold the display unit with your hand and remove the two mounting screws.

(2) Turn the display unit 90 degrees clockwise and confirm the assembling position, taking care of the connector and wire of the display unit.

(3) Secure the display unit using its two mounting screws.

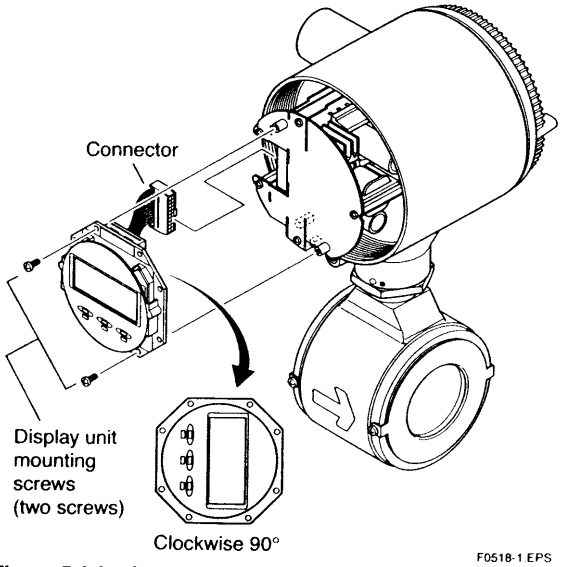


**Figure 5.4.4 Assembling the Display Unit**

#### 5.4.2.4 Installing the Cover

(1) Install the cover to the flowmeter by turning it in the direction of the arrow as shown below. Tighten cover locking screw 1 counterclockwise using a hexagonal wrench (nominal size 3) to lock the cover.

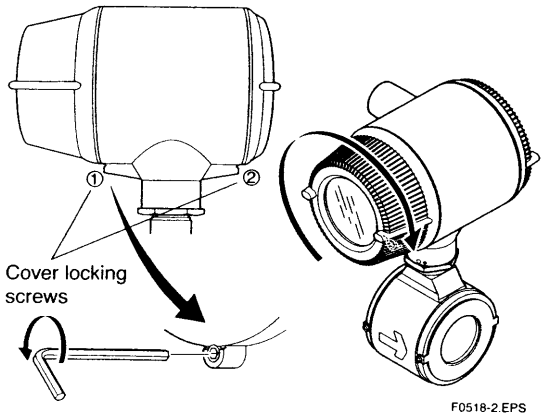


**Figure 5.4.5 Installing the Display Cover**

### 5.4.3 Amplifier Replacement

**IMPORTANT**

In case of amplifier replacement, it is necessary to perform the parameter resetting.
For parameters, refer to Chapter 6: Parameter Description.

#### 5.4.3.1 Removing the Amplifier Assembly

(1) Turn off the power.

(2) Remove the cover.

(3) Remove wiring connectors 1 and 2 (refer to Figure 5.4.6) from the amplifier assembly. Remove them carefully, without applying excessive force.

(4) Loosen the three mounting screws while holding the assembly with your hand.

(5) Pull the assembly straight out.

#### 5.4.3.2 Assembling the Amplifier Assembly

(1) To replace the amplifier assembly, follow the procedures used to remove it in the reverse order.

(2) Replace the assembly by pushing it in, taking care not to damage the amplifier mounting connectors on the circuit board.

(3) Carefully connect wiring connectors 1 and 2 to the amplifier assembly, making sure that the connectors' directions are correct. Let wiring connector 2 pass along the amplifier side of the rod.

(4) Tighten the three mounting screws while holding the assembly with your hand.

(5) Replace the cover, taking care not to entangle the cables of the wiring connectors.

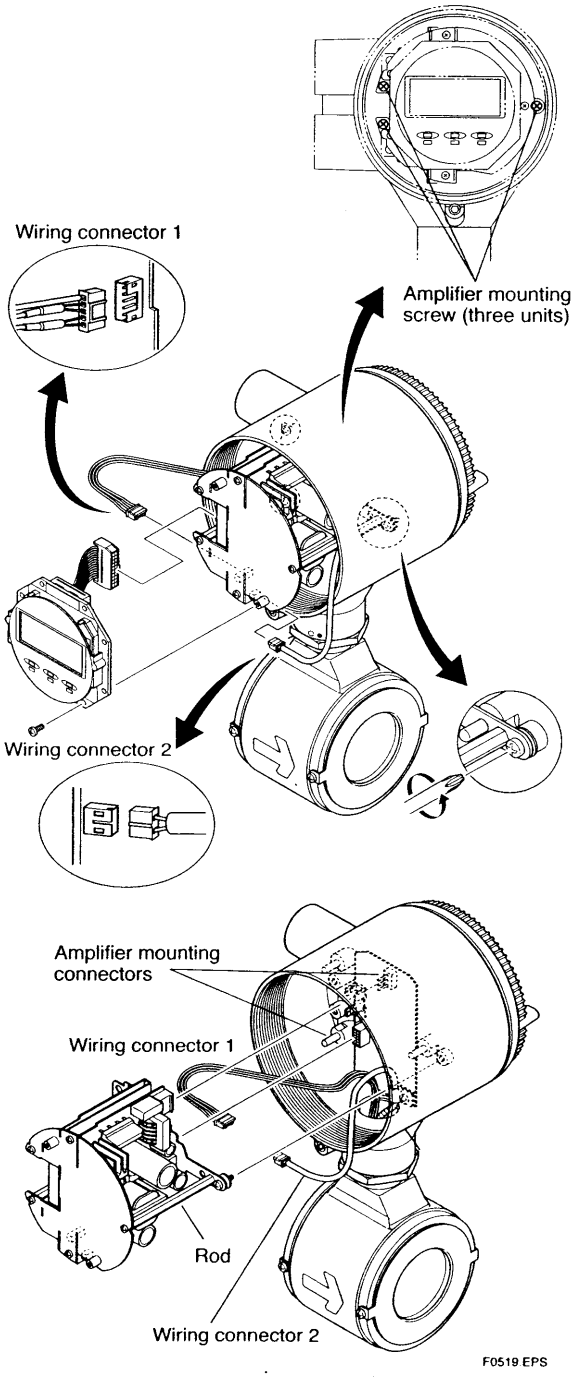


**Figure 5.4.6 Assembling the Amplifier**

# 5.5 Setting of Switches (Integral Flowmeter Only)

## 5.5.1 Setting of Burnout Switch

The burnout function sets the direction of current output in situations where the CPU has become damaged. Upon shipment from the manufacturing plant, the burnout direction is set to High (i.e., 25 mA); however, in cases where the optional code C1 has been specified, the output direction will be set to Low (i.e., 0 mA).

Modification of the burnout direction must be carried out using the setting switch from the amplifier's CPU board (i.e., Switch 1) (See Figure 5.5.1).

**Table 5.5.1 Output Setting Pins for Burnout**

| Position of Pin | Burnout Direction | Burnout Output | Remarks |
|---|---|---|---|
| Low High | High | 25 mA | Set to High before shipment |
| Low High | Low | 0 mA | Set to Low for optional code C1 |

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**NOTE**

On the amplifier's CPU board, the burnout setting switch (i.e., Switch 1) and the write protect switch (i.e., Switch 2) are located adjacent to each other. Accordingly, special care should be taken when making switch settings.

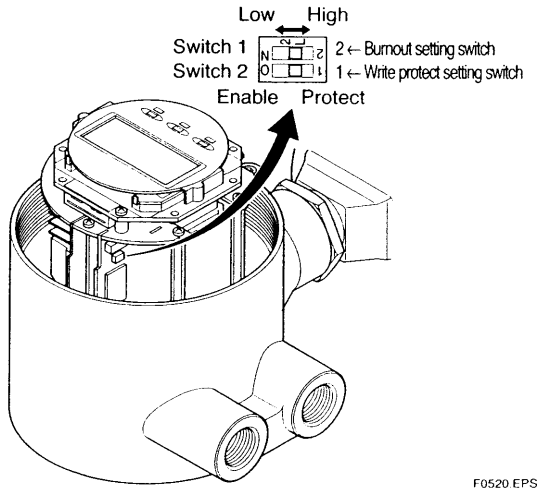


**Figure 5.5.1 Switch Configuration**

### 5.5.2 Setting of Write Protect Switch

By setting the write protect function to "Protect" it is possible to prevent the overwriting of parameters. Write protection can be carried out using either the hardware switch on the CPU board (i.e., Switch 2) or software parameter settings. If either of these items is set to "Protect," the overwriting of parameters will be prohibited.

**NOTE**

If the hardware switch is set to "Protect," it will not be possible to overwrite parameters; furthermore, this condition will be maintained until the switch is set to "Enable."

For more details regarding usage of the write protect function and the software's parameter switches, refer to "Chapter 6: Parameter Description" in the user's manual of the AXF Integral Flowmeter [Software Edition] (IM 01E20C02-01E).

## 5.6 Regular Inspection Items

**(1) Inspection of moisture-proofing inside the terminal box: Once/year**

**(2) Retightening of piping joint screws: About twice/year**

**(3) Inspection of electrodes and lining (in case of adhesive and/or abrasive fluids, etc.)**

Determine the period of regular inspection as necessary.

## 5.7 Excitation Coil and Insulation Resistance Check (Remote Flowtube Only)

**WARNING**

- Before checking of the excitation coil and the insulation resistance, be sure that the power supply for AXFA11 or the AXFA14 converter has been turned off.
- Before checking, be sure to disconnect the cables from the terminals of the remote flowtube.

#### (1) Excitation Coil Check (Remote Flowtube Only)

Check that there is continuity between terminals EX1 and EX2 in the terminal box. If there is no continuity, the coils may be broken and replacement or repair of the flowtube is necessary. The coil resistance is designed to be 150 Ω or less. If it is not, this may be an abnormal condition. Consult Yokogawa's sales or service offices.

#### (2) Insulation Resistance Check (Remote Flowtube Only)

Check the insulation resistances in the terminal box in accordance with the tables below. If any of them falls below the values listed in the tables, consult Yokogawa's sales or service offices for investigation. If the insulation resistance cannot be restored, replacement or repair of the flowtube is needed. In case of submersible type flowmeters, undo the wiring connection on the converter side and measure resistance at the cable terminals.

### Coil Circuit

Checking is possible even if the pipe is filled with fluid.

| Test Terminals | Test Voltage | Specification |
|---|---|---|
| Between terminals EX1 and C | 500 V DC (Use an insulation tester or the equivalent.) | 1 MΩ or more |

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### Signal Circuit

Before testing, be sure to empty and dry the interior of the pipe, checking that there is no adhesive material. Also undo the wiring connection on the converter side before testing.

| Test Terminals | Test Voltage | Specification |
|---|---|---|
| Between terminals A and C<br>Between terminals B and C | 500 V DC (Use an insulation tester or the equivalent.) | 100 MΩ or more for each |

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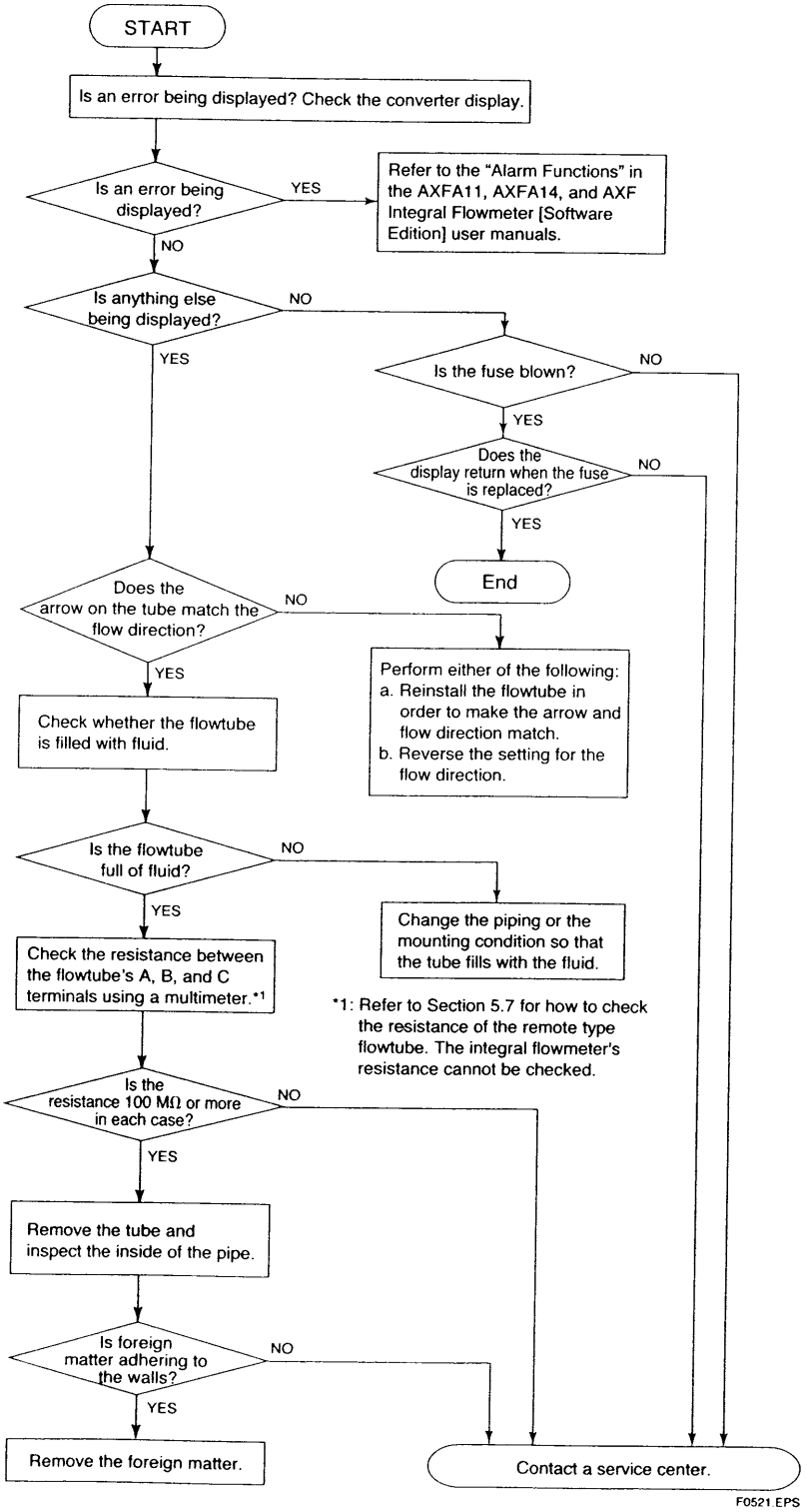
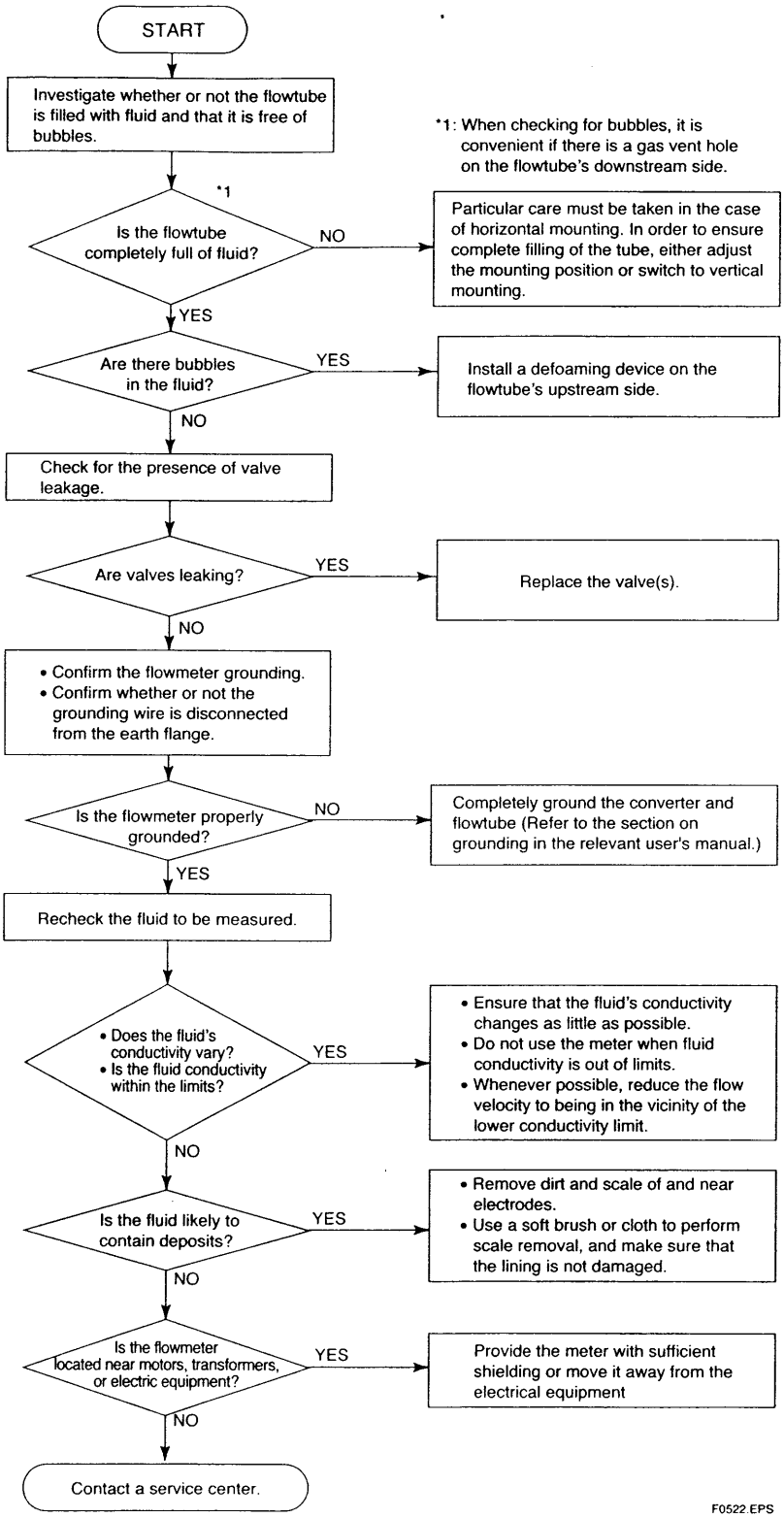
# 5.8 Troubleshooting

Although magnetic flowmeters rarely require maintenance, failures may occur when the instrument is not operated correctly. This section describes troubleshooting procedures where the cause of the breakdown is identified through receiver indication.

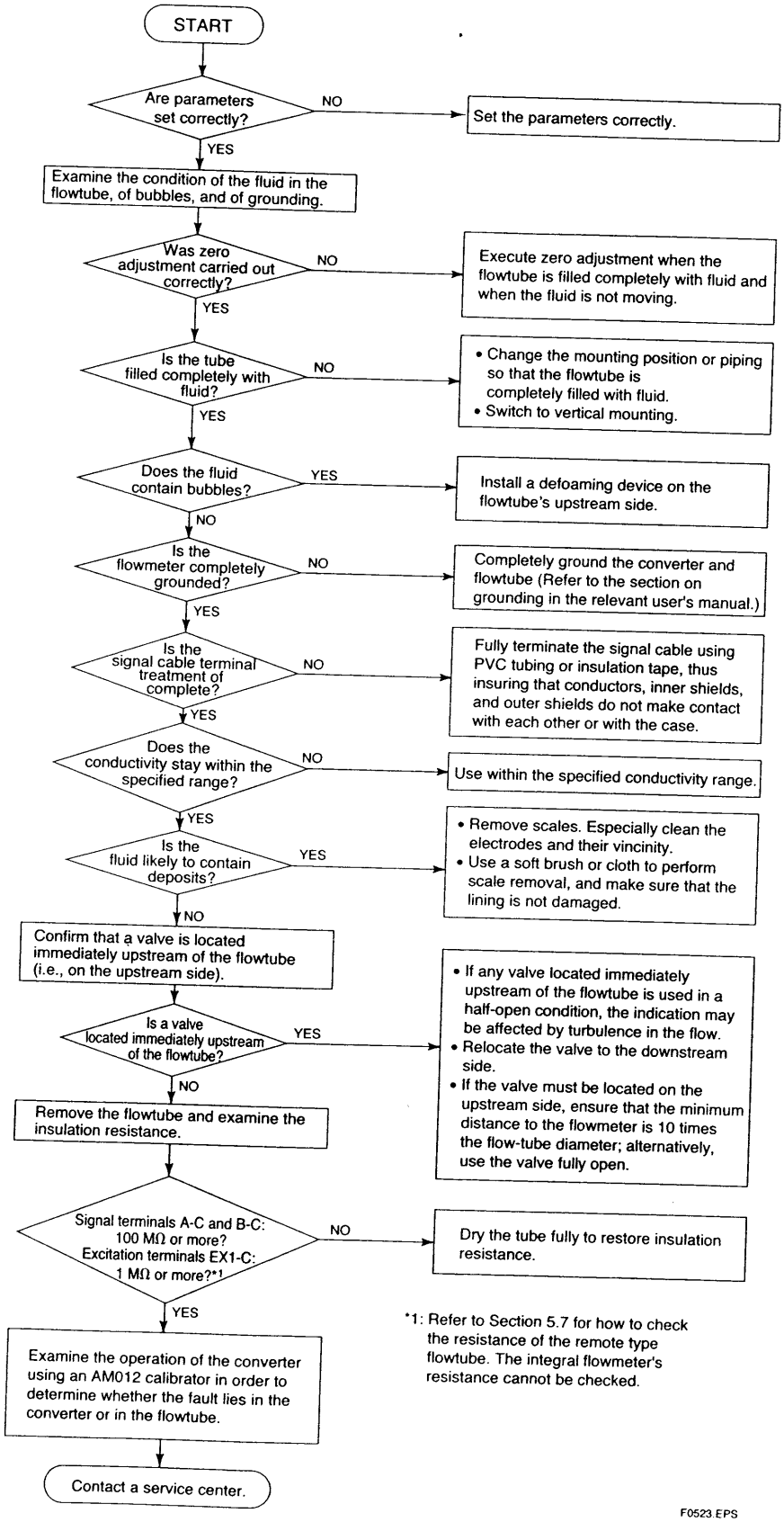
## 5.8.1 No Indication



## 5.8.2 Unstable Zero



## 5.8.3 Disagreement Between Indication and Actual Flow




*1: Refer to Section 5.7 for how to check the resistance of the remote type flowtube. The integral flowmeter's resistance cannot be checked.

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# 6. OUTLINE

## ■ STANDARD SPECIFICATIONS

### ● Converter (Integral flowmeter)

*1: Select two points from: one pulse output, one alarm output, one status input, or two status outputs.
*2: For models without an indicator, the hand-held terminal is necessary to set parameters.

**Excitation Method:**
- Standard dual frequency excitation:
  Size 2.5 to 400 mm (0.1 to 16 in.)
- Enhanced dual frequency excitation:
  Size 25 to 200 mm (1.0 to 8.0 in.)
  (Optional code HF1 or HF2)

**Input Signal (*1):**
One Status Input: Dry contact
Load Resistance: 200 Ω or less (ON), 100 kΩ or more (OFF)

**Output Signals:**
- One Current Output: 4 to 20 mA DC (load resistance: 750Ω maximum, including cable resistance)
- One Pulse Output (*1):
  Transistor contact output (open collector)
  Contact capacity: 30 V DC (OFF), 200 mA (ON)
  Output rate: 0.0001 to 10,000 pps (pulse/second)
- One Alarm Output (*1):
  Transistor contact output (open collector)
  Contact capacity: 30 V DC (OFF), 200 mA (ON)
- Two Status Outputs (*1):
  Transistor contact output (open collector)
  Contact capacity: 30 V DC (OFF), 200 mA (ON)

**Communication Signals:**
BRAIN or HART communication signal
(Superimposed on the 4 to 20 mA DC signal)
Distance from Power Line: 15 cm (6 in.) or more (Parallel wiring should be avoided.)

**BRAIN:**

**Communication Distance:**
Up to 2 km (1.25 miles), when polyethylene insulated PVC-sheathed cables (CEV cables) are used. Communication distance varies depending on the type of cable and wiring used.

**Load Resistance:**
250 to 600Ω (including cable resistance)

**Load Capacitance:** 0.22 μF or less

**Load Inductance:** 3.3 mH or less

**Input Impedance of Communicating Device:**
10 kΩ or more (at 24 kHz)

**HART:**

**Communication Distance:**
Up to 1.5 km (0.9 mile), when using multiple twisted pair cables. Communication distance varies depending on the type of cable used.

**Load Resistance:**
230 to 600Ω (including cable resistance)

**Cable Length for Specific Applications:**
Use the following formula to determine the cable length for specific applications.

$$L = \frac{65\times10^6}{(R\times C)} - \frac{(Cf+10{,}000)}{C}$$

where:
L = length in meters or feet
R = resistance in Ω (including barrier resistance)
C = cable capacitance in pF/m or pF/ft
Cf = maximum shunt capacitance of receiving devices in pF/m or pF/ft

Note: HART is a registered trademark of the HART Communication Foundation.

**Data Security During Power Failure:**
Data (parameters, totalizer value, etc.) storage by EEPROM. No back-up battery required.

**Indicator (*2):**
Full dot-matrix LCD (32×132 pixels)

**Lightning Protector:**
The lightning protector is built into the current output and pulse/alarm/status input and output terminals. When optional code A is selected, the lightning protector is built into the power terminals.

**Protection:**
IP67, NEMA4X, JIS C0920 immersion-proof type

**Coating:**
Case and Cover: Polyurethane corrosion-resistant
Coating Color: Mint green coating (Munsell 5.6 BG 3.3/2.9 or its equivalent)

**Converter Material:**
Case and Cover : Aluminum alloy

**Mounting/Shapes (Integral Flowmeter):**
- Electrical Connection: ANSI 1/2 NPT female
  ISO M20 ×1.5 female
  JIS G1/2 (PF1/2) female
- Direction of Electrical Connection: The direction can be changed even after delivery.
- Terminal Connection: M4 size screw terminal

**Grounding:**
Grounding resistance 100 Ω or less
When optional code A is selected, grounding resistance 10 Ω or less shall be applied.
* In case of explosion proof type except TIIS, follow the domestic electrical requirements as regulated in each country.
* In case of TIIS Flame proof type, refer to description of "HAZARDOUS AREA CLASSIFICATION".

## Functions

**How to Set Parameters (*2):**
The indicator's LCD and three infra-red switches enable users to set parameters without opening the case cover. Parameters can also be set by means of the HHT (Handheld terminal).

**Displayed Languages (*2):**
Users can choose a language from among English, Japanese, German, French, Italian, and Spanish.

**Instantaneous Flow Rate/Totalized Value Display Functions (for models with an indicator) (*2):**
The full dot-matrix LCD enables user selections of displays from one line to three lines for:
- Instantaneous flow rate
- Instantaneous flow rate (%)
- Instantaneous flow rate (bar graph)
- Current output value (mA)
- Totalized value
- Tag No.
- Results of electrode adhesion diagnostics

**Totalizer Display Function (*2):**
The flow rate is counted one pulse at a time according to the setting of totalization pulse weights. For forward and reverse flow measurement functions, the totalized values of the flow direction (forward or reverse) and the flow direction are displayed on the indicator together with the units. The difference of totalized values between the forward and reverse flow rate can be displayed. Totalization for the reverse flow rate is carried out only when "Forward and reverse flow measurement functions" is selected.

**Damping Time Constant (*2):**
Time constant can be set from 0.1 second to 200.0 seconds (63% response).

**Span Setting Function (*2):**
Span flows can be set in units such as volume flow rate, mass flow rate, time, or flow rate value. The velocity unit can also be set.
Volume Flow Rate Unit: kcf, cf, mcf, Mgal (US), kgal (US), gal (US), mgal (US), kbbl (US)*, bbl (US)*, mbbl (US)*, µbbl (US)*, Ml (megaliter), $m^3$, kl (kiloliter), l (liter), $cm^3$
Mass Flow Rate Unit (Density must be set.): klb (US), lb (US), t (ton), kg, g
Velocity Unit: ft, m (meter)
Time Unit: s (sec), min, h (hour), d (day)
* "US oil" or "US Beer" can be selected.

**Pulse Output (*1)(*2):**
Scaled pulse can be output by setting a pulse weight.
Pulse Width: Duty 50% or fixed pulse width (0.05, 0.1, 0.5, 1, 20, 33, 50, 100 ms) can be selected.
Output Rate: 0.0001 to 10,000 pps (pulse/second)

**Multi-range Function (*1)(*2):**
- Range switching via status input
  Status input enables the switching of up to two ranges.
- Automatic range switching
  When the flow rate exceeds 100 % of the range, transition to the next range (up to four ranges) is carried out automatically. Range swiching can be confirmed by status outputs and indicator.

**Forward and Reverse Flow Measurement Functions (*1)(*2):**
Flows in both forward and reverse directions can be measured. The reverse flow measurement can be confirmed by status output and indicator.

**Totalization Switch (*1)(*2):**
The status output is carried out when a totalized value becomes equal to or greater than the set value.

**Preset Totalization (*1)(*2):**
The parameter setting or status input enables a totalized value to be preset to a setting value or zero.

**0% Signal Lock (*1)(*2):**
Status input forcibly fixes the instantaneous flow rate display, current output, pulse output, and flow rate totalization to 0%.

**Alarm Selection Function (*2):**
Alarms are classified into the System Alarms (hard failures), Process Alarms (such as 'Empty Pipe', 'Signal Overflow' and 'Adhesion Alarm'), Setting Alarms, and Warnings.
Whether alarms should be generated or not can be selected for each item.
The current output generated for an alarm can be selected from among 2.4 mA or less, fixed to 4 mA, 21.6 mA or more, or HOLD.

**Alarm Output (*1)(*2):**
Alarms are generated only for the items selected via the 'Alarm Selection Function' if relevant failures occur.

**Self Diagnostics Functions (*2):**
If alarms are generated, details of the System Alarms, Process Alarms, Setting Alarms and Warnings are displayed together with concrete descriptions of countermeasures.

**Flow Upper/Lower Limit Alarms (*1)(*2):**
If a flow rate becomes greater or smaller than the set value, this alarm is generated. In addition, two upper limits (H, HH) and two lower limits (L, LL) can be set.
If a flow rate becomes greater or smaller than any of the set values, the status is output.

**Electrode Adhesion Diagnostics Function (*1) (*2):**
This function enables monitoring of the adhesion level of insulating substances to the electrodes. Depending on the status of adhesion, users are notified by a warning or an alarm via status outputs. If replaceable electrodes are used, they can be removed and cleaned when adhesion occurs.

## ● Flowtubes (Remote Flowtube/Integral Flowmeter)

### Size of AXF Flowtubes: AXF Standard (Lay length code 1)

Unit: mm (in.)

| Use | Process Connection | Lining | Remote Flowtube | Integral Flowmeter | High Grade Accuracy 0.2% of Rate (*3) | Enhanced Dual Frequency Excitation (Optional code HF1,HF2) (*3) | Replaceable Electrode (Electrode structure code 2) |
|---|---|---|---|---|---|---|---|
| General-purpose Use | Wafer | PFA | 2.5 (0.1), 5 (0.2), 10 (0.4), 15 (0.5), 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12) | | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12) |
| | | Polyurethane Rubber | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12) | | – | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12) |
| | | Natural Soft Rubber | 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12) | | – | 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | – |
| | | EPDM Rubber | 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12) | | – | 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | – |
| | | Ceramics (*1) | 15 (0.5), 25 (1.0), 40 (1.5), 50 (2.0), 80 (3.0), 100 (4.0), 150 (6.0), 200 (8.0) | | 25 (1.0), 40 (1.5), 50 (2.0), 80 (3.0), 100 (4.0), 150 (6.0), 200 (8.0) | 25 (1.0), 40 (1.5), 50 (2.0), 80 (3.0), 100 (4.0), 150 (6.0), 200 (8.0) | – |
| | Flange | PFA | 2.5 (0.1), 5 (0.2), 10 (0.4), 15 (0.5), 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12), 350 (14), 400 (16) | | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12), 350 (14), 400 (16) |
| | | Polyurethane Rubber | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12), 350 (14), 400 (16), 500(20), 600 (24), 700 (28), 800 (32), 900(36), 1000(40), 1100(44), 1200(48), 1350(54), 1500(60), 1600(64), 1800(72), 2000(80), 2200(88), 2400(96), 2600(104) | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12), 350 (14), 400 (16), | – | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12), 350 (14), 400 (16) |
| | | Natural Soft Rubber | 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12), 350(14), 400(16) | | – | 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | – |
| | | EPDM Rubber | 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12), 350(14), 400(16) | | – | 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | – |
| | Union Joint | Ceramics (*2) | 2.5 (0.1), 5 (0.2), 10 (0.4) | | – | – | – |

## Size of AXF Flowtubes: AXF Standard (Lay length code 1) (continued)

Unit: mm (in.)

| Use | Process Connection | Lining | Remote Flowtube | Integral Flowmeter | *High Grade Accuracy 0.2% of Rate (*3) | Enhanced Dual Frequency Excitation (Optional code HF1,HF2) (*3) | Replaceable Electrode (Electrode structure code 2) |
|---|---|---|---|---|---|---|---|
| Submersible Type | Wafer | PFA | 15 (0.5), 25 (1.0), 32 (1.25), 40 (1.5) 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12) | – | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | – |
| | | Polyurethane Rubber | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12) | – | – | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | – |
| | | Natural Soft Rubber | 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12) | – | – | 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | – |
| | | EPDM Rubber | 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12) | – | – | 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | – |
| | Flange | PFA | 15 (0.5), 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12), 350 (14), 400 (16) | – | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | – |
| | | Polyurethane Rubber | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12), 350 (14), 400 (16), 500(20), 600 (24), 700 (28), 800 (32), 900(36), 1000(40), 1100(44), 1200(48), 1350(54), 1500(60), 1600(64), 1800(72), 2000(80), 2200(88), 2400(96), 2600(104) | – | – | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | – |
| | | Natural Soft Rubber | 50 (2.0), 65 (2.5), 80(3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12), 350 (14), 400 (16) | – | – | 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | – |
| | | EPDM Rubber | 50 (2.0), 65 (2.5), 80(3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10) 300 (12), 350 (14), 400 (16) | – | – | 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | – |
| Explosion proof Type | Wafer | PFA | 2.5 (0.1), 5 (0.2), 10 (0.4), 15 (0.5), 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12) | | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | – |
| | | Ceramics (*1) | 15 (0.5), 25 (1.0), 40 (1.5), 50 (2.0), 80 (3.0), 100 (4.0), 150 (6.0), 200 (8.0) | | 25 (1.0), 40 (1.5), 50 (2.0), 80 (3.0), 100 (4.0), 150 (6.0), 200 (8.0) | 25(1.0),40(1.5),50(2.0), 80(3.0),100(4.0), 150(6.0),200(8.0) | – |
| | Flange | PFA | 2.5 (0.1), 5 (0.2), 10 (0.4), 15 (0.5), 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0), 250 (10), 300 (12), 350 (14), 400 (16) | | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0), 150 (6.0), 200 (8.0) | – |
| | Union Joint | Ceramics (*2) | 2.5 (0.1), 5 (0.2), 10 (0.4) | | – | – | – |
| Sanitary Type | Clamp: Tri-Clamp (*4), DIN32676 ISO2852/SMS3016 Union: DIN11851 ISO2853 (*5) SMS1145 (*6) Butt Weld: DIN11850, ISO203 | PFA | 15 (0.5), 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0) | | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0) | 25 (1.0), 32 (1.25), 40 (1.5), 50 (2.0), 65 (2.5), 80 (3.0), 100 (4.0), 125 (5.0) | – |

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*1: AXF standard lay length dimensions for wafer type ceramics linings are the same as those for ADMAG ceramics linings.
*2: AXF standard lay length dimensions for union joint type ceramics linings are the same as those for ADMAG ceramics linings.
*3: Enhanced dual frequency excitation is not available for models with High grade accuracy.
*4: Not available with 32 mm (1.25 in.), 125 mm (5.0 in.)
*5: Not available with 125 mm (5.0 in.)
*6: Not available with 15 mm (0.5 in.), 125 mm (5.0 in.)

**Size of AXF Flowtubes: Replacement model for earlier ADMAG or ADMAG AE (Lay length code 2)**

Unit: mm (in.)

| Use | Process Connection | Lining | Remote Flowtube | Integral Flowmeter | High Grade Accuracy 0.2% of Rate | Enhanced Dual Frequency Excitation (Optional code HF1,HF2) | Replaceable Electrode (Electrode structure code 2) |
|---|---|---|---|---|---|---|---|
| General-purpose use | Wafer (*6) | PFA | 2.5 (0.1), 5 (0.2), 10 (0.4), 15 (0.5), 25 (1.0), 40 (1.5), 50 (2.0), 80 (3.0), 100 (4.0), 150 (6.0), 200 (8.0) | | – | 25 (1.0), 40 (1.5), 50 (2.0), 80 (3.0), 100 (4.0), 150 (6.0), 200 (8.0) | – |
| | | Polyurethane rubber | 25 (1.0), 40 (1.5), 50 (2.0), 80 (3.0), 100(4.0), 150 (6.0), 200(8.0) | | – | 25 (1.0), 40(1.5), 50 (2.0), 80(3.0), 100 (4.0), 150 (6.0), 200 (8.0) | – |
| | Flange (*7) | PFA | 150 (6.0), 200 (8.0), 250 (10) | | – | 150 (6.0), 200 (8.0) | 150 (6.0), 200 (8.0), 250 (10) |
| | | Polyurethane rubber | 150 (6.0), 200 (8.0), 250 (10) | | – | 150 (6.0), 200 (8.0) | 150 (6.0), 200 (8.0), 250 (10) |
| Submersible Type | Wafer (*6) | PFA | 15 (0.5), 25 (1.0), 40 (1.5), 50 (2.0), 80 (3.0), 100 (4.0), 150 (6.0), 200 (8.0) | – | – | 25 (1.0), 40 (1.5), 50 (2.0), 80 (3.0), 100 (4.0), 150 (6.0), 200 (8.0) | – |
| | | Polyurethane rubber | 25 (1.0), 40 (1.5), 50 (2.0), 80 (3.0), 100 (4.0), 150 (6.0), 200 (8.0) | – | – | 25 (1.0), 40 (1.5), 50 (2.0), 80 (3.0), 100 (4.0), 150 (6.0), 200 (8.0) | – |
| | Flange (*7) | PFA | 150 (6.0), 200 (8.0), 250(10) | – | – | 150 (6.0), 200 (8.0) | – |
| | | Polyurethane rubber | 150 (6.0), 200 (8.0), 250 (10) | – | – | 150 (6.0), 200 (8.0) | – |
| Explosion proof Type | Wafer (*6) | PFA | 2.5 (0.1), 5 (0.2), 10 (0.4), 15 (0.5), 25 (1.0), 40 (1.5), 50 (2.0), 80 (3.0), 100 (4.0), 150 (6.0), 200 (8.0) | | – | 25 (1.0), 40 (1.5), 50 (2.0), 80 (3.0), 100 (4.0), 150 (6.0), 200 (8.0) | – |
| | Flange (*7) | PFA | 150 (6.0), 200 (8.0), 250 (10) | | – | 150 (6.0), 200 (8.0) | – |

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*6: ADMAG lay length dimensions for wafer type of 250 mm (10 in.), and 300 mm (12 in.) are the same as those for AXF Standard.
*7: ADMAG lay length dimensions for flange type of 15 mm (0.5 in.) to 100 mm (4.0 in.), or 300 mm (12 in.) to 2600 mm (104 in.) are the same as those for AXF Standard. However, in case of platinum-iridium (grounding ring code P) or tantalum (grounding ring code T) or None (grounding ring code N) in flange type of 15 mm (0.5 in.) to 100 mm (4.0 in.), the lay length of AXF Standard are longer by approx. 4mm (0.16 in) than those of earlier ADMAG or ADMAG AE.

**Protection:**

**General-Purpose Use/Sanitary Type/Explosion proof Type:**

IP67, NEMA4X , JIS C0920 immersion-proof type

**Submersible Type (only for Remote Flowtube):**

IP68 (can be used for temporary submergence)
JIS C0920 Submersible Type

Note: Test Condition: 50 m below the surface of the water, equivalent to 0.5 MPa hydraulic pressure, for one month.
Cable should be protected at customer site. In the case of installation always under water or corrosion fluid, contact Yokogawa office.

**Carting:**

**General-Purpose Use/Explosion proof Type:**

Size 2.5 to 125 mm (0.1 to 5.0 in.) (Wafer type),
Size 2.5 to 100 mm (0.1 to 4.0 in.) (Process connection code B or D of flange type):

- Housing: No coating (Stainless steel surface)
- Flange (Flange type only) : No coating (Stainless steel surface)
- Terminal Box and Cover (Remote Flowtube):
  Polyurethane corrosion-resistant coating
  Coating color: Mint green (Munsell 5.6 BG 3.3/2.9 or its equivalent)

Size 150 to 300 mm (6.0 to 12 in.) (Wafer type),
Size 125 to 400 mm (5.0 to 16 in.) (Process connection code B of flange type),
Size 50 to 2600 mm (2.0 to 104 in.) (Process connection code C of flange type):

- Housing, Flange (Flange type only), Terminal Box and Cover (Remote Flowtube):
  Polyurethane corrosion-resistant coating
  Coating color: Mint green (Munsell 5.6 BG 3.3/2.9 or its equivalent)

**Sanitary Type:**

Size 15 to 125 mm (0.5 to 5.0 in.):

- Housing: No coating (Stainless steel surface)
- Adapter : No coating (Stainless steel surface)
- Terminal Box and Cover (Remote Flowtube):
  Polyurethane corrosion-resistant coating
  Coating color: Mint green (Munsell 5.6 BG 3.3/2.9 or its equivalent)

**Submersible Type:** Non-tar epoxy coating (black)

**Flowtube Material:**

**Size 2.5 mm (0.1 in.) to 15 mm (0.5 in.)**

| Part Name | | Material |
|---|---|---|
| Housing | | Stainless steel-JIS SCS11 |
| Flange | | Stainless steel-JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) |
| Mini-Flange | Wafer Type PFA/Polyurethane Rubber lining | Stainless steel-JIS SCS13 /EN 1.4308 equivalent |
| | Wafer Type Ceramics lining [only for 15 mm (0.5 in.)] | Stainless steel-JIS SUS316L (AISI 316 SS/EN 1.4404 equivalent) |
| | Sanitary Type [only for 15 mm (0.5 in.)] | Stainless steel-JIS SCS13 /EN 1.4308 equivalent |
| Pipe | Flange/Wafer Type PFA/Polyurethane Rubber lining | Stainless steel-JIS SCS13 /EN 1.4308 equivalent |
| | Wafer Type/Union Joint Ceramics lining | Alumina ceramics (99.9%) |
| | Sanitary Type [only for 15 mm (0.5 in.)] | Stainless steel-JIS SCS13 /EN 1.4308 equivalent |
| Terminal Box (Remote Flowtube) | | Aluminum alloy |

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### Size 25 mm (1.0 in.) to 125 mm (5.0 in.)

| Part Name | | | Material |
|---|---|---|---|
| Housing | | | Stainless steel-JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) |
| Flange | Process Connection code: B** | | Stainless steel-JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) |
| | Process Connection code: C** [(Size 50 mm (2.0 in.) to 125 mm (5.0 in.)] | | Carbon steel-JIS SS400 |
| Mini-Flange | Wafer Type PFA/Polyurethane Rubber/ Natural Soft Rubber/ EPDM Rubber lining | Size 25 mm (1.0 in.) | Stainless steel- EN 1.4308 SCS 13 equivalent |
| | | Size 32 mm (1.25 in.) to 125 mm (5.0 in.) | Stainless steel-JIS SUS430 (ASTM 43000/DIN X6Cr17/EN 1.4016 equivalent) |
| | Wafer Type Ceramics lining | Size 25 mm (1.0 in.) to 50 mm (2.0 in.) | Stainless steel-JIS SUS316L (AISI 316L SS/EN 1.4404 equivalent) |
| | | Size 80 mm (3.0 in.), 100 mm (4.0 in.) | Stainless steel-JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) |
| | Sanitary Type | Size 25 mm (1.0 in.) | Stainless steel-JIS SCS13 /EN 1.4308 equivalent |
| | | Size 32 mm (1.25 in.) to 125 mm (5.0 in.) | Stainless steel-JIS SUS430 (ASTM 43000/DIN X6Cr17/EN 1.4016 equivalent) |
| Pipe | Flange/Wafer Type PFA/Polyurethane Rubber/ Natural Soft Rubber/ EPDM Rubber lining | Size 25 mm (1.0 in.) | Stainless steel- EN 1.4308 SCS 13 equivalent |
| | | Size 32 mm (1.25 in.) to 125 mm (5.0 in.) | Stainless steel-JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) |
| | Wafer Type Ceramics lining | Size 25 mm (1.0 in.) to 100 mm (4.0 in.) | Alumina ceramics (99.9%) |
| | Sanitary Type | Size 25 mm (1.0 in.) | Stainless steel-JIS SCS13 /EN 1.4308 equivalent |
| | | Size 32 mm (1.25 in.) to 125 mm (5.0 in.) | Stainless steel-JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) |
| Terminal Box (Remote Flowtube) | | | Aluminum alloy |

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### Size 150 mm (6.0 in.) to 400 mm (16 in.)

| Part Name | | Material |
|---|---|---|
| Housing | | Carbon steel-JIS SPCC |
| Flange | Process Connection code: B** | Stainless steel-JIS SUS304 or SUS304F (AISI 304 SS/EN 1.4301 equivalent) |
| | Process Connection code: C** | Carbon steel-JIS SS400 |
| Mini-Flange | Wafer Type PFA/Polyurethane Rubber/Natural Soft Rubber/ EPDM Rubber lining | Carbon steel-JIS SS400 |
| | Wafer Type Ceramics lining [available with 150 mm (6.0 in.), 200 mm (8.0 in.)] | Stainless steel-JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) |
| Pipe | Flange Type/Wafer Type PFA/Polyurethane Rubber/Natural Soft Rubber/ EPDM Rubber lining | Stainless steel-JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) |
| | Wafer Type Ceramics lining [available with 150 mm (6.0 in.), 200 mm (8.0 in.)] | Alumina ceramics (99.9%) |
| Terminal Box (Remote Flowtube) | | Aluminum alloy |

T05.EPS

### Size 500 mm (20 in.) to 2600 mm (104 in.)

| Part Name | | Material |
|---|---|---|
| Housing | | Carbon steel-JIS SPCC |
| Flange | | Carbon steel-JIS SS400 |
| Pipe | | Stainless steel-JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) |
| Terminal Box (Remote Flowtube) | Case, Cover (500 to 1000 mm) (20 to 40 in.) | Aluminum alloy |
| | Case (1100 to 2600 mm) (44 to 104 in.) | Stainless steel-JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) Electrical connection: Carbon steel |
| | Cover (1100 to 2600 mm) (44 to 104 in.) | Aluminum alloy |

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### Wetted Part Material:

#### Lining:

Fluorocarbon PFA*1 lining
Polyurethane Rubber lining
Natural Soft Rubber lining*2
EPDM Rubber lining*3
Alumina ceramics lining

*1: PFA is FDA (U.S. Food and Drug Administration) approval material.
*2: Natural soft rubber is a material which can reduce wear of the lining due to fluids mixed with slurries. If the concentration of mixed slurries is high, contact Yokogawa as necessary measures need to be taken separately for the electrodes.
*3: EPDM rubber lining is superior in the ozone proof.

#### Electrode:

Stainless steel-JIS SUS316L (AISI 316L SS/EN 1.4404 equivalent), Hastelloy*1 C276 equivalent, Titanium, Tantalum, Platinum-Iridium, Tungsten Carbide, Platinum-Alumina cermet(only for ceramics lining)

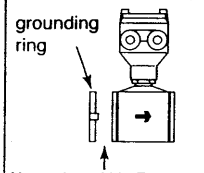
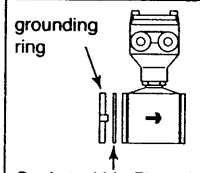
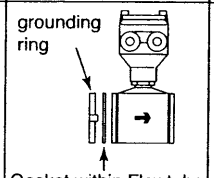
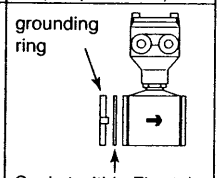
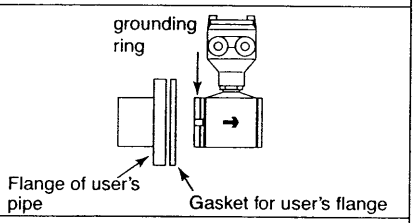
Note : For size over 500 mm and sanitary type, SUS316L only.

#### Grounding Ring/Grounding Electrode:

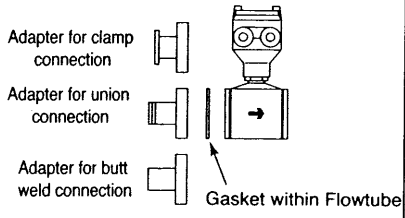
- Grounding Ring(plate type)
  Stainless steel-JIS SUS316 (AISI 316 SS/EN 1.4401 equivalent),
  Stainless steel-JIS SUS316L (AISI 316L SS/EN 1.4404 equivalent),
  Hastelloy*1 C276 equivalent, Titanium,
  Stainless steel-JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) for size 500 to 1000mm (20 to 40 in.) only,
  SS400 carbon steel lined with stainless steel-JIS SUS316 (AISI 316 SS/EN 1.4404 equivalent) for size 1100 to 2600mm (44 to 104 in.) only.
- Grounding Electrode(electrode type)
  Fluorocarbon PFA lining + grounding electrode (Tantalum, Platinum-Iridium)

*1: Hastelloy is a registered trademark of Haynes International Inc.
*2: Available with sizes 2.5 to 200mm (0.1 to 8.0 in.), PFA and ceramics linings only.

**Gasket:**

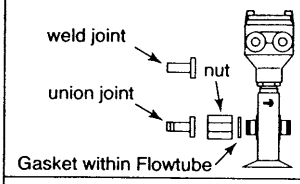
| Use | General-Purpose Use / Submersible Type / Explosion proof Type | |
|---|---|---|
| Lining | PFA/Polyurethane Rubber/ Natural Soft Rubber/ EPDM Rubber | Ceramics |
| Standard |  |  |
| | Gasket Material (within Flowtube) | |
| | – | Fluororesin with ceramic fillers (Valqua #7020) |
| Optional code (GA, GC, GD, or GF) (Only when selecting the PFA lining/ ceramics lining) |  |  |
| | Gasket Material (within Flowtube) | |
| | GA: Fluororubber for PVC pipes (Viton®)<br>GC: Acid-resistant fluororubber for PVC pipes (Viton®)<br>GD: Alkali-resistant fluororubber for PVC pipes (Viton®)<br>GF*1: Fluororesin with alkali-resistant carbons for metal pipes<br>*1: GF is applicable only for ceramics lining. | |
| Optional code (BCF, BSF, BCC, or BSC) |  | |
| | Gasket Material (for user's flange) | |
| | BCF, BSF: PTFE-sheathed non-asbestos<br>BCC, BSC: Chloroprene rubber | |

T23-1.EPS

| Use | Sanitary Type |
|---|---|
| Lining | PFA |
| Standard |  |
| | Gasket Material (within Flowtube) |
| | EPDM (ethylene propylene) rubber |
| Optional code (GH) | GH: Silicone rubber |

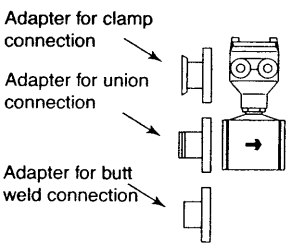
T23-2.EPS

**Joints:**

| Lining | Ceramics Weld / Union Joints (size 10 mm or less) | |
|---|---|---|
| Standard |  | |
| | Materials for Weld / Union Joint | |
| | Process Connection Code GUW: weld joint | Stainless steel (JIS SUS316L (ANSI 316L SS/EN 1.4404 equivalent)) |
| | Process Connection Code GUN, GUR: union joint | |

Note: Contact Yokogawa office if PVC union joint is required.

T23-3.EPS

| Use | Sanitary Type |
|---|---|
| Standard |  |
| | Materials for Adapters (clamp, union, butt weld) |
| | Stainless steel-JIS SUS316L (AISI 316L SS/EN 1.4404 equivalent) |

T23-4.EPS

**O-Ring (Replaceable electrode type only):**
Fluororubber (Part number : G9303SE)

**Electrode Construction:**

**Non-replaceable Electrode Type**

General-Purpose Use/Submersible Type/Explosion proof Type:

PFA, Polyurethane Rubber lining:
External insertion type

Natural Soft Rubber, EPDM Rubber lining:
Internal insertion type

Ceramics lining: Integral type

Sanitary Type: Internal insertion type

**Replaceable Electrode Type**

Electrode parts can be put into unit to facilitate replacement or mounting at customer site.
The optional dedicated tool (F9807SK) is required.

**Replaceable electrodes are available for the following:**

**AXF standard:**

| Use | Process Connection | Available Size | Lining | Electrode Material |
|---|---|---|---|---|
| General-Purpose Use | Wafer | 25 to 300 mm (1.0 to 12 in.) | PFA/ Polyurethane Rubber | JIS SUS316L (AISI 316L SS/EN 1.4404 equivalent)(*1) |
| | Flange | 25 to 400 mm (1.0 to 16 in.) | | |

T06.EPS

**Replacement model for earlier ADMAG or ADMAG AE:**

| Use | Process Connection | Available Size | Lining | Electrode Material |
|---|---|---|---|---|
| General-Purpose Use | Flange | 150 to 250 mm (6.0 to 10 in.) | PFA/ Polyurethane Rubber | JIS SUS316L (AISI 316L SS/EN 1.4404 equivalent)(*1) |

T07.EPS

*1: If any other electrode materials are required, please contact Yokogawa office.

**Mounting/Shapes (Remote Flowtube):**

- Electrical Connection: ANSI 1/2 NPT female
  ISO M20 × 1.5 female
  JIS G1/2 (PF1/2) female
- Direction of Electrical Connection: The direction can be changed even after delivery.
  Note: In case of submersible types, an optional code DHC, and sizes of 1100 mm or larger, the direction can not be changed after delivery.
- Terminal Connection at Terminal Box: M4 size screw

**Grounding:**

Grounding resistance 100 Ω or less

* In case of explosion proof type except TIIS, follow the domestic electrical requirements as regulated in each country.

* In case of TIIS Flame proof type, refer to description of "HAZARDOUS AREA CLASSIFCATION".

**Combined Converter:**

- A remote flowtube for sizes of up to 400 mm can be combined with the AXFA11 Converter or the AXFA14 Converter. If a combined converter is changed from AXFA11 to AXFA14 or vice versa, a new meter factor must be adjusted by flow calibrations.
- In case that size 250 mm (10 in.) or larger is used in low conductivity or high concentration slurries, please use the AXFA11 Converter.
- A remote flowtube for sizes of 500 mm or larger can be combined with the AXFA11 Converter only.
- Maximum Cable Length:
  Combination of AXF remote Flowtube and AXFA11: up to 200 m (660 ft)
  Combination of AXF remote Flowtube and AXFA14: up to 100 m (330 ft)

## ■ HAZARDOUS AREA CLASSIFICATION

**FM:**

*AXF002C – AXF400C

**(Integral Flowmeter)**

Explosion proof for Class I, Division 1, Group A, B, C, & D.
Dust-ignition proof for Class II/III, Division1, Group E, F & G.
Intrinsically safe (electrodes) for Class I, Division 1, Group A, B, C, & D.
"SEAL ALL CONDUITS WITHIN 18 INCHES"
"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"
Electrode Circuit Um: 250 Vac/dc
Excitation Circuit: 140V max
Enclosure: NEMA 4X

| Temperature Code | Maximum Process Temperature | Minimum Process Temperature |
|---|---|---|
| T6 | +70°C (+158°F) | –40°C (–40°F) |
| T5 | +85°C (+185°F) | –40°C (–40°F) |
| T4 | +120°C (+248°F) | –40°C (–40°F) |
| T3 | +130°C (+266°F) | –40°C (–40°F) |

T27-1.EPS

Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

**(Remote Flowtube)**

Explosion proof for Class I, Division 1, Group A, B, C, & D.
Dust-ignition proof for Class II/III, Division1, Group E, F & G.
Intrinsically safe (electrodes) for Class I, Division 1, Group A, B, C, & D.
"SEAL ALL CONDUITS WITHIN 18 INCHES"
"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"
Electrode Circuit Um: 250 Vac/dc
Excitation Circuit: 170V max
Enclosure: NEMA 4X

| Temperature Code | Maximum Process Temperature | Minimum Process Temperature |
|---|---|---|
| T6 | +70°C (+158°F) | –40°C (–40°F) |
| T5 | +85°C (+185°F) | –40°C (–40°F) |
| T4 | +120°C (+248°F) | –40°C (–40°F) |
| T3 | +150°C (+302°F) | –40°C (–40°F) |

T28-1.EPS

Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

Note: Installation shall be in accordance with the manufacturer's instructions and National Electric code, ANSI/NFPA-70.

**CENELEC ATEX (KEMA):**
**No. KEMA 03ATEX2435**
*AXF002C – AXF400C

**(Integral Flowmeter)**
**CENELEC ATEX (KEMA) Flame proof Type**
Group category: II 2G
EEx dme [ia] IIC T6...T3
Electrode Circuit Um: 250 Vac/dc
Excitation Circuit: 140V max
Enclosure: IP66, IP67

| Temperature Class | Maximum Process Temperature | Minimum Process Temperature |
|---|---|---|
| T6 | +70°C (+158°F) | –40°C (–40°F) |
| T5 | +85°C (+185°F) | –40°C (–40°F) |
| T4 | +120°C (+248°F) | –40°C (–40°F) |
| T3 | +130°C (+266°F) | –40°C (–40°F) |

T27-2.EPS

Ambient Temp.: –40°C to +60°C (–40°F to +140°F)
**CENELEC ATEX (KEMA) Type of Protection "Dust"**
Group category: II 1D
Maximum surface temperature:

| Maximum Surface Temperature | Maximum Process Temperature |
|---|---|
| T75°C (+167°F) | +70°C (+158°F) |
| T85°C (+185°F) | +85°C (+185°F) |
| T100°C (+212°F) | +120°C (+248°F) |
| T110°C (+230°F) | +130°C (+266°F) |

T29.EPS

**(Remote Flowtube)**
**CENELEC ATEX (KEMA) Flame proof Type**
Group category: II 2G
EEx dme [ia] IIC T6...T3
Electrode Circuit Um: 250 Vac/dc
Excitation Circuit: 170V max
Enclosure: IP66, IP67

| Temperature Class | Maximum Process Temperature | Minimum Process Temperature |
|---|---|---|
| T6 | +70°C (+158°F) | –40°C (–40°F) |
| T5 | +85°C (+185°F) | –40°C (–40°F) |
| T4 | +120°C (+248°F) | –40°C (–40°F) |
| T3 | +150°C (+302°F) | –40°C (–40°F) |

T28-2.EPS

Ambient Temp.: –40°C to +60°C (–40°F to +140°F)
**CENELEC ATEX (KEMA) Type of Protection "Dust"**
Group category: II 1D
Maximum surface temperature:

| Maximum Surface Temperature | Maximum Process Temperature |
|---|---|
| T75°C (+167°F) | +70°C (+158°F) |
| T85°C (+185°F) | +85°C (+185°F) |
| T100°C (+212°F) | +120°C (+248°F) |
| T115°C (+239°F) | +150°C (+302°F) |

T30.EPS

**CSA:**
*AXF002C – AXF400C
**(Integral Flowmeter)**
**For CSA C22. 2 Series**
Explosion proof for Class I, Division 1, Group A, B, C, & D.
Dust-ignition proof for Class II/III, Division 1, Group E, F & G.
Intrinsically safe (electrodes) for Class I, Division 1, Group A, B, C, & D.
"SEAL ALL CONDUITS WITHIN 50 cm OF THE ENCLOSURE"
"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"
**For CSA E79 Series**
Flame proof for Zone 1, Ex dme [ia] IIC T6...T3
Intrinsically safe (electrodes) for Zone 0, Ex ia IIC T6...T3

Electrode Circuit Um: 250 Vac/dc
Excitation Circuit: 140V max
Enclosure: Type 4X, IP66, IP67

| Temperature Code | Maximum Process Temperature | Minimum Process Temperature |
|---|---|---|
| T6 | +70°C (+158°F) | –40°C (–40°F) |
| T5 | +85°C (+185°F) | –40°C (–40°F) |
| T4 | +120°C (+248°F) | –40°C (–40°F) |
| T3 | +130°C (+266°F) | –40°C (–40°F) |

T27-1.EPS

Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

**(Remote Flowtube)**
**For CSA C22.2 Series**
Explosion proof for Class I, Division 1, Group A, B, C, & D.
Dust-ignition proof for Class II/III, Division 1, Group E, F & G.
Intrinsically safe (electrodes) for Class I, Division 1, Group A, B, C, & D.
"SEAL ALL CONDUITS WITHIN 50 cm OF THE ENCLOSURE"
"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"
**For CSA E79 Series**
Flame proof for Zone 1, Ex dme [ia] IIC T6...T3
Intrinsically safe (electrodes) for Zone 0,Ex ia IIC T6...T3

Electrode Circuit Um: 250 Vac/dc
Excitation Circuit: 170V max
Enclosure: Type 4X, IP66, IP67

| Temperature Code | Maximum Process Temperature | Minimum Process Temperature |
|---|---|---|
| T6 | +70°C (+158°F) | –40°C (–40°F) |
| T5 | +85°C (+185°F) | –40°C (–40°F) |
| T4 | +120°C (+248°F) | –40°C (–40°F) |
| T3 | +150°C (+302°F) | –40°C (–40°F) |

T28-1.EPS

Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

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19.1.2

**TIIS:**

**(Integlal Flowmeter)**

- Construction: Exde[ia] II CT4
  : Converter, Terminal box ; Explosion proof
  Flowtube ; Increased Safety
  Signal Ciruit ; Intrinsically Safety(ia)
- Ambient Temperature: –40 to 60°C (power supply code 1)
  : –40 to 50°C (power supply code 2)
- Fluid Temperature: 120°C max
- Electrode Circuit: 250 V AC/DC
- Grounding: JIS Class C(grouding resister 10Ω or less) or JIS Class A(grounding resister 10Ω or less)

*In case that ambient temperature exceeds 50°C, use heat-resistant cables with maximum allowable temperature of 70°C or above.

**(Remote Flowtube)**

- Construction: Exde[ia] II CT4
  : Terminal box ; Explosion proof
  Flowtube; Increased Safety
  Electrode; Intrinsically Safety(ia)
- Ambient Temperature: –40 to 60°C
- Fluid Temperature: 120°C max
- Electrode Circuit: 250 V AC/DC
- Grounding: JIS Class C(grouding resistance 10Ω or less) or JIS Class A(grounding resistance 10Ω or less)

Note : In case of TIIS Flame proof type, a remote flowtube is available for combined use with the AXFA14 converter only.

*In case that ambient temperature exceeds 50°C, use heat-resistant cables with maximum allowable temperature of 70°C or above.

## ■ STANDARD PERFORMANCE

**Reference Conditions:**

Similar to BS EN 29104 (1993); ISO9104 (1991)

- Fluid temperature: 20°C ± 10°C (+68°F ± 18°F)
- Ambient temperature: 25°C ± 5°C (+77°F ± 9°F)
- Warm-up time: 30 min
- Straight runs:
  Upstream > 10 × DN
  Downstream > 5 × DN
- Properly grounded
- Properly centered

### Accuracy (at reference conditions)

**Pulse Output:**

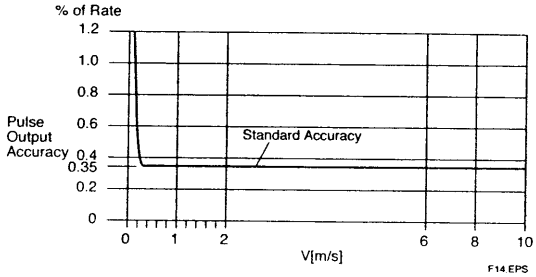
**·PFA/Ceramics Lining:**

| Size mm (In.) | Flow Velocity V m/s (ft/s) | Standard Accuracy (Calibration code B) | Flow Velocity V m/s (ft/s) | High Grade Accuracy (Calibration code C) |
|---|---|---|---|---|
| 2.5 (0.1) to 15 (0.5) | $V < 0.3$ (1) | ±1.0 mm/s | – | |
| | $0.3 \leqq V \leqq 10$ (1) (33) | ±0.35% of Rate | | |
| 25 (1.0) to 200 (8.0) | $V < 0.15$ (0.5) | ±0.5 mm/s | $V < 0.15$ (0.5) | ±0.5 mm/s |
| | $0.15 \leqq V \leqq 10$ (0.5) (33) | ±0.35% of Rate | $0.15 \leqq V < 1$ (0.5) (3.3) | ±0.18% of Rate ± 0.2mm/s |
| | | | $1 \leqq V \leqq 10$ (3.3) (33) | ±0.2% of Rate |
| 250 (10) to 400 (16) | $V < 0.15$ (0.5) | ±0.5 mm/s | – | |
| | $0.15 \leqq V \leqq 10$ (0.5) (33) | ±0.35% of Rate | | |

T08.EPS

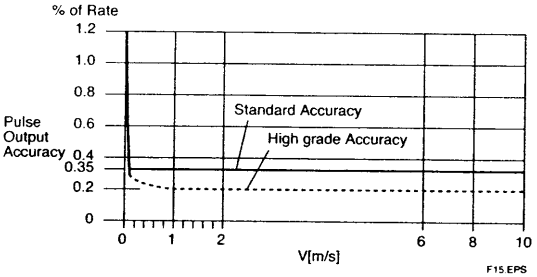
Enhanced dual frequency excitation(Option code HF2):
Standard accuracy ±1 mm/ s

**Size 2.5 mm (0.1 in.) to 15 mm (0.5 in.)**




F14.EPS

**Size 25 mm (1.0 in.) to 400 mm (16 in.)**




F15.EPS

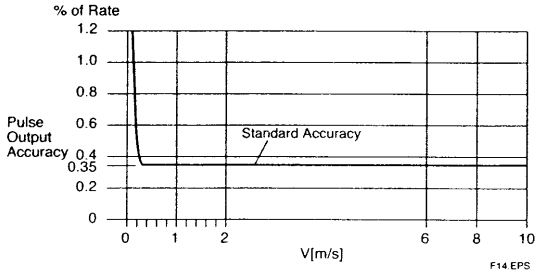
**Polyurethane Rubber /Natural Soft Rubber / EPDM Rubber Lining:**

| Size mm (in.) | Flow Velocity *V* m/s (ft/s) | Standard Accuracy (Calibration code B) |
|---|---|---|
| 25 (1.0) to 400 (16) | $V < 0.3$ (1.0) | ±1.0 mm/s |
| | $0.3 \leqq V \leqq 10$ (1.0) (33) | ±0.35% of Rate |
| 500 (20) to 1000 (40) | $V < 0.3$ (1.0) | ±1.75 mm/s |
| | $0.3 \leqq V < 1$ (1.0) (3.3) | ±0.25% of Rate ±1 mm/s |
| | $1 \leqq V \leqq 10$ (3.3) (33) | ±0.35% of Rate |
| 1100 (44) to 2000 (80) | $V < 0.3$ (1.0) | ±2.2 mm/s |
| | $0.3 \leqq V < 1$ (1.0) (3.3) | ±0.4% of Rate ±1 mm/s |
| | $1 \leqq V \leqq 10$ (3.3) (33) | ±0.5% of Rate |
| 2200 (88) to 2600 (104) | $V < 1$ (3.3) | ±8.5 mm/s |
| | $1 \leqq V \leqq 10$ (3.3) (33) | ±0.85% of Rate |

T09.EPS

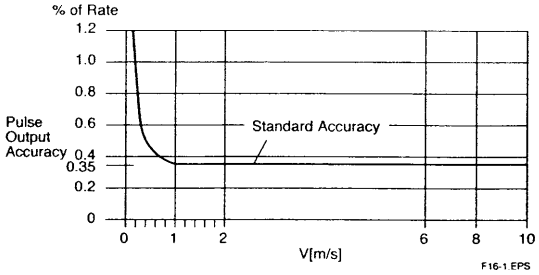
Enhanced dual frequency excitation(Option code HF2) : Standard accuracy ±1 mm/ s

**Size 25 mm (1.0 in.) to 400 mm (16 in.)**



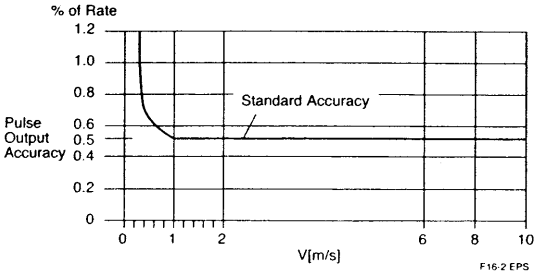

F14.EPS

**Size 500 mm (20 in.) to 1000 mm (40 in.)**



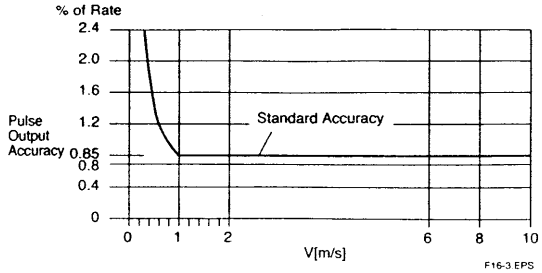

F16-1.EPS

**Size 1100 mm (44 in.) to 2000 mm (80 in.)**




F16-2.EPS

**Size 2200 mm (88 in.) to 2600 mm (104 in.)**




F16-3.EPS

**Current Output:** Pulse output accuracy plus ±0.05% of Span

**Repeatability:**
±0.1% of Rate ($V \geqq 1$ m/s (3.3 ft/s))
±0.05% of Rate ±0.5 mm/s ($V < 1$ m/s (3.3 ft/s))

**Maximum Power Consumption:**
Integral Flowmeter: 12W
Remote Flowtube: Combined with AXFA11: 20W
Combined with AXFA14: 12W

**Insulation Resistance** (*1):
Integral Flowmeter:
Between power supply terminals and ground terminalm : 100MΩ at 500V DC
Between power supply terminals and input /output terminals : 100MΩ at 500V DC
Between ground terminal and input/output terminals : 20MΩ at 100V DC
Between input/output terminals : 20MΩ at 100V DC
Remote Flowtube:
Between excitation current terminal and signal /common terminals : 100MΩ at 500V DC
Between signal terminals : 100MΩ at 500V DC
Between signal terminals and common terminal (C) : 100MΩ at 500V DC

**Withstand Voltage** (*1):
Integral Flowmeter:
Between power supply terminals and ground terminal : 1390V AC for 2 seconds
Between power supply terminals and input/output terminals : 1390V AC for 2 seconds
Remote Flowtube (option code JF3, KF2, and CF1)
Between excitation current terminal and ground terminal : 1500V AC for 1 minute
Between signal terminals and ground terminal : 1500V AC for 1 minute
Between signal terminals and excitation current terminal : 2000V AC for 1 minute
Remote Flowtube (option code FF1)
Between signal terminals and ground terminal : 500V AC for 1 minute or 600V AC for 1 second
Between signal terminals and excitation current terminal : 2000V AC for 1 minute or 2400V AC for 1 second.

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19.1.2

## ⚠ CAUTION

*1: When performing the Insulation Resistance Test or the Withstand Voltage Test, please obey the following caution.
- Following the relevant test, wait for more than 10 seconds after the power supply has been turned off before removing the cover.
- Remove all wires from terminals before testing.
- When the power terminal has a lighting protector (optional code A), remove the short bar at the ground terminal.
- After testing, be sure to discharge by using a resistance and return all wires and the short bar to its correct position.
- Screws must be tightened to a torque of 1.18 N-m or more.
- After closing the cover, the power supply can be restored.

**Safety Requirement Standards:**

EN61010
- Altitude at installation site: Max. 2000 m above sea level
- Installation category based on IEC1010:
  Overvoltage category II ("II" applies to electrical equipment which is supplied from the fixed installation like distribution board.)
- Pollution degree based on IEC1010
  Pollution degree 2 ("Pollution degree" describes the degree to which a solid, liquid, or gas which deteriorates dielectric strength or surface resistivity is adhering. "2" applies to a normal indoor atmosphere.)

**EMC Conformity Standards:**

EN61326
EN61000-3-2, EN61000-3-3
AS/NZS 2064

## ■ NORMAL OPERATING CONDITIONS

**Ambient Temperature:** –40° to +60°C (–40° to +140°F)

*1: Minimum temperature should also be limited according to minimum fluid temperature of linings.

*2: Indicator's operating range (integral flowmeter): –20° to +60°C (–4° to +140°F)

*3: Maximum temperature should be +50°C (+122°F) in the case of power supply code 2 (integral flowmeter).

**Ambient Humidity:** 0 to 100%

Lengthy continuous operation at 95% or more is not recommended.

**Power Supply (integral flowmeter):**

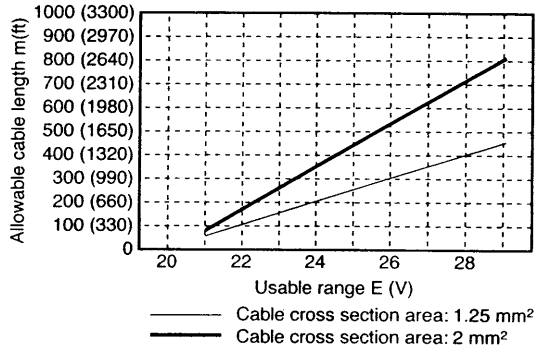
**Power supply code 1:**

- AC specifications
  Rated power supply: 100 to 240 V AC, 50/60 Hz
  (Operating voltage range: 80 to 264 V AC)
- DC specifications
  Rated power supply: 100 to 120 V DC
  (Operating voltage range: 90 to 130 V DC)

**Power supply code 2:**

- AC specifications
  Rated power supply: 24 V AC, 50/60 Hz
  (Operating voltage range: 20.4 to 28.8 V AC)
- DC specifications
  Rated power supply: 24 V DC
  (Operating voltage range: 20.4 to 28.8 V DC)

**Supplied Voltage and Cable Length for Power Supply Code 2**




F01.EPS

**Fluid Conductivity:**

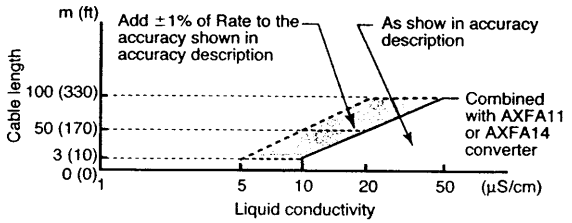
Size 2.5 to 10 mm (0.1 to 0.4 in.): 5 µS/cm or larger
Size 15 to 125 mm (0.5 to 5 in.): 1 µS/cm or larger
Size 150 to 400 mm (6 to 16 in.): 3 µS/cm or larger

Note: In the case of fluids which have large flow noise (pure water, pure alcohol or others), low conductivity and low viscosity, please contact Yokogawa office.

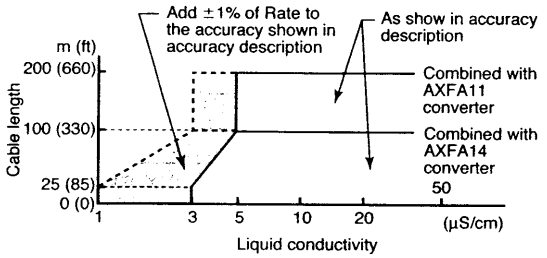
Size 500 to 2600 mm (20 to 104 in.) : 50 µS/cm or large.

**Cable Length and Liquid Conductivity (Remote Flowtube):**

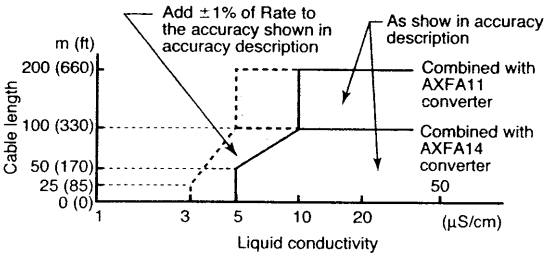
**Size 2.5 to 10 mm (0.1 to 0.4 in.)**




**Size 15 to 125 mm (0.5 to 5.0 in.)**



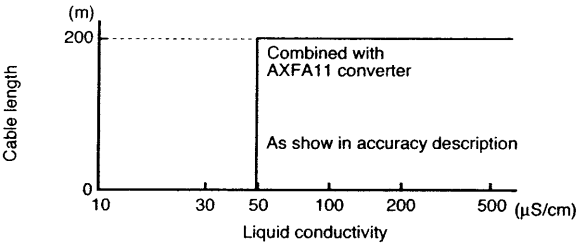

**Size 150 to 400 mm (6.0 to 16 in.)**




F03.EPS

Note: In case that size 250 or 300 mm (10 or 12 in.) is used for high conductivity fluid (ex. caustic soda, seawater), please use the flange type.

**Size 500 to 2600 mm (20 to 104 in.)**




F02.EPS

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19.1.2

**Measurable Flow Rate Range:**

SI Units (Size: mm, Flow rate: $m^3/h$)

| Size (mm) | 0 to Min. Span Flow Rate (0.1 m/s) | 0 to Max. Span Flow Rate (10 m/s) |
|---|---|---|
| 2.5 | 0 to 0.0018 $m^3/h$ | 0 to 0.1767 $m^3/h$ |
| 5 | 0 to 0.0071 | 0 to 0.7068 |
| 10 | 0 to 0.0283 | 0 to 2.8274 |
| 15 | 0 to 0.0637 | 0 to 6.361 |
| 25 | 0 to 0.1768 | 0 to 17.671 |
| 32 | 0 to 0.2897 | 0 to 28.967 |
| 40 | 0 to 0.4524 | 0 to 45.23 |
| 50 | 0 to 0.7069 | 0 to 70.68 |
| 65 | 0 to 1.1946 | 0 to 119.45 |
| 80 | 0 to 1.8096 | 0 to 180.95 |
| 100 | 0 to 2.8275 | 0 to 282.74 |
| 125 | 0 to 4.418 | 0 to 441.7 |
| 150 | 0 to 6.362 | 0 to 636.1 |
| 200 | 0 to 11.310 | 0 to 1,130.9 |
| 250 | 0 to 17.672 | 0 to 1,767.1 |
| 300 | 0 to 25.447 | 0 to 2,544.6 |
| 350 | 0 to 34.64 | 0 to 3,463 |
| 400 | 0 to 45.24 | 0 to 4,523 |
| 500 | 0 to 70.69 | 0 to 7,068 |
| 600 | 0 to 101.79 | 0 to 10,178 |
| 700 | 0 to 138.55 | 0 to 13,854 |
| 800 | 0 to 180.96 | 0 to 18,095 |
| 900 | 0 to 229.03 | 0 to 22,902 |
| 1000 | 0 to 282.75 | 0 to 28,274 |

T11.EPS

English Units (Size: in., Flow rate: GPM)

| Size (in.) | 0 to Min. Span Flow Rate (0.33ft/s) | 0 to Max. Span Flow Rate (33ft/s) |
|---|---|---|
| 0.1 | 0 to 0.0081 GPM | 0 to 0.8031 GPM |
| 0.2 | 0 to 0.0322 | 0 to 3.212 |
| 0.4 | 0 to 0.1286 | 0 to 12.850 |
| 0.5 | 0 to 0.2008 | 0 to 20.078 |
| 1.0 | 0 to 0.8032 | 0 to 80.31 |
| 1.25 | 0 to 1.004 | 0 to 100.39 |
| 1.5 | 0 to 1.8071 | 0 to 180.70 |
| 2.0 | 0 to 3.213 | 0 to 321.2 |
| 2.5 | 0 to 5.020 | 0 to 501.9 |
| 3.0 | 0 to 7.229 | 0 to 722.8 |
| 4.0 | 0 to 12.851 | 0 to 1,285.0 |
| 5.0 | 0 to 20.079 | 0 to 2,007.8 |
| 6.0 | 0 to 28.914 | 0 to 2,891.3 |
| 8.0 | 0 to 51.41 | 0 to 5,140 |
| 10 | 0 to 80.32 | 0 to 8,031 |
| 12 | 0 to 115.66 | 0 to 11,565 |
| 14 | 0 to 157.42 | 0 to 15,741 |
| 16 | 0 to 205.61 | 0 to 20,560 |
| 20 | 0 to 321.3 | 0 to 32,125 |
| 24 | 0 to 462.7 | 0 to 46,261 |
| 28 | 0 to 629.7 | 0 to 62,966 |
| 32 | 0 to 822.5 | 0 to 82,242 |
| 36 | 0 to 1040.9 | 0 to 104,082 |
| 40 | 0 to 1285.1 | 0 to 128,503 |

T24.EPS

| Size (mm) | 0 to Min. Span Flow Rate (0.3 m/s) | 0 to Max. Span Flow Rate (10 m/s) |
|---|---|---|
| 1100 | 0 to 1,026.4 $m^3/h$ | 0 to 34,211 $m^3/h$ |
| 1200 | 0 to 1,221.5 | 0 to 40,715 |
| 1350 | 0 to 1,545.9 | 0 to 51,529 |
| 1500 | 0 to 1,908.6 | 0 to 63,617 |
| 1600 | 0 to 2,171.5 | 0 to 72,382 |
| 1800 | 0 to 2,748.3 | 0 to 91,608 |
| 2000 | 0 to 3,393 | 0 to 113,097 |
| 2200 | 0 to 4,106 | 0 to 136,847 |
| 2400 | 0 to 4,886 | 0 to 162,860 |
| 2600 | 0 to 5,735 | 0 to 191,134 |

T11-1.EPS

| Size (in.) | 0 to Min. Span Flow Rate (1.0ft/s) | 0 to Max. Span Flow Rate (33ft/s) |
|---|---|---|
| 44 | 0 to 4,665 GPM | 0 to 155,489 GPM |
| 48 | 0 to 5,552 | 0 to 185,045 |
| 54 | 0 to 7,026 | 0 to 234,197 |
| 60 | 0 to 8,674 | 0 to 289,133 |
| 64 | 0 to 9,870 | 0 to 328,969 |
| 72 | 0 to 12,491 | 0 to 416,351 |
| 80 | 0 to 15,421 | 0 to 514,014 |
| 88 | 0 to 18,659 | 0 to 621,957 |
| 96 | 0 to 22,206 | 0 to 740,181 |
| 104 | 0 to 26,061 | 0 to 868,684 |

T24-1.EPS

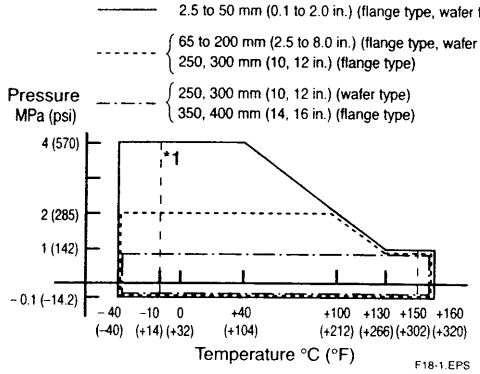
**Fluid Temperature and Pressure:**

Note *1 The following figures show maximum allowable fluid pressure for the flowtube itself. Further fluid pressure should also be limitted according to flange rating.

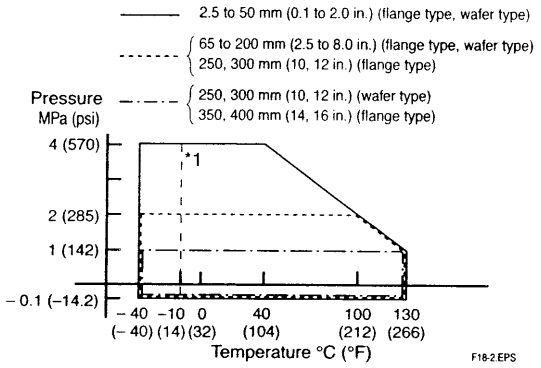
*2 For fluid temperature of the explosion proof type, refer to descriptions of "HAZARDOUS AREA CLASSIFICATION".

**PFA Lining (*1)**

**General-Purpose Use, Submersible Type, Explosion proof Type, Remote Flowtube (electrode structure code 1: Non-replaceable electrode)**



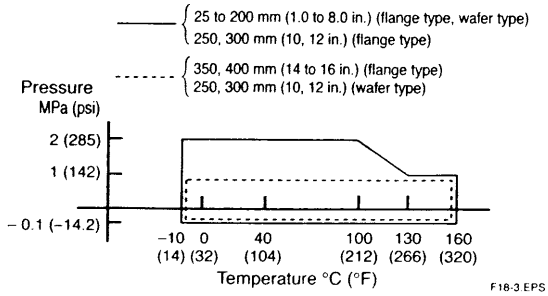

**General-Purpose Use and Explosion proof Type, Integral Flowmeter (electrode structure code 1: Non-replaceable electrode)**



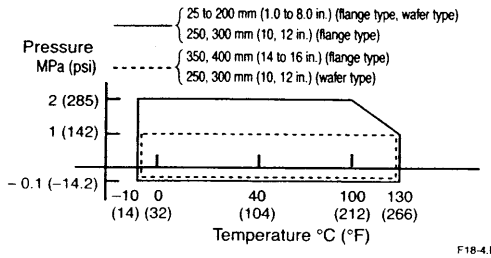

*1: For wafer types of 32 mm to 300 mm(1.25 to 12 in.), and for carbon steel flange types (process connection code: C**) of 50 to 400 mm (2.0 to 16 in.) the minimum temperature is -10°C (+14°F).

*2: For fluid temperature of the explosion proof type, refer to descriptions of "HAZARDOUS AREA CLASSIFICATION".

**General-Purpose Use, Remote Flowtube (electrode structure code 2: replaceable electrode)**

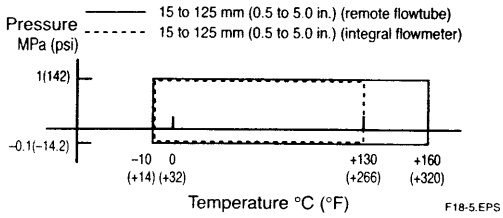



**General-Purpose Use, Integral Flowmeter (electrode structure code 2: replaceable electrode)**



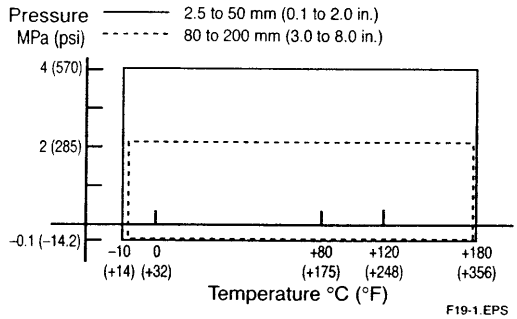

Note: For replaceable electrodes for fluid temperatures of 10°C (50°F)or less, please contact Yokogawa office.

**Sanitary Type (electrode structure code 1: Non-replaceable electrode)**

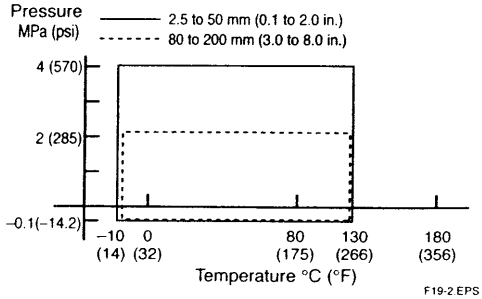



**Ceramics Lining**

**General-Purpose Use and Explosion proof Type, Remote Flowtube (electrode structure code 1: Non-replaceable electrode)**



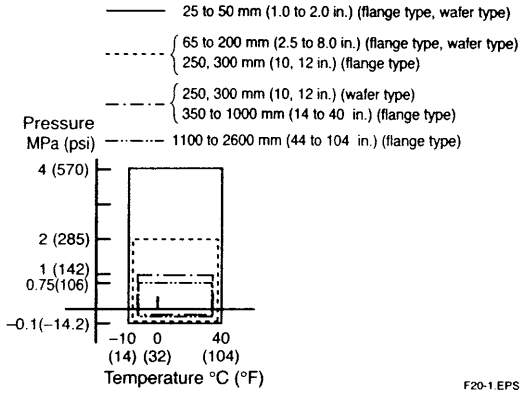

**General-Purpose Use and Explosion proof Type, Integral flowmeter (electrode structure code 1: Non-replaceable electrode)**




*1: For fluid temperature of the explosion proof type, refer to descriptions of "HAZARDOUS AREA CLASSIFICATION".

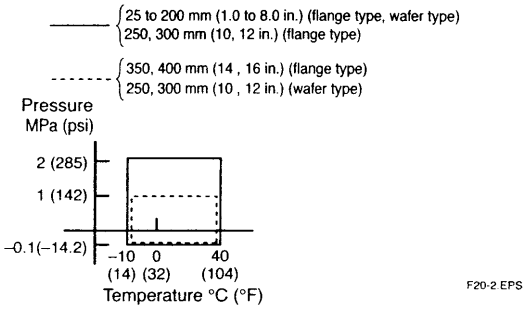
### Polyurethane Rubber Lining

#### General-Purpose Use and Submersible Type, Remote Flowtube (electrode structure code 1: Non-replaceable electrode)




F20-1.EPS

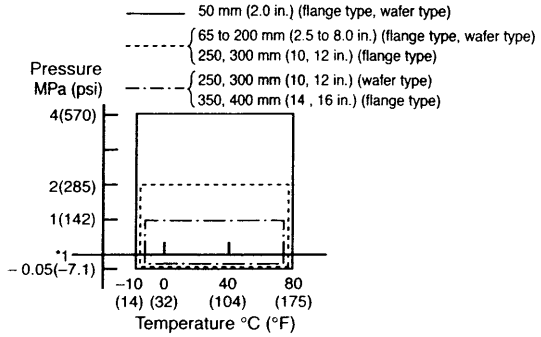
#### General-Purpose Use, Integral Flowmeter (electrode structure code 2: replaceable electrode)




F20-2.EPS

### Natural Soft Rubber Lining

#### General-Purpose Use and Submersible Type, Remote Flowtube (electrode structure code 1: Non-replaceable electrode)

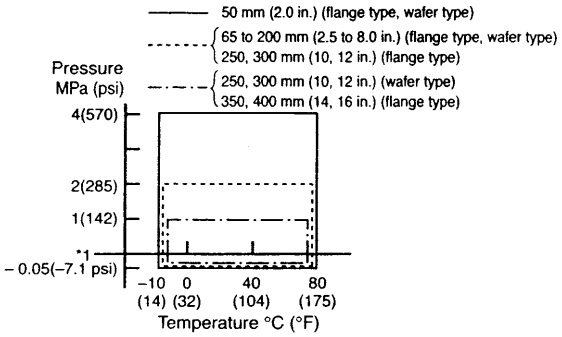



*1 : –0.04 MPa (–5.7 psi) for sizes of 350 mm (14 in.) and 400 mm (16 in.)

F05-2.EPS

### EPDM Rubber Lining

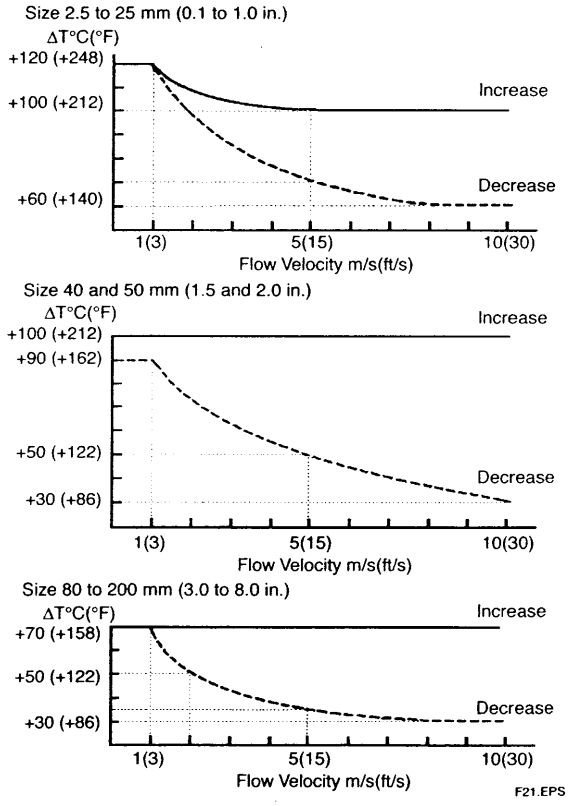
#### General-Purpose Use and Submersible Type, Remote Flowtube (electrode structure code 1: Non-replaceable electrode)




*1 : –0.04 MPa (–5.7 psi) for sizes of 350 mm (14 in.) and 400 mm (16 in.)

F05-3.EPS

#### Reasonable Figure for Thermal Shock of Creamics Lining:




F21.EPS

"Decrease" means that the temperature of a measured fluid drops rapidly, while "increase" means that the temperature rises rapidly. The maximum allowable ranges in both cases are indicated by the curves shown in the diagrams, with the solid line indicating the maximum increase, and the broken line the maximum decrease.

ΔT: Change in temperature of measured fluid in one second

Flow velocity: flow velocity of the measured fluid

**Allowable Conditions for Cleaning Sanitary Type Linings**

Steam or hot water cleaning: Max.temp.= +150 °C (+302°F), time= 60 minutes or less

**Vibration Conditions:**

Level of vibration in conformity with IEC 60068-2-6 (SAMA 31.1-1980)

- Integral Flowmeter: 1 G or less (frequency 500 Hz or less)
- Remote Flowtube (size 2.5 to 400 mm (0.1 to 16 in.)): 2 G or less (frequency 500 Hz or less)

Note: Avoid locations with much vibration (where the pipe vibration frequency is 500 Hz or more), which may cause damage to the equipment.
(This dimension is also applied to when no grounding ring is used).
If the I.D of the gasket is too large, however, fluid leakage may result.

## ■ ACCESSORIES

**Remote Flowtube (size 2.5 to 1000 mm(0.1 to 40 in.)):**

Centering device (wafer type only): 1 pc.
Hexagonal wrench: 2 pcs.

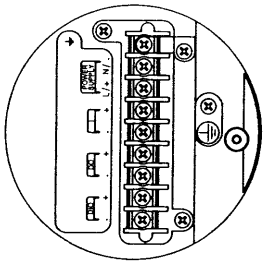
**Integral Flowmeter:**

Centering device (wafer type only): 1 pc.
Fuse (T2.0A, 250 V): 1 pc.
*Time lag fuse
Hexagonal wrench: 2 pcs.

## ■ TERMINAL CONFIGURATION AND TERMINAL WIRING

### ● Integral Flowmeter

**Terminal configuration**



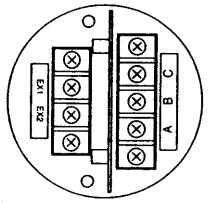
**Terminal wiring**

| Terminal Symbols | Description |
|---|---|
| ⏚ | Functional grounding |
| N/- | Power supply |
| L/+ | |
| I+ | Current output 4 to 20mA DC |
| I- | |
| DO+ | Pulse output/Alarm output/ Status output |
| DO- | |
| DIO+ | Alarm output/Status output Status input |
| DIO- | |
| ⏚ | Protective grounding (Outside of the terminal) |

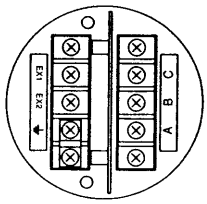
F41.EPS

### ● Remote Flowtube

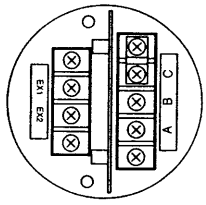
**Terminal configuration**



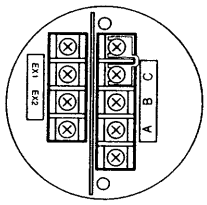

size 2.5 to 400 mm (0.1 to 16 in.)




(Only for Explosion proof type)




size 500 to 1000 mm (20 to 40 in.)




size 1100 to 2600 mm (44 to 104 in.)

**Terminal wiring**

| Terminal Symbols | Description |
|---|---|
| A<br>B<br>C | Flow signal output |
| EX1<br>EX2 | Excitation current input |
| ⏚ | Functional grounding (Only for explosion proof type) |
| ⏚ | Protective grounding (Outside of the terminal) |

F42.EPS

Note: When submersible type or option code DHC is selected, waterproof glands and a 30m long cable are attached.

85



19.1.2

# ■ MODEL AND SUFFIX CODE

## AXF STANDARD (Wafer Type)

### General-purpose Use/Submersible Type/Explosion proof Type, PFA/Polyurethane Rubber/Natural Soft Rubber/EPDM Rubber Lining

| Model | Suffix Code | Description | Applicable Model |
|---|---|---|---|
| AXF002 | | Size 2.5 mm (0.1 in.) Integral Flowmeter/Remote Flowtube | |
| AXF005 | | Size 5 mm (0.2 in.) Integral Flowmeter/Remote Flowtube | |
| AXF010 | | Size 10 mm (0.4 in.) Integral Flowmeter/Remote Flowtube | |
| AXF015 | | Size 15 mm (0.5 in.) Integral Flowmeter/Remote Flowtube | |
| AXF025 | | Size 25 mm (1.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF032 | | Size 32 mm (1.25 in.) Integral Flowmeter/Remote Flowtube | |
| AXF040 | | Size 40 mm (1.5 in.) Integral Flowmeter/Remote Flowtube | |
| AXF050 | | Size 50 mm (2.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF065 | | Size 65 mm (2.5 in.) Integral Flowmeter/Remote Flowtube | |
| AXF080 | | Size 80 mm (3.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF100 | | Size 100 mm (4.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF125 | | Size 125 mm (5.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF150 | | Size 150 mm (6.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF200 | | Size 200 mm (8.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF250 | | Size 250 mm (10 in.) Integral Flowmeter/Remote Flowtube | |
| AXF300 | | Size 300 mm (12 in.) Integral Flowmeter/Remote Flowtube | |
| Use | G | General-Purpose Use | |
| | W | Submersible Type | Size 15 mm (0.5 in.) to 300 mm (12 in.) Remote Flowtube only |
| | C | Explosion proof Type (*5) | PFA lining only |
| Converter Output Signal and Communication | -D | Integral Flowmeter with 4 to 20mA DC Output and BRAIN Communication | |
| | -E | Integral Flowmeter with 4 to 20 mA DC Output and HART Communication | |
| | -N | Remote Flowtube for Combined Use with AXFA11 | |
| | -P | Remote Flowtube for Combined Use with AXFA14 | |
| Power Supply | 1 | Integral Flowmeter, 100 V to 240 V AC or 100 to 120 V DC | |
| | 2 | Integral Flowmeter, 24V AC/DC | |
| | N | Remote Flowtube | |
| Lining | A | Fluorocarbon PFA | |
| | U | Polyurethane Rubber | Size 25 mm (1.0 in.) to 300 mm (12 in.) |
| | D | Natural Soft Rubber | Size 50 mm (2.0 in.) to 300 mm (12 in.) |
| | G | EPDM Rubber | Size 50 mm (2.0 in.) to 300 mm (12 in.) |
| Elecrode Material | L | JIS SUS316L (AISI 316L SS/EN 1.4404 Equivalent) | |
| | P | Platinum-iridium | PFA lining only |
| | H | Hastelloy C276 Equivalent | |
| | T | Tantalum | PFA lining only |
| | V | Titanium | |
| | W | Tungsten Carbide | PFA/Polyurethane Rubber lining only |
| Electrode Structure | 1 | Non-replaceable | |
| | 2 | Replaceable | General-Purpose use, Size 25 mm (1.0 in.) to 300 mm (12 in.), PFA/Polyurethane Rubber lining only Electrode Material: JIS SUS316L only |
| Grounding Ring and Grounding Electrode Material | N | None | |
| | S | JIS SUS316 (AISI 316 SS/EN 1.4401 Equivalent) | |
| | L | JIS SUS316L (AISI 316L SS/EN 1.4404 Equivalent) | |
| | P | Platinum-iridium | Size 2.5 mm (0.1 in.) to 200 mm (8.0 in.), PFA lining only |
| | H | Hastelloy C276 Equivalent | |
| | T | Tantalum | Size 2.5 mm (0.1 in.) to 200 mm (8.0 in.), PFA lining only |
| | V | Titanium | |
| Process Connection (*3) | -AA1 | ANSI Class 150 Wafer (*1) | Size 2.5 mm (0.1 in.) to 300 mm (12 in.) |
| | -AA2 | ANSI Class 300 Wafer (*1) | Size 2.5 mm (0.1 in.) to 200 mm (8.0 in.) |
| | -AD1 | DIN PN 10 Wafer (*2) | Size 200 mm (8.0 in.) to 300 mm (12 in.) |
| | -AD2 | DIN PN 16 Wafer (*2) | Size 65 mm (2.5 in.) to 300 mm (12 in.) |
| | -AD4 | DIN PN 40 Wafer (*1)(*2) | Size 2.5 mm (0.1in.) to 50 mm (2.0 in.) |
| | -AJ1 | JIS 10K Wafer (*1) | Size 2.5 mm (0.1in.) to 300 mm (12 in.) |
| | -AJ2 | JIS 20K Wafer (*1) | Size 2.5 mm (0.1in.) to 200 mm (8.0 in.) |
| | -AG1 | JIS F12 (JIS75M) Wafer | Size 80 mm (3.0 in.) to 300 mm (12 in.) |
| Lay Length | 1 | Standard | |
| Electrical Connection (*6) | -0 | JIS G1/2 female | |
| | -2 | ANSI 1/2 NPT female | Not available for Submersible Type |
| | -4 | ISO M20×1.5 female | Not available for Submersible Type |
| Indicator (*4)(*7) | 1 | Integral Flowmeter with indicator (Horizontal) | |
| | 2 | Integral Flowmeter with indicator (Vertical) | |
| | N | Integral Flowmeter without indicator /Remote Flowtube | |
| Calibration | B | Standard | |
| | C | High Grade | Size 25 mm (1.0 in.) to 200 mm (8.0 in.), PFA lining only |
| | /□ | Optional code (See the Table of Optional Specifications) | |

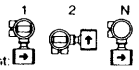
T15.EPS

*1: For a wafer type of 2.5 to 10 mm (0.1 to 0.4 in.), prepare 15 mm (0.5 in.) diameter nominal flanges on the process pipe side. (Process connection codes: AA1, AA2, AD4, AJ1, and AJ2)

*2: Even when DIN PN10 or 16 is required for a model of size 2.5 to 50 mm (0.1 to 2.0 in.), select PN40 (Process connection code: AD4) because there is no difference in the dimensions of the mating faces.
Even when DIN PN10 is required for a model of size 65 to 150 mm (2.5 to 6.0 in.), select PN16 (Process connection code: AD2) because there is no difference in the dimensions of the mating faces.

*3: Mating dimensions are based on standards as follow:
ANSI:ASME B 16.5, DIN: DIN 2501, JIS:JIS B 2220 and JIS G 3451

*4: N shall be always selected for remote flowtubes
In the case of an integral flowmeter, select from among the figures at the right:




*5: For explosion proof types, specify types of explosion proof certification using the optional codes. In case of TIIS flame proof type, the remote flowtube is available only for combined use with the AXFA14. For the TIIS flame proof type with wiring using a flame proof packing adapter, select optional code G12 or G11. Available only for JIS G1/2 electrical connections.

*6: JIS G1/2 Female electrical connection is available only for TIIS flame proof type.

*7: In case of integral flowmeters of the TIIS flame proof type, select "with indicator"(code 1 or 2).

## AXF STANDARD (Wafer /Union Joint Type)

### General-purpose Use/Explosion proof Type, Ceramics Lining

| Model | Suffix Code | Description | Applicable Model |
|---|---|---|---|
| AXF002 | | Size 2.5 mm (0.1 in.) Integral Flowmeter/Remote Flowtube | |
| AXF005 | | Size 5 mm (0.2 in.) Integral Flowmeter/Remote Flowtube | |
| AXF010 | | Size 10 mm (0.4 in.) Integral Flowmeter/Remote Flowtube | |
| AXF015 | | Size 15 mm (0.5 in.) Integral Flowmeter/Remote Flowtube | |
| AXF025 | | Size 25 mm (1.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF040 | | Size 40 mm (1.5 in.) Integral Flowmeter/Remote Flowtube | |
| AXF050 | | Size 50 mm (2.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF080 | | Size 80 mm (3.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF100 | | Size 100 mm (4.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF150 | | Size 150 mm (6.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF200 | | Size 200 mm (8.0 in.) Integral Flowmeter/Remote Flowtube | |
| Use | G | General-Purpose Use | |
| | C | Explosion proof Type(*5) | |
| Converter Output Signal and Communication | -D | Integral Flowmeter with 4 to 20 mA DC Output and BRAIN Communication | |
| | -E | Integral Flowmeter with 4 to 20 mA DC Output and HART Communication | |
| | -N | Remote Flowtube for Combined use with AXFA11 | |
| | -P | Remote Flowtube for Combined use with AXFA14 | |
| Power Supply | 1 | Integral Flowmeter, 100 V to 240 V AC or100 to 120 V DC | |
| | 2 | Integral Flowmeter, 24 V AC/DC | |
| | N | Remote Flowtube | |
| Lining | C | Ceramics | |
| Elecrode Material | E | Platinum-alumina Cermet | |
| Electrode Structure | 1 | Non-replaceable | |
| Grounding Ring and Grounding Electrode Material | N | None | Size 2.5 mm (0.1 in.) to 200 mm (8.0 in.) |
| | S | JIS SUS316 (AISI 316 SS/EN 1.4401 Equivalent) | Size 15 mm (0.5 in.) to 200 mm (8.0 in.) |
| | L | JIS SUS316L (AISI 316L SS/EN 1.4404 Equivalent) | Size 15 mm (0.5 in.) to 200 mm (8.0 in.) |
| | P | Platinum-iridium | Size 15 mm (0.5 in.) to 200 mm (8.0 in.) |
| | H | Hastelloy C276 Equivalent | Size 15 mm (0.5 in.) to 200 mm (8.0 in.) |
| | T | Tantalum | Size 15 mm (0.5 in.) to 200 mm (8.0 in.) |
| | V | Titanium | Size 15 mm (0.5 in.) to 200 mm (8.0 in.) |
| Process Connection (*2) | -AA1 | ANSI Class 150 Wafer | Size 15 mm (0.5 in.) to 200 mm (8.0 in.) |
| | -AA2 | ANSI Class 300 Wafer | Size 15 mm (0.5 in.) to 200 mm (8.0 in.) |
| | -AD1 | DIN PN 10 Wafer (*1) | Size 200 mm (8.0 in.) only |
| | -AD2 | DIN PN 16 Wafer (*1) | Size 80 mm (3.0 in.) to 200 mm (8.0 in.) |
| | -AD4 | DIN PN 40 Wafer (*1) | Size 15 mm (0.5 in.) to 50 mm (2.0 in.) |
| | -AJ1 | JIS 10K Wafer | Size 15 mm (0.5 in.) to 200 mm (8.0 in.) |
| | -AJ2 | JIS 20K Wafer | Size 15 mm (0.5 in.) to 200 mm (8.0 in.) |
| | -AG1 | JIS F12 (JIS75M) Wafer | Size 80 mm (3.0 in.) to 200 mm (8.0 in.) |
| | -GUW | Union Joint (Weld Joint) | Size 2.5 mm (0.1 in.) to 10 mm (0.4 in.) |
| | -GUN | Union Joint (1/4NPT Male for 2.5 or 5 mm dia.: 3/8NPT Male for 10 mm dia.) | Size 2.5 mm (0.1 in.) to 10 mm (0.4 in.) |
| | -GUR | Union Joint (R1/4 Male for 2.5 or 5 mm dia.: R3/8 Male for 10mm dia.) | Size 2.5 mm (0.1 in.) to 10 mm (0.4 in.) |
| Lay Length (*3) | 1 | Standard | |
| Electrical Connection (*6) | -0 | JIS G1/2 female | |
| | -2 | ANSI 1/2 NPT female | |
| | -4 | ISO M20×1.5 female | |
| Indicator (*4)(*7) | 1 | Integral Flowmeter with indicator (Horizontal) | |
| | 2 | Integral Flowmeter with indicator (Vertical) | |
| | N | Integral Flowmeter without indicator /Remote Flowtube | |
| Calibration | B | Standard | |
| | C | High Grade | Size 25 mm (1.0 in.) to 200mm (8.0 in.) |
| | /□ | Optional code (See the Table of Optional Specifications) | |

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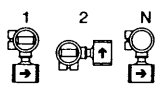
*1: Even when DIN PN10 or 16 is required for a model of size 2.5 to 50 mm (0.1 to 2.0 in.), select PN40 (Process connection code : AD4) because there is no difference in the dimensions of the mating faces.
Even when DIN PN10 is required for a model of size 65 to 150 mm (2.5 to 6.0 in.), select PN16 (Process connection code : AD2) because there is no difference in the dimensions of the mating faces.

*2: Mating dimensions are based on standards as follow:
ANSI:ASME B 16.5, DIN: DIN 2501, JIS:JIS B 2220 and JIS G 3451

*3: AXF standard lay length dimension for ceramics linings are the same as those for ADMAG ceramics linings.

*4: N shall be always selected for remote flowtubes
In the case of an integral flowmeter, select from among the figures at the right:




*5: For explosion proof types, specify types of explosion proof certification using the optional codes. In case of TIIS flame proof type, the remote flowtube is available only for combined use with the AXFA14. For the TIIS flame proof type with wiring using a flame proof packing adapter, select optional code G12 or G11. Available only for JIS G1/2 electrical connections.

*6: JIS G1/2 Female electrical connection is available only for TIIS flame proof type.

*7: In case of integral flowmeters of the TIIS flame proof type, select "with indicator"(code 1 or 2).

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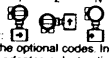
## AXF STANDARD (Flange Type) Size 2.5 mm (0.1 in.) to 400 mm (16 in.)

### General-purpose Use/Submersible Type/Explosion proof Type, PFA/Polyurethane Rubber /Natural Soft Rubber/ EPDM Rubber Lining

| Model | Suffix Code | Description | Applicable Model |
|---|---|---|---|
| AXF002 | | Size 2.5 mm (0.1 in.) Integral Flowmeter/Remote Flowtube | |
| AXF005 | | Size 5 mm (0.2 in.) Integral Flowmeter/Remote Flowtube | |
| AXF010 | | Size 10 mm (0.4 in.) Integral Flowmeter/Remote Flowtube | |
| AXF015 | | Size 15 mm (0.5 in.) Integral Flowmeter/Remote Flowtube | |
| AXF025 | | Size 25 mm (1.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF032 | | Size 32 mm (1.25 in.) Integral Flowmeter/Remote Flowtube | |
| AXF040 | | Size 40 mm (1.5 in.) Integral Flowmeter/Remote Flowtube | |
| AXF050 | | Size 50 mm (2.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF065 | | Size 65 mm (2.5 in.) Integral Flowmeter/Remote Flowtube | |
| AXF080 | | Size 80 mm (3.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF100 | | Size 100 mm (4.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF125 | | Size 125 mm (5.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF150 | | Size 150 mm (6.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF200 | | Size 200 mm (8.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF250 | | Size 250 mm (10 in.) Integral Flowmeter/Remote Flowtube | |
| AXF300 | | Size 300 mm (12 in.) Integral Flowmeter/Remote Flowtube | |
| AXF350 | | Size 350 mm (14 in.) Integral Flowmeter/Remote Flowtube | |
| AXF400 | | Size 400 mm (16 in.) Integral Flowmeter/Remote Flowtube | |
| Use | G | General-Purpose Use | |
| | W | Submersible Type | Size 15 mm (0.5 in.) to 400 mm (16 in.), Remote Flowtube only |
| | C | Explosion proof Type (*6) | PFA lining only |
| Converter Output Signal and Communication | -D | Integral Flowmeter with 4 to 20 mA DC Output and BRAIN Communication | |
| | -E | Integral Flowmeter with 4 to 20 mA DC Output and HART Communication | |
| | -N | Remote Flowtube for Combined Use with AXFA11 | |
| | -P | Remote Flowtube for Combined Use with AXFA14 | |
| Power Supply | 1 | Integral Flowmeter, 100 V to 240 V AC or 100 to 120 V DC | |
| | 2 | Integral Flowmeter, 24 V AC/DC | |
| | N | Remote Flowtube | |
| Lining | A | Fluorocarbon PFA | |
| | U | Polyurethane Rubber | Size 25 mm (1.0 in.) to 400 mm (16 in.) |
| | D | Natural Soft Rubber | Size 50 mm (2.0 in.) to 400 mm (16 in.) |
| | G | EPDM Rubber | Size 50 mm (2.0 in.) to 400 mm (16 in.) |
| Elecrode Material | L | JIS SUS316L (AISI 316L SS/EN 1.4404 Equivalent) | |
| | P | Platinum-iridium | PFA lining only |
| | H | Hastelloy C276 Equivalent | |
| | T | Tantalum | PFA lining only |
| | V | Titanium | |
| | W | Tungsten Carbide | PFA/Polyurethane Rubber lining only |
| Electrode Structure | 1 | Non-replaceable | |
| | 2 | Replaceable | General-Purpose use, Size 25 mm (1.0 in.) to 400 mm (16 in.)<br>PFA/Polyurethane Rubber lining only<br>Electrode Material: JIS SUS316L only |
| Grounding Ring and Grounding Electrode Material | N | None | |
| | S | JIS SUS316 (AISI 316 SS/EN 1.4401 Equivalent) | |
| | L | JIS SUS316L (AISI 316L SS/EN 1.4404 Equivalent) | |
| | P | Platinum-iridium | Size 2.5 mm (0.1 in.) to 200 mm (8.0 in.), PFA lining only |
| | H | Hastelloy C276 Equivalent | |
| | T | Tantalum | Size 2.5mm (0.1 in.) to 200 mm (8.0 in.), PFA lining only |
| | V | Titanium | |
| Process Connection (*4) | -BA1 | ANSI Class 150 Flange (Stainless Steel)(*1) | Size 2.5 mm (0.1 in.) to 400 mm (16 in.) |
| | -BA2 | ANSI Class 300 Flange (Stainless Steel)(*1) | Size 2.5 mm (0.1 in.) to 300 mm (12 in.) |
| | -BD1 | DIN PN 10 Flange (Stainless Steel)(*2) | Size 200 mm (8.0 in.) to 400 mm (16 in.) |
| | -BD2 | DIN PN 16 Flange (Stainless Steel)(*2) | Size 65 mm (2.5 in.) to 300 mm (12 in.) |
| | -BD4 | DIN PN 40 Flange (Stainless Steel)(*1)(*2) | Size 2.5 mm (0.1 in.) to 50 mm (2.0 in.) |
| | -BJ1 | JIS 10K Flange (Stainless Steel)(*1) | Size 2.5 mm (0.1 in.) to 400 mm (16 in.) |
| | -BJ2 | JIS 20K Flange (Stainless Steel)(*1) | Size 2.5 mm (0.1 in.) to 300 mm (12 in.) |
| | -BG1 | JIS F12 (JIS75M) Flange (Stainless Steel) | Size 80 mm (3.0 in.) to 400 mm (16 in.) |
| | -CA1 | ANSI Class 150 Flange (Carbon Steel) | Size 50 mm (2 in.) to 400 mm (16 in.) |
| | -CA2 | ANSI Class 300 Flange (Carbon Steel) | Size 50 mm (2 in.) to 300 mm (12 in.) |
| | -CD1 | DIN PN 10 Flange (Carbon Steel)(*2) | Size 200 mm (8.0 in.) to 400 mm (16 in.) |
| | -CD2 | DIN PN 16 Flange (Carbon Steel)(*2) | Size 65 mm (2.5 in.) to 300 mm (12 in.) |
| | -CD4 | DIN PN 40 Flange (Carbon Steel)(*2) | Size 50 mm (2.0 in.) only |
| | -CJ1 | JIS 10K Flange (Carbon Steel) | Size 50 mm (2.0 in.) to 400 mm (16 in.) |
| | -CJ2 | JIS 20K Flange (Carbon Steel) | Size 50 mm (2.0 in.) to 300 mm (12 in.) |
| | -CG1 | JIS F12 (JIS75M) Flange (Carbon Steel) | Size 80 mm (3.0 in.) to 400 mm (16 in.) |
| | -DD4 | DIN PN 40 Flange (Stainless Steel), DN10(*2)(*3)" | Size 2.5 mm (0.1 in.) to 10 mm (0.4 in.) |
| | -DJ1 | JIS 10K Flange (Stainless Steel ), 10 mm Diameter Nominal (*3) | Size 2.5 mm (0.1 in.) to 10 mm (0.4 in.) |
| | -DJ2 | JIS 20K Flange (Stainless Steel ), 10 mm Diameter Nominal (*3) | Size 2.5 mm (0.1 in.) to 10 mm (0.4 in.) |
| Lay Length | 1 | Standard | |
| Electrical Connection (*7) | -0 | JIS G1/2 female | |
| | -2 | ANSI 1/2 NPT female | Not available for Submersible Type |
| | -4 | ISO M20×1.5 female | Not available for Submersible Type |
| Indicator (*5)(*8) | 1 | Integral Flowmeter with indicator (Horizontal) | |
| | 2 | Integral Flowmeter with indicator (Vertical) | |
| | N | Integral Flowmeter without indicator /Remote Flowtube | |
| Calibration | B | Standard | |
| | C | High Grade | Size 25 mm (1.0 in.) to 200 mm (8.0 in.),<br>PFA lining only |
| | /□ | Optional code (See the Table of Optional Specifications) | |

*1: For a wafer type of 2.5 to 10 mm (0.1 to 0.4 in.), prepare 15 mm (0.5 in.) diameter nominal flanges on the process pipe side.
(Process connection codes: BA1, BA2, BD4, BJ1, and BJ2)
*2: Even when DIN PN10 or 16 is required for a model of size 2.5 to 50 mm (0.1 to 2.0 in.), select PN40 (Process connection codes: BD4,CD4 and DD4) because there is no difference in the dimensions of the mating faces.
Even when DIN PN10 is required for a model of size 65 to 150 mm (2.5 to 6.0 in.), select PN16 (Process connection codes: BD2 , CD2) because there is no difference in the dimensions of the mating faces.
*3: For a flange type of 2.5 to 10 mm (0.1 to 0.4 in)(Process connection codes: DJ1, DJ2, and DD4), prepare 10 mm (0.4 in.) diameter nominal flanges on the process pipe side.
*4: Mating dimensions are based on standards as follow:
ANSI:ASME B 16.5, DIN: DIN 2501, JIS:JIS B 2220 and JIS G 3451
*5: N shall be always selected for remote flowtubes
In the case of an integral flowmeter, select from among the figures at the right:




*6: For explosion proof types, specify types of explosion proof certification using the optional codes. In case of TIIS flame proof type, the remote flowtube is available only for combined use with the AXFA14. For the TIIS flame proof type with wiring using a flame proof packing adapter, select optional code G12 or G11. Available only for JIS G1/2 electrical connections.
*7: JIS G1/2 Female electrical connection is available only for TIIS flame proof type.
*8: In case of integral flowmeters of the TIIS flame proof type, select "with indicator"(code 1 or 2).

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## AXF STANDARD (Flange Type) Size 500 mm (20 in.) to 2600 mm (104 in.)

### General-purpose Use/Submersible Type, Polyurethane Rubber Lining

| Model | Suffix Code | Description | Applicable Model |
|---|---|---|---|
| AXF500 | ····· | Size 500 mm (20 in.) Remote Flowtube | |
| AXF600 | ····· | Size 600 mm (24 in.) Remote Flowtube | |
| AXF700 | ····· | Size 700 mm (28 in.) Remote Flowtube | |
| AXF800 | ····· | Size 800 mm (32 in.) Remote Flowtube | |
| AXF900 | ····· | Size 900 mm (36 in.) Remote Flowtube | |
| AXF10L | ····· | Size 1000 mm (40 in.) Remote Flowtube | |
| AXF11L | ····· | Size 1100 mm (44 in.) Remote Flowtube | |
| AXF12L | ····· | Size 1200 mm (48 in.) Remote Flowtube | |
| AXF13L | ····· | Size 1350 mm (54 in.) Remote Flowtube | |
| AXF15L | ····· | Size 1500 mm (60 in.) Remote Flowtube | |
| AXF16L | ····· | Size 1600 mm (64 in.) Remote Flowtube | |
| AXF18L | ····· | Size 1800 mm (72 in.) Remote Flowtube | |
| AXF20L | ····· | Size 2000 mm (80 in.) Remote Flowtube | |
| AXF22L | ····· | Size 2200 mm (88 in.) Remote Flowtube | |
| AXF24L | ····· | Size 2400 mm (96 in.) Remote Flowtube | |
| AXF26L | ····· | Size 2600 mm (104 in.) Remote Flowtube | |
| Use | G ····· | General-Purpose Use | |
| | W ····· | Submersible Type | |
| Converter | -N ····· | Remote Flowtube for Combined Use with AXFA11 | |
| Power Supply | N ····· | Remote Flowtube | |
| Lining | U ····· | Polyurethane Rubber | |
| Elecrode Material | L ····· | JIS SUS316L(AISI 316L SS/EN 1.4404 Equivalent) | |
| Electrode Structure | 1 ····· | Non-replaceable | |
| Grounding Ring material | S ····· | JIS SUS304 (AISI 304 SS/EN 1.4301 Equivalrnt) | Size 500 mm (20 in.) to 1000 mm (40 in.) |
| | | SS400 Carbon Steel lined with Stainless Steal SUS316 | Size 1100 mm (44 in.) to 2600 mm (104 in.) |
| Process Connection (*1) | -CA1 ····· | ANSI Class 150 Flange (Carbon Steel) (*2) | Size 500 mm (20 in.), 600 mm (24 in.) |
| | -CD1 ····· | DIN PN10 Flange (Carbon Steel) (*2) | Size 500 mm (20 in.) to 1000 mm (40 in.) |
| | -CJ1 ····· | JIS 10K Flange (Carbon Steel) (*2) | Size 500 mm (20 in.) to 1000 mm (40 in.) |
| | -CG1 ····· | JIS F12 (JIS 75M) Flange (Carbon Steel) (*2)(*3) | Size 500 mm (20 in.) to 2600 mm (104 in.) |
| Lay Length | 1 ····· | AXF Standard | |
| Electrical Connection | -0 ···· | JIS G1/2 female | |
| | -2 ···· | ANSI 1/2 NPT female | Size 500 mm (20 in.) to 1000 mm (40 in.), Not available for Submersible Type |
| | -4 ···· | ISO M20×1.5 female | Size 500 mm (20 in.) to 1000 mm (40 in.), Not available for Submersible Type |
| Indicator | N ··· | None | |
| Calibration | B ··· | Standard | |
| Options | /□ | Optional code (See the Table of Optional Specifications) | |

*1: Mating dimensions are based on standards as follows:
ANSI:ASME B 16.5, DIN: DIN 2501, JIS:JIS B 2220 and JIS G 3451

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*2: Carbon steel Flange Material: JIS SS400(EN S275 Equivalent)

*3: There are no differences in dimensions of mating faces between JIS F12(JIS 75M) and JIS 7.5K.

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## AXF STANDARD (Clamp/Union/Butt Weld Connection)

### Sanitary Type , PFA Lining

| Model | Suffix Code | Description | Applicable Model |
|---|---|---|---|
| AXF015 | ····· | Size 15 mm (0.5 in.), Integral Flowmeter/Remote Flowtube | |
| AXF025 | ····· | Size 25 mm (1.0 in.), Integral Flowmeter/Remote Flowtube | |
| AXF032 | ····· | Size 32 mm (1.25 in.), Integral Flowmeter/Remote Flowtube | |
| AXF040 | ····· | Size 40 mm (1.5 in.), Integral Flowmeter/Remote Flowtube | |
| AXF050 | ····· | Size 50 mm (2.0 in.), Integral Flowmeter/Remote Flowtube | |
| AXF065 | ····· | Size 65 mm (2.5 in.), Integral Flowmeter/Remote Flowtube | |
| AXF080 | ····· | Size 80 mm (3.0 in.), Integral Flowmeter/Remote Flowtube | |
| AXF100 | ····· | Size 100 mm (4.0 in.), Integral Flowmeter/Remote Flowtube | |
| AXF125 | ····· | Size 125 mm (5.0 in.), Integral Flowmeter/Remote Flowtube | |
| Use | H ····· | Sanitary Type | |
| Converter Output Signal and Communication | -D ····· | Integral Flowmeter with 4 to 20 mA DC Output and BRAIN Communication | |
| | -E ····· | Integral Flowmeter with 4 to 20 mA DC Output and HART Communication | |
| | -N ····· | Remote Flowtube for Combined use with AXFA11 | |
| | -P ····· | Remote Flowtube for Combined use with AXFA14 | |
| Power Supply | 1 ····· | Integral Flowmeter, 100 V to 240 V AC or 100 to 120 V DC | |
| | 2 ····· | Integral Flowmeter, 24 V AC/DC | |
| | N ····· | Remote Flowtube | |
| Lining | A ····· | Fluorocarbon PFA | |
| Elecrode Material | L ····· | JIS SUS316L (AISI 316L SS/EN 1.4404 Equivalent) | |
| Electrode Structure | 1 ····· | Non-replaceable | |
| Grounding Ring | N ····· | None | |
| Process Connection (*2) | -HAB ····· | Tri-Clamp (3A), JIS SUS316L (AISI 316L SS/EN1.4404 Equivalent)(*1) | Size 15 mm (0.5 in.) to 100 mm (4.0in.), except 32 mm (1.25 in.) |
| | -HDB ····· | DIN32676 Clamp, JIS SUS316L (AISI 316L SS/EN1.4404 Equivalent) | Size 15 mm (0.5 in.) to 125 mm (5.0 in.) |
| | -HKB ····· | ISO2852/SMS3016 Clamp, JIS SUS316L (AISI 316L SS/ EN1.4404 Equivalent) | Size 15 mm (0.5 in.) to 125 mm (5.0 in.) |
| | -JDB ····· | DIN11851 Union, SUS316L (AISI 316L SS/EN1.4404 Equivalent) | Size 15 mm (0.5 in.) to 125 mm (5.0 in.) |
| | -JKB ····· | ISO2853 Union, SUS316L (AISI 316L SS/EN1.4404 Equivalent) | Size 15 mm (0.5 in.) to 100 mm (4.0 in.) |
| | -JSB ····· | SMS1145 Union, SUS316L (AISI 316L SS/EN1.4404 Equivalent) | Size 25 mm (1.0 in.) to 100 mm (4.0 in.) |
| | -KDB ····· | Butt Weld for DIN 11850 Pipe Connection (SUS316L [AISI 316L SS/EN1.4404 Equivalent]) | Size 15 mm (0.5 in.) to 125 mm (5.0 in.) |
| | -KKB ····· | Butt Weld for ISO 2037 Pipe Connection (SUS316L [AISI 316L SS/EN1.4404 Equivalent]) | Size 15 mm (0.5 in.) to 125 mm (5.0 in.) |
| Lay Length | 1 ····· | Standard | |
| Electrical Connection | -0 ···· | JIS G1/2 female | |
| | -2 ···· | ANSI 1/2 NPT female | |
| | -4 ···· | ISO M20×1.5 female | |
| Indicator (*3) | 1 ··· | Integral Flowmeter with indicator (Horizontal) | |
| | 2 ··· | Integral Flowmeter with indicator (Vertical) | |
| | N ··· | Integral Flowmeter without indicator /Remote Flowtube | |
| Calibration | B ··· | Standard | |
| | C ··· | High Grade | Size 25 mm (1.0 in.) to 125 mm (5.0 in.) |
| | /□ | Optional code (See the Table of Optional Specifications) | |

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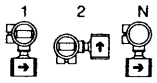
*1: For a tri-clamp type of size15 mm (0.5 in.)(Process connection code: HAB), prepare a 3/4 in. tri-clamp on the process pipe side.

*2: The detail dimensions of process connections (clamp/union/butt weld) are shown in the 'EXTERNAL DIMENSIONS' section of the sanitary type.
In case of Butt Weld type, ferrules, sleeves, or alternative must be provided by the user. User need to weld these parts to the butt weld adapter.

*3: N shall be always selected for remote flowtubes.
In the case of an integral flowmeter, select from among the following figures.



## REPLACEMENT MODEL FOR EARLIER ADMAG OR ADMAG AE (Wafer Type)

**General-purpose Use/Submersible Type/Explosion proof Type, PFA/Polyurethane Rubber Lining**

For the Wafer Types of size 250 mm (10 in.), 300 mm (12 in.), **AXF Standard** shall be selected.

| Model | Suffix Code | Description | Applicable Model |
|---|---|---|---|
| AXF002 | ····· | Size 2.5 mm (0.1 in.) Integral Flowmeter/Remote Flowtube | |
| AXF005 | ····· | Size 5 mm (0.2 in.) Integral Flowmeter/Remote Flowtube | |
| AXF010 | ····· | Size 10 mm (0.4 in.) Integral Flowmeter/Remote Flowtube | |
| AXF015 | ····· | Size 15 mm (0.5 in.) Integral Flowmeter/Remote Flowtube | |
| AXF025 | ····· | Size 25 mm (1.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF040 | ····· | Size 40 mm (1.5 in.) Integral Flowmeter/Remote Flowtube | |
| AXF050 | ····· | Size 50 mm (2.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF080 | ····· | Size 80 mm (3.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF100 | ····· | Size 100 mm (4.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF150 | ····· | Size 150 mm (6.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF200 | ····· | Size 200 mm (8.0 in.) Integral Flowmeter/Remote Flowtube | |
| Use | G ····· | General-Purpose Use | |
| | W ····· | Submersible Type | Size 15 mm (0.5 in.) to 200 mm (8.0 in.), Remote Flowtube only |
| | C ····· | Explosion proof Type (*5) | PFA lining only |
| Converter Output Signal and Communication | -D ····· | Integral Flowmeter with 4 to 20 mA DC Output and BRAIN Communication | |
| | -E ····· | Integral Flowmeter with 4 to 20 mA DC Output and HART Communication | |
| | -N ····· | Remote Flowtube for Combined Use with AXFA11 | |
| | -P ····· | Remote Flowtube for Combined Use with AXFA14 | |
| Power Supply | 1 ····· | Integral Flowmeter, 100 V to 240 V AC or 100 to 120 V DC | |
| | 2 ····· | Integral Flowmeter, 24 V AC/DC | |
| | N ····· | Remote Flowtube | |
| Lining | A ····· | Fluorocarbon PFA | |
| | U ····· | Polyurethane Rubber | Size 25 mm (1.0 in.) to 200 mm (8.0 in.) |
| Elecrode Material | L ····· | JIS SUS316L (AISI 316L SS/EN 1.4404 Equivalent) | |
| | P ····· | Platinum-iridium | PFA lining only |
| | H ····· | Hastelloy C276 Equivalent | |
| | T ····· | Tantalum | PFA lining only |
| | V ····· | Titanium | |
| | W ····· | Tungsten Carbide | |
| Electrode Structure | 1 ····· | Non-replaceable | |
| Grounding Ring and Grounding Electrode Material | N ····· | None | Size 25 mm (1.0 in.) to 200 mm (8.0 in.)(*5) |
| | S ····· | JIS SUS316 (AISI 316 SS/EN 1.4401 Equivalent) | |
| | L ····· | JIS SUS316L (AISI 316L SS/EN 1.4404 Equivalent) | |
| | P ····· | Platinum-iridium | PFA lining only |
| | H ····· | Hastelloy C276 Equivalent | |
| | T ····· | Tantalum | PFA lining only |
| | V ····· | Titanium | |
| Process Connection (*3) | -AA1 ····· | ANSI Class 150 Wafer(*1) | Size 2.5 mm (0.1 in.) to 200 mm (8.0 in.) |
| | -AA2 ····· | ANSI Class 300 Wafer(*1) | Size 2.5 mm (0.1 in.) to 200 mm (8.0 in.) |
| | -AD1 ····· | DIN PN 10 Wafer(*2) | Size 200 mm(8.0 in.) only |
| | -AD2 ····· | DIN PN 16 Wafer(*2) | Size 80 mm (3.0 in.) to 200 mm (8.0 in.) |
| | -AD4 ····· | DIN PN 40 Wafer(*1)(*2) | Size 2.5 mm (0.1 in.) to 50 mm (2.0 in.) |
| | -AJ1 ····· | JIS 10K Wafer(*1) | Size 2.5 mm (0.1 in.) to 200 mm (8.0 in.) |
| | -AJ2 ····· | JIS 20K Wafer(*1) | Size 2.5 mm (0.1 in.) to 200 mm (8.0 in.) |
| | -AG1 ····· | JIS F12 (JIS75M) Wafer | Size 80 mm (3.0 in.) to 200 mm (8.0 in.) |
| Lay Length | 2 ····· | Matches an Earlier ADMAG Flowmeter (ADMAG or ADMAG AE) for Replacement | |
| Electrical Connection (*6) | -0 ···· | JIS G1/2 female | |
| | -2 ···· | ANSI 1/2 NPT female | Not available for Submersible Type |
| | -4 ···· | ISO M20×1.5 female | Not available for Submersible Type |
| Indicator (*4)(*7) | 1 ··· | Integral Flowmeter with indicator(Horizontal) | |
| | 2 ··· | Integral Flowmeter with indicator(Vertical) | |
| | N ··· | Integral Flowmeter without indicator /Remote Flowtube | |
| Calibration | B ··· | Standard | |
| | /□ | Optional code (See the Table of Optional Specifications) | |

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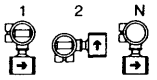
*1: For a wafer type of 2.5 to 10 mm (0.1 to 0.4 in.), prepare 15 mm (0.5 in.) diameter nominal flanges on the process pipe side.
(Process connection codes: AA1, AA2, AD4, AJ1, and AJ2)

*2: Even when DIN PN10 or 16 is required for a model of size 2.5 to 50 mm (0.1 to 2.0 in.), select PN40 (Process connection code: AD4) because there is no difference in the dimensions of the mating faces.
Even when DIN PN10 is required for a model of size 65 to 150 mm (2.5 to 6.0 in.), select PN16 (Process connection code: AD2) because there is no difference in the dimensions of the mating faces.

*3: Mating dimensions are based on standards as follow:
ANSI:ASME B 16.5, DIN: DIN 2501, JIS:JIS B 2220 and JIS G 3451

*4: N shall be always selected for remote flowtubes
In the case of an integral flowmeter, select from among the figures at the right:




*5: For explosion proof types, specify types of explosion proof certification using the optional codes. In case of TIIS flame proof type, the remote flowtube is available only for combined use with the AXFA14. For the TIIS flame proof type with wiring using a flame proof packing adapter, select optional code G12 or G11. Available only for JIS G1/2 electrical connections.

*6: JIS G1/2 Female electrical connection is available only for TIIS flame proof type.

*7: In case of integral flowmeters of the TIIS flame proof type, select "with indicator"(code 1 or 2).

## REPLACEMENT MODEL FOR EARLIER ADMAG OR ADMAG AE (Flange Type)

### General-purpose Use/Submersible Type/Explosion proof Type, PFA/Polyurethane Rubber Lining

For Flange Types of size 15 mm (0.5 in.) to 100 mm (4.0 in.), 300 mm (12 in.) to 2600 mm (104 in.), **AXF Standard** shall be selected.

| Model | Suffix Code | Description | Applicable Model |
|---|---|---|---|
| AXF150 | ····· | Size 150 mm (6.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF200 | ····· | Size 200 mm (8.0 in.) Integral Flowmeter/Remote Flowtube | |
| AXF250 | ····· | Size 250 mm (10 in.) Integral Flowmeter/Remote Flowtube | |
| Use | G ····· | General-Purpose Use | |
| | W ····· | Submersible Type | Remote Flowtube only |
| | C ····· | Explosion proof Type (*4) | PFA lining only |
| Converter Output Signal and Communication | -D ····· | Integral Flowmeter with 4 to 20 mA DC Output and BRAIN Communication | |
| | -E ····· | Integral Flowmeter with 4 to 20 mA DC Output and HART Communication | |
| | -N ····· | Remote Flowtube for Combined Use with AXFA11 | |
| | -P ····· | Remote Flowtube for Combined Use with AXFA14 | |
| Power Supply | 1 ····· | Integral Flowmeter, 100 V to 240 V AC or 100 to 120 V DC | |
| | 2 ····· | Integral Flowmeter, 24 V AC/DC | |
| | N ····· | Remote Flowtube | |
| Lining | A ····· | Fluorocarbon PFA | |
| | U ····· | Polyurethane Rubber | |
| Elecrode Material | L ····· | JIS SUS316L (AISI 316L SS/EN 1.4404 Equivalent) | |
| | P ····· | Platinum-iridium | PFA lining only |
| | H ····· | Hastelloy C276 Equivalent | |
| | T ····· | Tantalum | PFA lining only |
| | V ····· | Titanium | |
| | W ····· | Tungsten Carbide | |
| Electrode Structure | 1 ····· | Non-replaceable | |
| | 2 ····· | Replaceable | General-Purpose use,Electrode Material : JIS SUS316L only |
| Grounding Ring and Grounding Electrode Material | N ····· | None | |
| | S ····· | JIS SUS316 (AISI 316 SS/EN 1.4401 Equivalent) | |
| | L ····· | JIS SUS316L (AISI 316L SS/EN 1.4404 Equivalent) | |
| | P ····· | Platinum-iridium | Size150 mm (6.0 in.), 200 mm (8.0 in.), PFA lining only |
| | H ····· | Hastelloy C276 Equivalent | |
| | T ····· | Tantalum | Size150 mm (6.0 in.), 200 mm (8.0 in.), PFA lining only |
| | V ····· | Titanium | |
| Process Connection (*2) | -CA1 ····· | ANSI Class 150 Flange (Carbon Steel) | Size 150 mm (6.0 in.) to 250 mm (10 in.) |
| | -CA2 ····· | ANSI Class 300 Flange (Carbon Steel) | Size 150 mm (6.0 in.) to 250 mm (10 in.) |
| | -CD1 ····· | DIN PN 10 Flange (Carbon Steel)(*1) | Size 200 mm (8.0 in.) to 250 mm (10 in.) |
| | -CD2 ····· | DIN PN 16 Flange (Carbon Steel)(*1) | Size 150 mm (6.0 in.) to 250 mm (10 in.) |
| | -CJ1 ····· | JIS 10K Flange (Carbon Steel) | Size 150 mm (6.0 in.) to 250 mm (10 in.) |
| | -CJ2 ····· | JIS 20K Flange (Carbon Steel) | Size 150 mm (6.0 in.) to 250 mm (10 in.) |
| | -CG1 ····· | JIS F12 (JIS75M) Flange (Carbon Steel) | Size 150 mm (6.0 in.) to 250 mm (10 in.) |
| Lay Length | 2 ····· | Matches an Earlier ADMAG Flowmeter (ADMAG or ADMAG AE) for Replacement | |
| Electrical Connection (*5) | -0 ···· | JIS G1/2 female | |
| | -2 ···· | ANSI 1/2 NPT female | Not available for Submersible Type |
| | -4 ···· | ISO M20×1.5 female | Not available for Submersible Type |
| Indicator (*3)(*6) | 1 ··· | Integral Flowmeter with indicator (Horizontal) | |
| | 2 ··· | Integral Flowmeter with indicator(Vertical) | |
| | N ··· | Integral Flowmeter without indicator /Remote Flowtube | |
| Calibration | B ··· | Standard | |
| | /□ | Optional code (See the Table of Optional Specifications) | |

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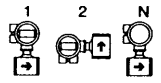
*1: Even when DIN PN10 is required for a 150 (6.0 in.)-mm model, select PN16 (Process connection code: CD2) because there is no difference in the dimensions of the mating faces.

*2: Mating dimensions are based on standards as follow:
ANSI: ASME B 16.5, DIN:DIN 2501, JIS:JIS B 2220 and JIS G 3451

*3: N shall be always selected for remote flowtubes.
In the case of an integral, select from among the following figures:




*4: For explosion proof types, specify types of explosion proof certification using the optional codes. In case of TIIS flame proof type, the remote flowtube is available only for combined use with the AXFA14. For the TIIS flame proof type with wiring using a flame proof packing adapter, select optional code G12 or G11. Available only for JIS G1/2 electrical connections.

*5: JIS G1/2 Female electrical connection is available only for TIIS flame proof type.

*6: In case of integral flowmeters of the TIIS flame proof type, select "with indicator"(code 1 or 2).

# ■ OPTIONAL SPECIFICATIONS FOR FLOWTUBES

## ● Table of Optional Specifications (Size 2.5 mm (0.1 in.) to 400 mm (16 in.))

○: Available –: Not available

| Item | Specifications | Applicable Model | | | | | | | Code |
|---|---|---|---|---|---|---|---|---|---|
| | | General | | Explosion proof | | Submersible | Sanitary | | |
| | | Integral Flowmeter | Remote Flowtube | Integral Flowmeter | Remote Flowtube | Remote Flowtube | Integral Flowmeter | Remote Flowtube | |
| | | AXF***G-D AXF***G-E | AXF***G-N AXF***G-P | AXF***C-D AXF***C-E | AXF***C-N AXF***C-P | AXF***W-N AXF***W-P | AXF***H-D AXF***H-E | AXF***H-N AXF***H-P | |
| For District Heating and Cooling or Condensation-proof | Urethane resin potting is applied in the terminal box of a remote flowtube. Select JIS G1/2 for the electrical connections. 30-m signal and excitation cables are pre-wired and waterproof grands with union joints are attached at factory. | – | ○ | – | – | – | – | ○ | DHC |
| User-specified Signal and Excitation Cable Length | Available for the submersible type and a model with optional code DHC. The cable length is limited up to 200 meters when combined with an AXFA11 converter, or 100 meters when combined with an AXFA14 converter. Following "L," specify the cable length in three digits as a multiple of 1 meter (e.g., 001, 002, or 005) for a length up to 5 m, or as a multiple of 5 meters (i.e., 005, 010, 015, or the like) for a length of 5 meters or more. If this optional code is not sellected, a 30m long cable is attached. | – | ○ | – | – | ○ | – | ○ | L*** |
| Lightning Protector | A lightning protector is built into the power terminals. | ○ | – | ○ | – | – | ○ | – | A |
| DC Noise Cut Circuit | The DC Noise Cut Circuit is built in. Available for 15 mm (0.5 in.) and larger sizes, and for fluids with the conductivity of 50 µS/cm or higher. Nullifies the empty check and electrode adhesion diagnostic function | ○ | – | ○ | – | – | ○ | – | ELC |
| Burn Out Down | The output level is set to 0 mA during a CPU failure and is set 2.4 mA (-10 %) or less during an alarm. Standard products are delivered with a setting 25 mA during a CPU failure and 21.6 mA (110%) or more during an alarm. | ○ | – | ○ | – | – | ○ | – | C1 |
| NAMUR NE43 Compliance | Output signal limits: 3.8 to 20.5 mA — Failure alarm down-scale: The output level is set to 0 mA during a CPU failure and is set 2.4 mA (–10%) or less during an alarm. | ○ | – | ○ | – | – | ○ | – | C2 |
| | Output signal limits: 3.8 to 20.5 mA — Failure alarm up-scale: The output level is set to 25 mA during a CPU failure and is set 21.6 mA (110%) or more during an alarm. | ○ | – | ○ | – | – | ○ | – | C3 |
| Active Pulse Output | Active pulses are output in order to drive an external electromagnetic or electronic counter directly using the converter's internal power supply. (Nullifies the standard transistor contact pulse output.)<br>Output voltage: 24 V DC ±20%<br>Pulse specifications:<br>• The drive current of 30 to 150 mA<br>• Pulse rate: 0.0001 to 2 pps (pulse/second); Pulse width: 20, 33, 50, or 100 ms | ○ | – | ○ | – | – | ○ | – | EM |
| Mass Unit Setting | The flow rate span, output pulse weight, and totalizer display pulse weight can be set in terms of mass. Specify the density of the process fluid when ordering in addition to the flow rate span, output pulse weight, and totalizer display pulse weight. The mass flow rate span must not exceed 32000 when ignoring the decimal point.<br>When ordering a remote flowtube, parameters for 'Mass Unit Setting' will be set in the corresponding converter before shipment.<br>Available mass units: t, kg, g, klb, lb<br>Available time units: /d, /h, /min, /s<br>Available density units: kg/m³ , lb/gal, lb/cf | ○ | ○ | ○ | ○ | ○ | ○ | ○ | MU |
| G3/4 Female Waterproof Glands | Waterproof glands for G3/4 conduits or flexible tubes are attached to the electrical connections. Available only for JIS G1/2 electric connections. | – | ○ | – | – | – | – | ○ | EW |
| Waterproof Glands | Waterproof glands are attached to the electrical connections. Available only for JIS G1/2 electric connections. | ○ | ○ | – | – | – | ○ | ○ | EG |
| Waterproof Glands with Union Joints | Waterproof glands with union joints are attached to the electrical connections. Available only for JIS G1/2 electric connections. | ○ | ○ | – | – | – | ○ | ○ | EU |
| Plastic Glands | Plastic glands are attached to the electrical connections. Available only for JIS G1/2 electric connections. | ○ | ○ | – | – | – | ○ | ○ | EP |

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## ● Table of Optional Specifications (Size 2.5 mm (0.1 in.) to 400 mm (16 in.)) (continued)

○: Available –: Not available

| Item | Specifications | | Applicable Model | | | | | | | Code |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | General | | Explosion proof | | Submersible | Sanitary | | |
| | | | Integral Flowmeter | Remote Flowtube | Integral Flowmeter | Remote Flowtube | Remote Flowtube | Integral Flowmeter | Remote Flowtube | |
| | | | AXF***G-D AXF***G-E | AXF***G-N AXF***G-P | AXF***C-D AXF***C-E | AXF***C-N AXF***C-P | AXF***W-N AXF***W-P | AXF***H-D AXF***H-E | AXF***H-N AXF***H-P | |
| Mirror Finished PFA Lining | Mirror finishing on the PFA lining inside of the tube to the smoothness lying between 0.05 and 0.15 μm of Ra. Available for 15 mm (0.5 in.) and larger sizes. | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | PM |
| Mirror Finished Ceramics | Mirror finishing on the inside of the ceramics tube to Rmax ≤ 1 μm. Available for 5 mm (0.2 in.) and larger sizes. | | ○ | ○ | ○ | ○ | – | – | – | CM |
| Stainless Steel Tag Plate | A pendant tag plate of JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) is provided. Choose this option when a pendant tag plate is required in addition to the standard nameplate with the tag number inscribed on it. Dimension (Height × Width): Appr. 12.5 (4.92) × 40 (15.7) mm (inch) | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | SCT |
| Direction change of the electrical connection (*1) | +90 degrees rotated converter (or terminal box) to change the direction of the electrical connection. | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | RA |
| | +180 degrees rotated converter (or terminal box) to change the direction of the electrical connection. | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | RB |
| | −90 degrees rotated converter (or terminal box) to change the direction of the electrical connection. | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | RC |
| Bolts, Nuts, and Gaskets (*2) | Bolts, nuts, and gaskets are provided for wafer connections. | Bolts and nuts: Carbon steel; Gaskets: Chloroprene rubber | ○ | ○ | ○ | ○ | ○ | – | – | BCC |
| | | Bolts and nuts: Carbon steel; Gaskets: PTFE-sheathed non-asbestos | ○ | ○ | ○ | ○ | ○ | – | – | BCF |
| | Available only for ANSI 150, JIS10K, or, JIS20K wafer connections. | Bolts: JIS SUS304 (AISI 304 SS stainless steel equivalent); Nuts: JIS SUS403 (AISI 403SS stainless steel equivalent) ; Gaskets: Chloroprene rubber | ○ | ○ | ○ | ○ | ○ | – | – | BSC |
| | | Bolts: JIS SUS304 (AISI 304 SS stainless steel equivalent); Nuts: JIS SUS403 (AISI 403SS stainless steel equivalent) ; Gaskets: PTFE-sheathed non-asbestos | ○ | ○ | ○ | ○ | ○ | – | – | BSF |
| Special Gaskets (*3) | Viton® gaskets for use with a PFA or ceramics lining with PVC piping. Valqua #4010, special fluororubber not mixed. Available for 2.5 mm (0.1 in.) to 200 mm (8.0 in.) of PFA lining or 15 to 200 mm (0.5 to 8 in.) sizes of ceramics lining. | | ○ | ○ | ○ | ○ | ○ | – | – | GA |
| | Acid-resistant Viton® gaskets for use with a PFA or ceramics lining with PVC piping. Valqua #4010, special fluororubber mixed (mixing #RCD470). Available for 2.5 mm (0.1 in.) to 200 mm (8.0 in.) of PFA lining or 15 to 200 mm (0.5 to 8 in.) sizes of ceramics lining. | | ○ | ○ | ○ | ○ | ○ | – | – | GC |
| | Alkali-resistant Viton® gaskets for use with a PFA or ceramics lining with PVC piping. Valqua #4010, special fluororubber mixed (mixing #RCD970). Available for 2.5 mm (0.1 in.) to 200 mm (8.0 in.) of PFA lining or 15 to 200 mm (0.5 to 8 in.) sizes of ceramics lining. | | ○ | ○ | ○ | ○ | ○ | – | – | GD |
| | Alkali-resistant carbonized fluororesin gaskets for use with a ceramics lining with metal piping. Valqua #7026. | | ○ | ○ | ○ | ○ | – | – | – | GF |
| | Silicon rubber gaskets for Sanitary Type, provided between the lining and the adapter. For the condition of fluid temp. 120 to 160°C (248 to 320°F). | | – | – | – | – | – | ○ | ○ | GH |
| Oil-prohibited Use | Electrodes, linings, and grounding rings are assembled and packed with polyethylene after being cleaned with water and acetone and dried with air. The label 'OIL FREE' is affixed. | | ○ | ○ | ○ | ○ | – | – | – | K1 |
| Oil-prohibited Use with Dehydrating Treatment | Electrodes, linings, and grounding rings are assembled and packed with polyethylene including desiccants after being cleaned with water and acetone and dried with air. The label 'OIL & WATER FREE' is affixed. | | ○ | ○ | ○ | ○ | – | – | – | K5 |
| Painting Color Change | Coated in black (Munsell N1.5 or its equivalent.) | | ○ | ○ | ○ | ○ | – | ○ | ○ | P1 |
| | Coated in jade green (Munsell 7.5 BG 4/1.5 or its equivalent.) | | ○ | ○ | ○ | ○ | – | ○ | ○ | P2 |
| | Coated in metallic silver. | | ○ | ○ | ○ | ○ | – | ○ | ○ | P7 |

T26-2 EPS

## ● Table of Optional Specifications (Size 2.5 mm (0.1 in.) to 400 mm (16 in.)) (continued)

○: Available –: Not available

| Item | Specifications | Applicable Model | | | | | | | Code |
|---|---|---|---|---|---|---|---|---|---|
| | | General | | Explosion proof | | Submersible | Sanitary | | |
| | | Integral Flowmeter | Remote Flowtube | Integral Flowmeter | Remote Flowtube | Remote Flowtube | Integral Flowmeter | Remote Flowtube | |
| | | AXF···G-D AXF···G-E | AXF···G-N AXF···G-P | AXF···C-D AXF···C-E | AXF···C-N AXF···C-P | AXF···W-N AXF···W-P | AXF···H-D AXF···H-E | AXF···H-N AXF···H-P | |
| Epoxy Resin Coating | Epoxy resin coating which has alkali-resistance instead of standard polyurethane resin coating. The color is same as standard type. | ○ | ○ | ○ | ○ | – | – | – | X1 |
| High Anti-corrosion Coating | Three-layer coating (polyurethane coating on two-layer epoxy resin coating) in the same range as that for the standard coating. The color is same as standard type. Salt/alkali/acid/weather-resistance. | ○ | ○ | ○ | ○ | – | – | – | X2 |
| Material Certificate | Reproduced material certificates for :<br>PFA/polyurethane: Pipe, electrodes, grounding rings/grounding electrodes, flanges or mini flanges, adapters (for sanitary type)<br>Ceramics: only grounding rings or grounding electrodes | ○ | ○ | ○ | ○ | ○ | ○ | ○ | M01 |
| Hydrostatic Test | The test verifies the absence of leaks by applying the following water pressures (which are determined under process connection conditions) to linings for ten minutes. Test results are described in the Note column of a test certificate (QIC).<br>**Process Connection:** / **Water Pressure:**<br>ANSI Class 150, DIN PN10, JIS 10K / 1.5 MPa<br>ANSI Class 300, DIN PN16, JIS 20K / 3.0 MPa<br>DIN PN40, Union joint (Ceramics lining) / 6.0 MPa<br>JIS F12 / 1.25 MPa | ○ | ○ | ○ | ○ | ○ | – | – | T01 |
| Calibration Certificate | Level 2: The Declaration and the Calibration Equipment List are issued. | ○ | ○ | ○ | ○ | ○ | ○ | ○ | L2 |
| | Level 3: The Declaration and the Primary Standard List are issued. | ○ | ○ | ○ | ○ | ○ | ○ | ○ | L3 |
| | Level 4: The Declaration and the Yokogawa Measuring Instruments Control System are issued. | ○ | ○ | ○ | ○ | ○ | ○ | ○ | L4 |
| Vent Hole | With a vent hole provided for permeable fluids (such as nitric acid, hydrofluoric acid, or sodium hydroxide at high temperature). Available only for a PFA lining flange type tube. | ○ | ○ | ○ | ○ | – | – | – | H |
| Enhanced Dual Frequency Excitation (*4) | Available for 25 to 200 mm (1.0 to 8.0 in.) sizes. Products are delivered with the Standard dual frequency excitation mode and the Enhanced dual frequency excitation mode enabled. As flow calibration is not performed for optional code HF1 while in Enhanced dual frequency excitation. Excitation mode select optional code HF2 when an accurate flow measurement is required. | ○ | ○ | ○ | ○ | ○ | ○ | ○ | HF1 |
| | Available for 25 to 200 mm (1.0 to 8.0 in.) sizes. Products are delivered with the Standard dual frequency excitation mode and the Enhanced dual frequency excitation mode enabled. The meter factor for the Enhanced dual frequency excitation obtained by flow calibration is inscribed on the nameplate and set into the combined converter in addition to the meter factor for the Standard dual frequency excitation. | ○ | ○ | ○ | ○ | ○ | ○ | ○ | HF2 |

T26-3.EPS

## ● Table of Optional Specifications (Size 2.5 mm (0.1 in.) to 400 mm (16 in.)) (continued)

○: Available –: Not available

| Item | Specifications | Applicable Model: General – Integral Flowmeter AXF***G-D AXF***G-E | General – Remote Flowtube AXF***G-N AXF***G-P | Explosion proof – Integral Flowmeter AXF***C-D AXF***C-E | Explosion proof – Remote Flowtube AXF***C-N AXF***C-P | Submersible – Remote Flowtube AXF***W-N AXF***W-P | Sanitary – Integral Flowmeter AXF***H-D AXF***H-E | Sanitary – Remote Flowtube AXF***H-N AXF***H-P | Code |
|---|---|---|---|---|---|---|---|---|---|
| Five-point Calibration in User-specified Span | A flow test at 0, 25, 50, 75, and 100% of the user-specified span is performed instead of the flow test of the standard 2m/s span and a test certificate (QIC) is submitted. Specify the span (100% flow rate) whose corresponding flow velocity lies between 0.5 to 10 m/s (limits imposed by the flowtube performance) and that is less than the maximum line capacity shown below.<br>**Size** / **Max. line capacity ($m^3/h$)**<br>2.5 mm (0.1 in.) 0.05<br>5 mm (0.2 in.) 0.2<br>10 mm (0.4 in.) 0.96<br>15 mm (0.5 in.) 2.8<br>25 mm (1 in.) 11<br>32 mm (1.25 in.) 30<br>40 mm (1.5 in.) 32<br>50 mm (2 in.) 56<br>65 mm (2.5 in.) 80<br>80 mm (3 in.) 126<br>100 mm (4 in.) 220<br>125 mm (5 in.) 300<br>150 mm (6 in.) 380<br>200 mm (8 in.) 670<br>250 mm (10 in.) 1000<br>300,350 mm (12, 14 in.) 1200<br>400 mm (16 in.) 1350 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | SC |
| FM Approval | FM Explosion proof<br>See "HAZARDOUS AREA CLASSIFICATION" | – | – | ○ | ○ | – | – | – | FF1 |
| CENELEC ATEX Certification (KEMA Approval) | ATEX Explosion proof<br>See "HAZARDOUS AREA CLASSIFICATION" | – | – | ○ | ○ | – | – | – | KF2 |
| CSA Certification | CSA Explosion proof<br>See "HAZARDOUS AREA CLASSIFICATION" | – | – | ○ | ○ | – | – | – | CF1 |
| TIIS Certification | TIIS Flame proof<br>See "HAZARDOUS AREA CLASSIFICATION" | – | – | ○ | △ (*6) | – | – | – | JF3 |
| Flame proof packing adapter for TIIS Flame proof Type (*5) | Two flame proof packing adapters | – | – | ○ | ○ | – | – | – | G12 |
| | One flame proof packing adapter and one blind plug.<br>Available for integral flowmeter and only when a four-wire cable is used for power input and signal output with a DC power supply. | – | – | ○ | – | – | – | – | G11 |

*1:

| | Standard | +90-degree rotation<br>Optional Code RA | +180-degree rotation<br>Optional Code RB | -90-degree rotation<br>Optional Code RC |
|---|---|---|---|---|
| Integral Flowmeter | Electrical Connection | Indicator | Electrical Connection | Indicator |
| Remote Flowtube | | Electrical Connection | | Electrical Connection |

*2: When specifying the optional code BCC or BSC for a PFA or ceramics lining, it is advisable to specify the optional code GA, GC, or GD at the same time to prevent potential leakage caused by the difference in elasticity between the flowtube and chloroprene gaskets. Refer to description of "Gasket" in the "Wetted Part Material".

*3: Special gaskets are inserted between the flowtube and the grounding ring or grounding electrode.

*4: Enhanced dual frequency excitation is not available for models with calibration code C (High Grade Accuracy).

*5: Select optional code G12 or G11 when TIIS Flame proof type with wiring using a flame proof packing adapter. Available only for JIS G1/2 electric connection.

*6: The TIIS flame proof type is only available for AXF***C-P (remote flowtube for combined use with AXFA14).

T26-4.EPS

## ● Table of Optional Specifications (Size 500 mm (20 in.) to 2600 mm (104 in.)) (continued)

○: Available –: Not available

| Item | Specifications | Applicable Model: General, Remote Flowtube, AXF***G-N | Applicable Model: Submersible, Remote Flowtube, AXF***W-N | Code |
|---|---|---|---|---|
| For District Heating and Cooling or Condensation-proof | Urethane resin potting is applied in the terminal box of a remote flowtube. Select JIS G1/2 for the electrical connections. 30-m dedicated and excitation cables are pre-wired and waterproof glands with union joints are attached at factory. | ○ | – | DHC |
| User-specified Signal and Excitation Cable Length | Available for the submersible type and a model with optional code DHC. The cable length is limited up to 200 meters when combined with an AXFA11 converter. Following "L," specify the cable length in three digits as a multiple of 1 meter (e. g., 001, 002, or 005) for a length up to 5 meters, or as a multiple of 5 meters (i.e., 005, 010, 015, or the like) for a length of 5 meters or more. If this optional code is not sellected, a 30m long cable is attached. | ○ | ○ | L*** |
| Mass Unit Setting | The flow rate span, output pulse weight, and totalizer display pulse weight can be set in terms of mass. Specify the density of the process fluid when ordering in addition to the flow rate span, output pulse weight, and totalizer display pulse weight. The mass flow rate span must not exceed 32000 when ignoring the decimal point.<br>When ordering a remote flowtube, parameters for 'Mass Unit Setting' will be set in the corresponding converter before shipment.<br>Available mass units: t, kg, g, klb, lb<br>Available time units: /d, /h, /min, /s<br>Available density units: kg/m$^3$ , lb/gal, lb/cf | ○ | ○ | MU |
| G3/4 Female Waterproof Glands | Waterproof glands for G3/4 conduits or flexible tubes are attached to the electrical connections. Available only for JIS G1/2 electric connections. | ○ | – | EW |
| Waterproof Glands | Waterproof glands are attached to the electrical connections. Available only for JIS G1/2 electric connections. | ○ | – | EG |
| Waterproof Glands with Union Joints | Waterproof glands with union joints are attached to the electrical connections. Available only for JIS G1/2 electric connections. | ○ | – | EU |
| Stainless Steel Tag Plate | Screwd JIS SUS304 (AISI 304 SS/EN 1.4301 stainless steel equivalent) stainless steel tag plate for size 1100 to 2600 mm, or a pendant tag plate of JIS SUS304 is provided for size 500 to 1000 mm. Choose this option when a SS tag plate is required in addition to the standard nameplate with the tag number inscribed on it.<br>Dimension (Height × Width): Appr. 12.5 (4.92) × 40 (15.7) mm (inch) | ○ | ○ | SCT |
| Direction Change of Electrical Connection (*1) | +90 degrees rotated terminal box to change the direction of the electrical connection. Available for 1000 mm (40 in.) and smaller sizes. | ○ | ○ | RA |
| | +180 degrees rotated terminal box to change the direction of the electrical connection. Available for 1000 mm (40 in.) and smaller sizes. | ○ | ○ | RB |
| | –90 degrees rotated terminal box to change the direction of the electrical connection. Available for 1000 mm (40 in.) and smaller sizes. | ○ | ○ | RC |
| Material Certificate | Material certificates are provided for linings, electrodes, grounding rings, and flanges. | ○ | ○ | M01 |
| Hydrostatic Test | The test verifies the absence of leaks by applying the following water pressures (which are determined under process connection conditions) to lining for ten minutes. Test results are described in the Note column of a test certificate(QIC).<br>**Process Connection:** / **Water Pressure:**<br>JIS 10K, ANSI Class 150, DIN PN10 / 1.5 MPa<br>JIS F12 / 1.25 MPa | ○ | ○ | T01 |
| Calibration Certificate | Level 2: The Declaration and the Calibration Equipment List are issued. | ○ | ○ | L2 |
| | Level 3: The Declaration and the Primary Standard List are issued. | ○ | ○ | L3 |
| | Level 4: The Declaration and the Yokogawa Measuring Instruments Control System are issued. | ○ | ○ | L4 |
| Five-point Calibration in User-specified Span | A flow test at 0, 25, 50, 75, and 100% of the user-specified span is performed instead of the flow test of the standard 2m/s span and a test certificate (QIC) is submitted. Specify the span (100% flow rate) whose corresponding flow velocity lies between 0.5 to 10m/s (limits imposed by the flowtube performance) and that is less than the maximum line capacity shown below.<br>**Size** / **Max. line capacity (m$^3$/h)**<br>500 to 1200 mm(20 to 48 in.) / 8200<br>1350 to 2600 mm(54 to 104 in.) / 41300 | ○ | ○ | SC |

*1:

| | Standard | +90-degree rotation<br>Optional Code RA | +180-degree rotation<br>Optional Code RB | –90-degree rotation<br>Optional Code RC |
|---|---|---|---|---|
| Remote Flowtube | | Electrical Connection | | Electrical Connection |

T26-5.EPS

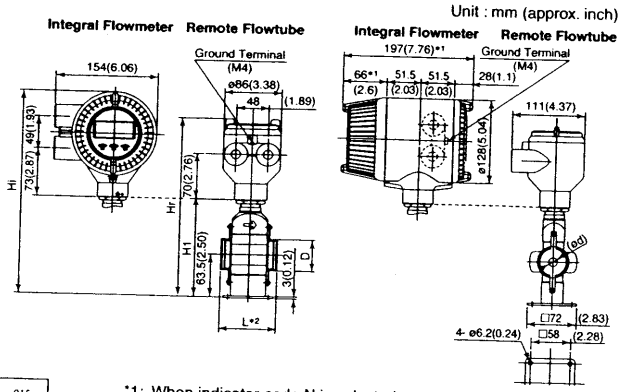
# ■ EXTERNAL DIMENSIONS

## ● AXF Standard, AXF002-AXF015, Wafer Type, PFA Lining

Unit : mm (approx. inch)

AXF002 / AXF005 / AXF010 / AXF015 — G / W / C — *4: D E N P — 1 2 N — A □ 1 □ − A □ □ 1

*4: D, E; Integral Flowmeter, N, P; Remote Flowtube




| Model | Size code | | 002 | 005 | 010 | 015 |
|---|---|---|---|---|---|---|
| | Size | | 2.5(0.1) | 5(0.2) | 10(0.4) | 15(0.5) |
| | Lining code | | A | A | A | A |
| Remote flowtube / Integral flowmeter | Face-to-face length | L*2 | 81(3.19) | | | |
| Remote flowtube | Outside dia. | D | 44(1.73) | | | |
| Integral flowmeter | Inner diameter of Grounding ring | ød | 15(0.59) | | | |
| Integral flowmeter | Height | H1 | 144(5.67) | | | |
| Remote flowtube | Max. Height | Hr | 268(10.55) | | | |
| | Weight kg (lb) *3 | | 2.4(5.3) | | | |
| Integral flowmeter | Max. Height | Hi | 306(12.03) | | | |
| | Weight kg (lb) | | 4.1(9.0) | | | |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
In case of explosion proof type with indicator, add 5 mm (0.2 inch) to it.

*2: Depending on the selection of grounding ring code and optional code, add the following value to L (face-to-face length).

| Grounding Ring Code | | S, L, H, V | P, T | N |
|---|---|---|---|---|
| Option Code | None | +0 | +26(1.02) | -2(0.08) |
| | GA, GC, GD (Special Gaskets) | +6(0.24) | +28(1.10) | – |

*3: When submersible type or option code DHC is selected, waterproof glands and a 30m long cable are attached.
Add 9.5kg(20.9lb) to the weight in the table.

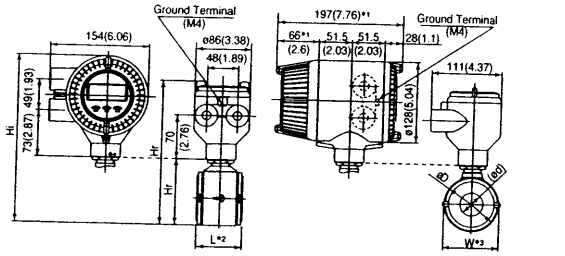
F22 EPS

## ● AXF Standard, AXF025-AXF125, Wafer Type, PFA /Polyurethane Rubber /Natural Soft Rubber /EPDM Rubber Lining

Unit : mm (approx. inch)

AXF025 / AXF032 / AXF040 / AXF050 / AXF065 / AXF080 / AXF100 / AXF125 — G / W / C — *5: D E N P — 1 2 N — A U D G — □ 1/2 □ − A □ □ 1

*5: D, E; Integral Flowmeter, N, P; Remote Flowtube




| Model | Size code | | 025 | 032 | 040 | 050 | 065 | 080 | 100 | 125 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Size | | 25(1) | 32(1.25) | 40(1.5) | 50(2) | 65(2.5) | 80(3) | 100(4) | 125(5) |
| | Lining code | | A,U | A,U | A,U | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G |
| Remote Flowtube / Integral Flowmeter | Face-to-face length | L*2 | 60(2.36) | 70(2.76) | 70(2.76) | 80(3.15) | 100(3.94) | 120(4.72) | 150(5.91) | 200(7.87) |
| Remote Flowtube | Outside dia. | ØD | 67.5(2.66) | 73(2.87) | 86(3.39) | 99(3.90) | 117(4.61) | 129(5.08) | 155(6.10) | 183(7.20) |
| Integral Flowmeter | Inner diameter of Grounding ring | Ød | 28(1.10) | 34(1.34) | 41(1.61) | 53(2.09) | 66(2.60) | 77(3.03) | 102(4.02) | 128(5.04) |
| Integral Flowmeter | Width | W*3 | 67.5(2.66) | 73(2.87) | 86(3.39) | 99(3.90) | 117(4.61) | 129(5.08) | 155(6.10) | 183(7.20) |
| | Height | H1 | 92(3.62) | 98(3.86) | 111(4.37) | 129(5.08) | 147(5.79) | 157(6.18) | 183(7.20) | 212(8.35) |
| Remote Flowtube | Max. Height | Hr | 216(8.50) | 222(8.74) | 235(9.25) | 253(9.96) | 271(10.67) | 281(11.06) | 307(12.09) | 336(13.23) |
| | Weight kg (lb)*4 | | 1.9(4.1) | 2.0(4.5) | 2.2(4.9) | 2.7(5.8) | 3.4(7.6) | 4.1(9.1) | 5.6(12.3) | 9.3(20.4) |
| Integral Flowmeter | Max. Height | Hi | 254(9.98) | 260(10.24) | 273(10.73) | 291(11.44) | 309(12.17) | 319(12.54) | 345(13.56) | 374(14.70) |
| | Weight kg (lb) | | 3.6(7.8) | 3.7(8.2) | 3.9(8.7) | 4.4(9.6) | 5.1(11.3) | 5.8(12.9) | 7.3(16.0) | 11.0(24.2) |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
In case of explosion proof type with indicator, add 5 mm (0.2 inch) to it.

*2: Depending on the selection of grounding ring code and optional code, add the following value to L (face-to-face length).

| Grounding Ring Code | | S, L, H, V | P, T | N |
|---|---|---|---|---|
| Option Code | None | +0 | +26(1.02) | -2(0.08) |
| | GA, GC, GD (Special Gaskets) | +8(0.31) | +30(1.18) | – |

*3: When electrode structure 2 is selected, add the following value to W (width).

| Nominal Size | 25 | 32, 40, 50 | 65, 80 | 100 | 125 |
|---|---|---|---|---|---|
| W | +52.5(2.07) | +52(2.05) | +49(1.93) | +48(1.89) | +47(1.85) |

*4: When submersible type or option code DHC is selected, waterproof glands and a 30m long cable are attached.
Add 9.5kg(20.9lb) to the weight in the table.

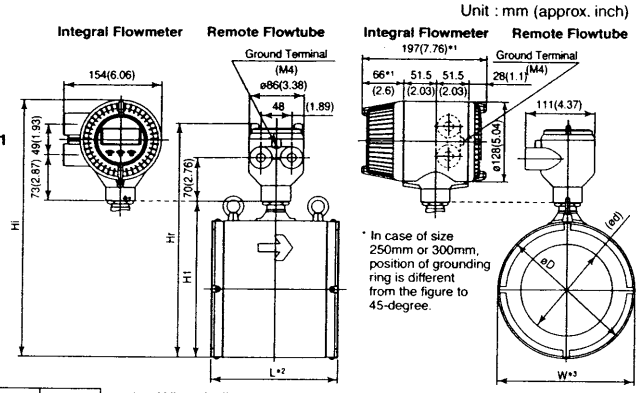
F23 EPS

## ● AXF Standard, AXF150-AXF300, Wafer Type, PFA /Polyurethane Rubber /Natural Soft Rubber /EPDM Rubber Lining

Unit : mm (approx. inch)

AXF150 / AXF200 / AXF250 / AXF300 — G / W / C — *5 — D / E / N / P — 1 / 2 / N — A / U / D / G — □ — 1 / 2 — □ — A □ □ 1

*5: D, E; Integral Flowmeter, N, P; Remote Flowtube




| Model | Size code | | 150 | 200 | 250 | 300 |
|---|---|---|---|---|---|---|
| | Size | | 150(6) | 200(8) | 250(10) | 300(12) |
| | Lining code | | A,U D,G | A,U D,G | A,U D,G | A,U D,G |
| Remote Flowtube / Integral Flowmeter | Face-to-face length | L*2 | 200(7.87) | 250(9.84) | 300(11.81) | 350(13.78) |
| Remote Flowtube | Outside dia. | ØD | 202(7.95) | 252(9.92) | 310(12.20) | 358(14.09) |
| Remote Flowtube / Integral Flowmeter | Inner diameter of Grounding ring | Ød | 146.1(5.75) | 193.6(7.62) | 243.7(9.59) | 294.7(11.60) |
| Integral Flowmeter | Width | W*3 | 202(7.95) | 252(9.92) | 310(12.20) | 358(14.09) |
| | Height | H1 | 243(9.57) | 293(11.54) | 354(13.94) | 402(15.83) |
| Remote Flowtube | Max. Height | Hr | 367(14.45) | 417(16.42) | 478(18.82) | 526(20.71) |
| | Weight kg (lb)*4 | | 14.5(32.0) | 22.1(48.7) | 39.0(86.0) | 48.3(106.5) |
| Integral Flowmeter | Max. Height | Hi | 405(15.93) | 455(17.89) | 516(20.31) | 564(22.20) |
| | Weight kg (lb) | | 16.2(35.7) | 23.8(52.4) | 40.7(89.7) | 50.0(110.2) |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
In case of explosion proof type with indicator, add 5 mm (0.2 inch) to it.

*2: Depending on the selection of grounding ring code and optional code, add the following value to L (face-to-face length).

| Nominal Size: 150 to 200mm | | | | |
|---|---|---|---|---|
| Grounding Ring Code | | S, L, H, V | P, T | N |
| Option Code | None | +0 | +32(1.26) | -2(0.08) |
| | GA, GC, GD (Special Gaskets) | +10(0.39) | +38(1.5) | – |

| Nominal Size: 250 to 300mm | | | |
|---|---|---|---|
| Grounding Ring Code | S, L, H, V | P, T | N |
| Option Code is "None" | +0 | – | -2(0.08) |

*3: When electrode structure 2 is selected, add the following value to W(width).

| Nominal size | 150 | 200 | 250 | 300 |
|---|---|---|---|---|
| W | +49(1.93) | +50(1.97) | +49(1.93) | +53(2.09) |

*4: When submersible type or option code DHC is selected, waterproof glands and a 30m long cable are attached. Add 9.5kg(20.9lb) to the weight in the table.

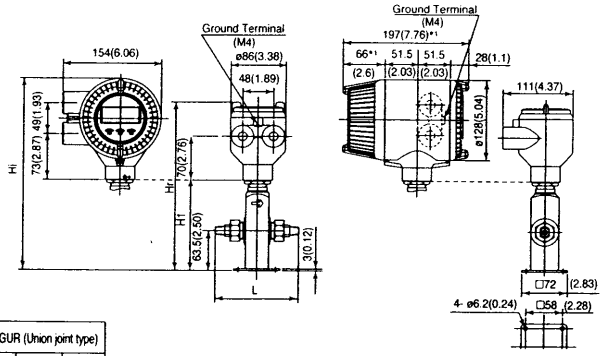
F24 EPS

## ● AXF Standard, AXF002-AXF010, Weld · Union Joint, Ceramics Lining

Unit : mm (approx. inch)

AXF002 / AXF005 / AXF010 — G / C — *2 — D / E / N / P — 1 / 2 / N — C E 1 N — G U N — W / 1 / R

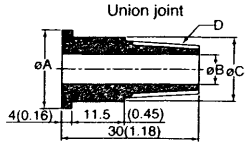
*2: D, E; Integral Flowmeter, N, P; Remote Flowtube




| Model | Process connection | | GUW (Welding type) | | | GUN/GUR (Union joint type) | | |
|---|---|---|---|---|---|---|---|---|
| | Size code | | 002 | 005 | 010 | 002 | 005 | 010 |
| | Size | | 2.5 (0.1) | 5 (0.2) | 10 (0.4) | 2.5 (0.1) | 5 (0.2) | 10 (0.4) |
| | Lining code | | C | C | C | C | C | C |
| Remote flowtube / Integral flowmeter | Face-to-face length | L | 140(5.51) | | | 130(5.12) | | |
| Integral flowmeter | Height | H1 | 144(5.67) | | | 144(5.67) | | |
| Remote flowtube | Max. Height | Hr | 268(10.55) | | | 268(10.55) | | |
| | Weight kg (lb) | | 2.3(5.1) | | | 2.3(5.1) | | |
| Integral flowmeter | Max. Height | Hi | 306(12.03) | | | 306(12.03) | | |
| | Weight kg (lb) | | 4(8.8) | | | 4(8.8) | | |

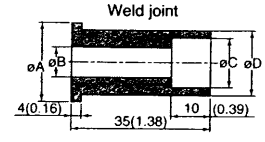
*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
In case of explosion proof type with indicator, add 5 mm (0.2 inch) to it.

Union joint




| Size | A | B | C | D |
|---|---|---|---|---|
| 2.5 (0.1) | 22(0.87) | 8(0.31) | 18.5(0.73) | R1/4 |
| | 22(0.87) | 8(0.31) | 18.5(0.73) | NPT1/4 |
| 5 (0.2) | 22(0.87) | 8(0.31) | 18.5(0.73) | R1/4 |
| | 22(0.87) | 8(0.31) | 18.5(0.73) | NPT1/4 |
| 10 (0.4) | 25(0.98) | 10(0.39) | 22.5(0.89) | R3/8 |
| | 25(0.98) | 10(0.39) | 22.5(0.89) | NPT3/8 |

Weld joint




| Size | A | B | C | D |
|---|---|---|---|---|
| 2.5(0.1) | 22(0.87) | 8(0.31) | 14.3(0.56) | 18.5(0.73) |
| 5(0.2) | 22(0.87) | 8(0.31) | 14.3(0.56) | 18.5(0.73) |
| 10(0.4) | 25(0.98) | 10(0.39) | 17.8(0.70) | 22.5(0.89) |

F25 EPS

99



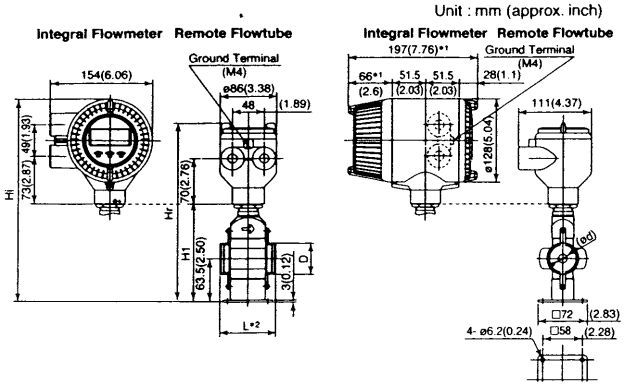
19.1.2

## ● AXF Standard, AXF015, Wafer Type, Ceramics Lining

Unit : mm (approx. inch)

AXF015 $\frac{G}{C}$ – *3 (D, E, N, P) 1 2 C E 1 □ – A □ □ 1

*3: D, E; Integral Flowmeter,
N, P; Remote Flowtube




| Model | Size code | | 015 |
|---|---|---|---|
| | Size | | 15(0.5) |
| | Lining code | | C |
| Remote flowtube | Face-to-face length | L*2 | 85(3.35) |
| | Outside dia. | D | 44(1.73) |
| Integral flowmeter | Inner diameter of Grounding ring | ød | 15(0.59) |
| | Height | H1 | 144(5.67) |
| Remote flowtube | Max. Height | Hr | 268(10.55) |
| | Weight kg (lb) | | 2.3(5.1) |
| Integral flowmeter | Max. Height | Hi | 306(12.03) |
| | Weight kg (lb) | | 4(8.8) |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
In case of explosion proof type with indicator, add 5 mm (0.2 inch) to it.

*2: Depending on the selection of grounding ring code and optional code, add the following value to L (face-to-face length).

| Grounding Ring Code | S, L, H, V | P, T | N |
|---|---|---|---|
| L(Face-to-face length) | +0 | +22(087) | -6(0.24) |

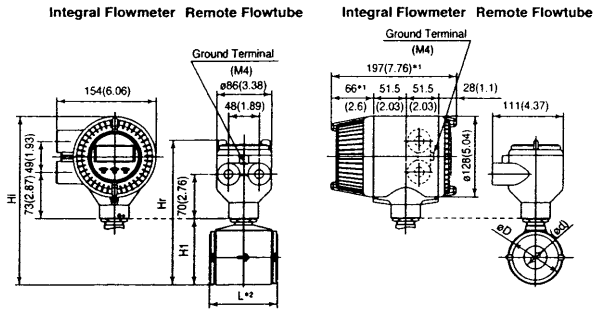
F26.EPS

## ● AXF Standard, AXF025-AXF100, Wafer Type, Ceramics Lining

Unit : mm (approx. inch)

AXF025
AXF040
AXF050 $\frac{G}{C}$ – *3 (D, E, N, P) 1 2 C E 1 □ – A □ □ 1
AXF080
AXF100

*3: D, E; Integral Flowmeter,
N, P; Remote Flowtube




| Model | Size code | | 025 | 040 | 050 | 080 | 100 |
|---|---|---|---|---|---|---|---|
| | Size | | 25(1) | 40(1.5) | 50(2) | 80(3) | 100(4) |
| | Lining code | | C | C | C | C | C |
| Remote Flowtube | Face-to-face length | L*2 | 93(3.66) | 106(4.17) | 120(4.72) | 160(6.30) | 180(7.09) |
| | Outside dia. | øD | 67.5(2.66) | 86(3.39) | 99(3.90) | 129(5.08) | 155(6.10) |
| Integral Flowmeter | Inner diameter of Grounding ring | ød | 27(1.06) | 40(1.57) | 52(2.05) | 81(3.19) | 98(3.86) |
| | Height | H1 | 92(3.62) | 111(4.37) | 129(5.08) | 159(6.26) | 184(7.24) |
| Remote Flowtube | Max. Height | Hr | 216(8.50) | 235(9.25) | 253(9.96) | 283(11.14) | 308(12.13) |
| | Weight kg (lb) | | 2.3(5.1) | 3.2(7.0) | 4.1(9.0) | 6.8(15.0) | 9.6(21.1) |
| Integral Flowmeter | Max. Height | Hi | 254(9.98) | 273(10.73) | 291(11.44) | 321(12.64) | 346(13.62) |
| | Weight kg (lb) | | 4.0(8.8) | 4.9(10.8) | 5.8(12.7) | 8.5(18.8) | 11.3(24.9) |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
In case of explosion proof type with indicator, add 5 mm (0.2 inch) to it.

*2: Depending on the selection of grounding ring code and optional code, add the following value to L (face-to-face length).

| Grounding Ring Code | S, L, H, V | P, T | N |
|---|---|---|---|
| L(Face-to-face length) | +0 | +22(0.87) | -6(0.24) |

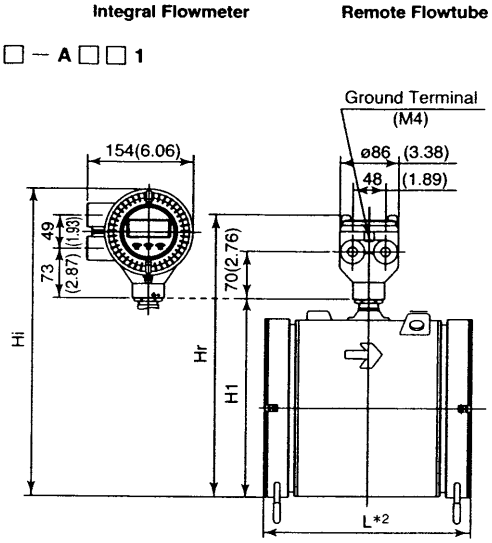
F27.EPS

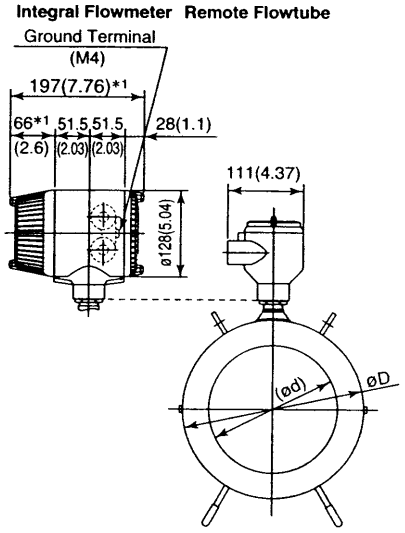
## ● AXF Standard, AXF150, AXF200, Wafer Type, Ceramics Lining

Unit : mm (approx. inch)

AXF150G — *3 D E N P 1 2 N C E 1 □ — A □ □ 1
AXF200C

*3: D, E; Integral Flowmeter,
N, P; Remote Flowtube




| Model | Size code | | 150 | 200 |
|---|---|---|---|---|
| | Size | | 150(6) | 200(8) |
| | Lining code | | C | C |
| Remote Flowtube / Integral Flowmeter | Face-to-face length | L*2 | 232(9.13) | 302(11.89) |
| | Outside dia. | D | 214(8.43) | 264(10.39) |
| | Inner diameter of Grounding ring | ød | 144(5.67) | 192(7.56) |
| | Height | H1 | 254(10.00) | 304(11.97) |
| Remote Flowtube | Max. Height | Hr | 378(14.88) | 428(16.85) |
| | Weight kg (lb) | | 20.2(44.5) | 33.5(73.9) |
| Integral Flowmeter | Max. Height | Hi | 416(16.36) | 466(18.33) |
| | Weight kg (lb) | | 21.9(48.3) | 35.2(77.6) |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
In case of explosion proof type with indicator, add 5 mm (0.2 inch) to it.

*2: Depending on the selection of grounding ring code and optional code, add the following value to L (face-to-face length).

| Grounding Ring Code | S, L, H, V | P, T | N |
|---|---|---|---|
| L(Face-to-face length) | +0 | +30(1.18) | -6(0.24) |

F28.EPS

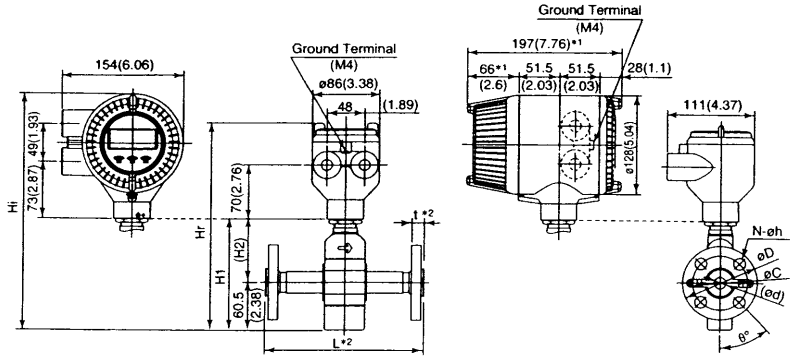
## ● AXF Standard, AXF002-AXF015, JIS/ANSI/DIN Flange Type, PFA Lininig

Unit : mm (approx. inch)

| | Integral Flowmeter | Remote Flowtube | Integral Flowmeter | Remote Flowtube |
|---|---|---|---|---|

AXF002 G
AXF005 W — *4 (D, E, N, P) 1 2 A □ 1 □ — (B J 1, B J 2, B A 1, B A 2, B D 4, D J 1, D J 2, D D 4) 1

*4: D, E; Integral Flowmeter,
N, P; Remote Flowtube




| Model | Process Connection | | BJ1(JIS10K) | | | | BJ2(JIS20K) | | | | BA1(ANSI Class 150) | | | | BA2(ANSI Class 300) | | | | BD4(DIN PN40) | | | | DJ1(JIS10K) | | | DJ2(JIS20K) | | | DD4(DIN PN40) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size code | | 002 | 005 | 010 | 015 | 002 | 005 | 010 | 015 | 002 | 005 | 010 | 015 | 002 | 005 | 010 | 015 | 002 | 005 | 010 | 015 | 002 | 005 | 010 | 002 | 005 | 010 | 002 | 005 | 010 |
| | Size | | 2.5 (0.1) | 5 (0.2) | 10 (0.4) | 15 (0.5) | 2.5 (0.1) | 5 (0.2) | 10 (0.4) | 15 (0.5) | 2.5 (0.1) | 5 (0.2) | 10 (0.4) | 15 (0.5) | 2.5 (0.1) | 5 (0.2) | 10 (0.4) | 15 (0.5) | 2.5 (0.1) | 5 (0.2) | 10 (0.4) | 15 (0.5) | 2.5 (0.1) | 5 (0.2) | 10 (0.4) | 2.5 (0.1) | 5 (0.2) | 10 (0.4) | 2.5 (0.1) | 5 (0.2) | 10 (0.4) |
| | Lining code | | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A |
| Remote Flowtube / Integral Flowmeter | Face-to-face length | L *2 | 150(5.91) | | | 200 (7.87) | 150(5.91) | | | 200 (7.87) | 150(5.91) | | | 200 (7.87) | 150(5.91) | | | 200 (7.87) | 150(5.91) | | | 200 (7.87) | 150(5.91) | | | 150(5.91) | | | 150(5.91) | | |
| | Outside dia. | øD | 95(3.74) | | | | 95(3.74) | | | | 88.9(3.50) | | | | 95.3(3.75) | | | | 95(3.74) | | | | 90(3.54) | | | 90(3.54) | | | 90(3.54) | | |
| | Thickness | t *2 | 18 to 22 (0.71 to 0.87) | | | 16 (0.63) | 20 to 24 (0.79 to 0.94) | | | 18 (0.71) | 17 to 22 (0.67 to 0.87) | | | 15.2 (0.60) | 20 to 25 (0.79 to 0.98) | | | 18.2 (0.72) | 21 to 25 (0.83 to 0.98) | | | 20 (0.79) | 18 to 22 (0.71 to 0.87) | | | 20 to 24 (0.79 to 0.94) | | | 21 to 25 (0.83 to 0.98) | | |
| | Inner diameter of Grounding ring | ød | 15(0.59) | | | | 15(0.59) | | | | 15(0.59) | | | | 15(0.59) | | | | 15(0.59) | | | | 12(0.47) | | | 12(0.47) | | | 12(0.47) | | |
| | Pitch circle dia. | øC | 70(2.76) | | | | 70(2.76) | | | | 60.5(2.38) | | | | 66.5(2.62) | | | | 65(2.56) | | | | 65(2.56) | | | 65(2.56) | | | 60(2.36) | | |
| | Bolt hole interval | θ° | 45 | | | | 45 | | | | 45 | | | | 45 | | | | 45 | | | | 45 | | | 45 | | | 45 | | |
| | Hole dia. | øh | 15(0.59) | | | | 15(0.59) | | | | 15.7(0.62) | | | | 15.7(0.62) | | | | 14(0.55) | | | | 15(0.59) | | | 15(0.59) | | | 14(0.55) | | |
| | Number of holes | N | 4 | | | | 4 | | | | 4 | | | | 4 | | | | 4 | | | | 4 | | | 4 | | | 4 | | |
| | Height | H1 | 141(5.54) | | | | 141(5.54) | | | | 141(5.54) | | | | 141(5.54) | | | | 141(5.54) | | | | 141(5.54) | | | 141(5.54) | | | 141(5.54) | | |
| | Height | H2 | 80(3.15) | | | | 80(3.15) | | | | 80(3.15) | | | | 80(3.15) | | | | 80(3.15) | | | | 80(3.15) | | | 80(3.15) | | | 80(3.15) | | |
| Remote Flowtube | Max. Height | Hr | 265(10.43) | | | | 265(10.43) | | | | 265(10.43) | | | | 265(10.43) | | | | 265(10.43) | | | | 265(10.43) | | | 265(10.43) | | | 265(10.43) | | |
| | Weight kg (lb) *3 | | 3.4(7.5) | | | 3.5 (7.7) | 3.6(7.9) | | | 3.7 (8.2) | 3.2(7.1) | | | 3.3 (7.3) | 3.6(7.9) | | | 3.7 (8.2) | 3.8(8.4) | | | 3.9 (8.6) | 3.3(7.3) | | | 3.4(7.5) | | | 3.6(7.9) | | |
| Integral Flowmeter | Max. Height | Hi | 303(11.91) | | | | 303(11.91) | | | | 303(11.91) | | | | 303(11.91) | | | | 303(11.91) | | | | 303(11.91) | | | 303(11.91) | | | 303(11.91) | | |
| | Weight kg (lb) | | 5.1(11.2) | | | 5.2 (11.5) | 5.3(11.7) | | | 5.4 (11.9) | 4.9(10.8) | | | 5.0 (11.0) | 5.3(11.7) | | | 5.4 (11.9) | 5.5(12.1) | | | 5.6 (12.4) | 5.0(11.0) | | | 5.1(11.2) | | | 5.3(11.7) | | |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
In case of explosion proof type with indicator, add 5 mm (0.2 inch) to it.

*2: Depending on the selection of grounding ring code and optional code, add the following value to "L" (face-to-face length) and "t" (thickness of flange).

| | | L | t | L | t | L | t |
|---|---|---|---|---|---|---|---|
| Grounding Ring Code | | S, L, H, V | | P, T | | N | |
| Option Code | None | +0 | +0 | +26(1.02) | +13(0.51) | -2(0.08) | -1(0.04) |
| | GA, GC, GD (Special Gaskets) | +8(0.31) | +4(0.16) | +30(1.18) | +15(0.59) | - | - |

*3: When submersible type or option code DHC is selected, waterproof glands and a 30m long cable are attached.
Add 9.5kg(20.9lb) to the weight in the table.

F29.EPS

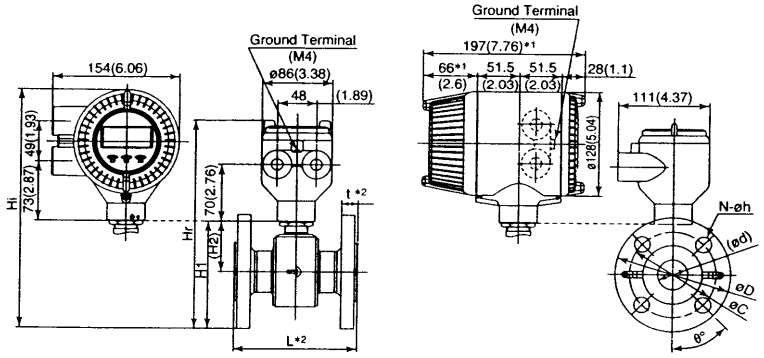
## ● AXF Standard, AXF025-AXF050, JIS/ANSI/DIN Flange Type, PFA /Polyurethane Rubber /Natural Soft Rubber /EPDM Rubber Lining

Unit : mm (approx. inch)

**Integral Flowmeter** **Remote Flowtube** **Integral Flowmeter** **Remote Flowtube**

AXF025 / AXF032 / AXF040 / AXF050 — *4 — 1 — 2 — B A / B J / B D 4 / C A / C J / C D 4

*4: D, E; Integral Flowmeter,
N, P; Remote Flowtube




| Model | Process Connection | | BJ1(JIS10K) | | | BJ1/CJ1 (JIS10K) | BJ2(JIS20K) | | | BJ2/CJ2 (JIS20K) | BA1(ANSI Class 150) | | | BA1/CA1 (ANSI Class 150) | BA2(ANSI Class 300) | | | BA2/CA2 (ANSI Class 300) | BD4(DIN PN40) | | | BD4/CD4 (DIN PN40) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size code | | 025 | 032 | 040 | 050 | 025 | 032 | 040 | 050 | 025 | 032 | 040 | 050 | 025 | 032 | 040 | 050 | 025 | 032 | 040 | 050 |
| | Size | | 25 (1) | 32 (1.25) | 40 (1.5) | 50 (2) | 25 (1) | 32 (1.25) | 40 (1.5) | 50 (2) | 25 (1) | 32 (1.25) | 40 (1.5) | 50 (2) | 25 (1) | 32 (1.25) | 40 (1.5) | 50 (2) | 25 (1) | 32 (1.25) | 40 (1.5) | 50 (2) |
| | Lining code | | A,U | A,U | A,U | A,U D,G | A,U | A,U | A,U | A,U D,G | A,U | A,U | A,U | A,U D,G | A,U | A,U | A,U | A,U D,G | A,U | A,U | A,U | A,U D,G |
| Remote Flowtube | Face-to-face length | L ⁰₋₃ *2 | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) | 200 (7.87) |
| | Outside dia. | øD | 125 (4.92) | 135 (5.31) | 140 (5.51) | 155 (6.10) | 125 (4.92) | 135 (5.31) | 140 (5.51) | 155 (6.10) | 108.0 (4.25) | 117.3 (4.62) | 127.0 (5.00) | 152.4 (6.00) | 124.0 (4.88) | 133.4 (5.25) | 155.4 (6.12) | 165.1 (6.50) | 115 (4.53) | 140 (5.51) | 150 (5.91) | 165 (6.50) |
| | Thickness | t*2 | 18 (0.71) | 20 (0.79) | 20 (0.79) | 20 (0.79) | 20 (0.79) | 22 (0.87) | 22 (0.87) | 22 (0.87) | 18.2 (0.72) | 19.7 (0.78) | 21.5 (0.85) | 23.1 (0.91) | 21.5 (0.85) | 23.1 (0.91) | 24.6 (0.97) | 26.4 (1.04) | 22 (0.87) | 22 (0.87) | 22 (0.87) | 24 (0.94) |
| | Inner diameter of Grounding ring | ød | 28 (1.10) | 34 (1.34) | 41 (1.61) | 53 (2.09) | 28 (1.10) | 34 (1.34) | 41 (1.61) | 53 (2.09) | 28 (1.10) | 34 (1.34) | 41 (1.61) | 53 (2.09) | 28 (1.10) | 34 (1.34) | 41 (1.61) | 53 (2.09) | 28 (1.10) | 34 (1.34) | 41 (1.61) | 53 (2.09) |
| | Pitch circle dia. | øC | 90 (3.54) | 100 (3.94) | 105 (4.13) | 120 (4.72) | 90 (3.54) | 100 (3.94) | 105 (4.13) | 120 (4.72) | 79.2 (3.12) | 88.9 (3.50) | 98.6 (3.88) | 120.7 (4.75) | 88.9 (3.50) | 98.6 (3.88) | 114.3 (4.50) | 127.0 (5.00) | 85 (3.35) | 100 (3.94) | 110 (4.33) | 125 (4.92) |
| | Bolt hole interval | θ° | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 22.5 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 22.5 | 45 | 45 | 45 | 45 |
| Integral Flowmeter | Hole dia. | øh | 19 (0.75) | 19 (0.75) | 19 (0.75) | 19 (0.75) | 19 (0.75) | 19 (0.75) | 19 (0.75) | 19 (0.75) | 15.7 (0.62) | 15.7 (0.62) | 15.7 (0.62) | 19.1 (0.75) | 19.1 (0.75) | 19.1 (0.75) | 22.4 (0.88) | 19.1 (0.75) | 14 (0.55) | 18 (0.71) | 18 (0.71) | 18 (0.71) |
| | Number of holes | N | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 4 | 4 | 4 | 4 |
| | Height | H1 | 120 (4.74) | 129 (5.08) | 138 (5.43) | 157 (6.16) | 120 (4.74) | 129 (5.08) | 138 (5.43) | 157 (6.16) | 112 (4.40) | 120 (4.72) | 131 (5.17) | 155 (6.11) | 120 (4.72) | 128 (5.04) | 146 (5.73) | 162 (6.36) | 115 (4.54) | 131 (5.16) | 143 (5.63) | 162 (6.36) |
| | Height | H2 | 58 (2.28) | 61 (2.40) | 68 (2.67) | 79 (3.11) | 58 (2.28) | 61 (2.40) | 68 (2.67) | 79 (3.11) | 58 (2.28) | 61 (2.40) | 68 (2.67) | 79 (3.11) | 58 (2.28) | 61 (2.40) | 68 (2.67) | 79 (3.11) | 58 (2.28) | 61 (2.40) | 68 (2.67) | 79 (3.11) |
| Remote Flowtube | Max. Height | Hr | 244 (9.62) | 253 (9.96) | 262 (10.31) | 281 (11.04) | 244 (9.62) | 253 (9.96) | 262 (10.31) | 281 (11.04) | 236 (9.28) | 244 (9.61) | 255 (10.05) | 279 (10.99) | 244 (9.60) | 252 (9.92) | 270 (10.61) | 286 (11.24) | 239 (9.42) | 255 (10.04) | 267 (10.51) | 286 (11.24) |
| | Weight kg (lb)*3 | | 4.4 (9.8) | 5.3 (11.7) | 5.7 (12.6) | 6.8 (14.9) | 4.8 (10.5) | 5.7 (12.6) | 6.2 (13.6) | 7.0 (15.4) | 3.9 (8.5) | 4.5 (9.9) | 5.4 (11.9) | 7.4 (16.4) | 5.0 (11.0) | 5.8 (12.9) | 7.8 (17.1) | 9.0 (19.8) | 4.7 (6.4) | 6.1 (7.8) | 6.9 (8.6) | 8.7 (10.4) |
| Integral Flowmeter | Max. Height | Hi | 282 (11.09) | 291 (11.46) | 299 (11.79) | 318 (12.52) | 282 (11.09) | 291 (11.46) | 299 (11.79) | 318 (12.52) | 273 (10.76) | 282 (11.10) | 293 (11.53) | 317 (12.47) | 281 (11.07) | 290 (11.42) | 307 (12.09) | 323 (12.72) | 277 (10.90) | 293 (11.54) | 304 (11.98) | 323 (12.72) |
| | Weight kg (lb) | | 6.1 (13.5) | 7.0 (15.5) | 7.4 (16.4) | 8.5 (18.6) | 6.5 (14.3) | 7.4 (16.4) | 7.9 (17.4) | 8.7 (19.1) | 5.6 (12.2) | 6.2 (13.6) | 7.1 (15.7) | 9.1 (20.1) | 6.7 (14.7) | 7.5 (16.6) | 9.5 (20.8) | 10.7 (23.6) | 6.4 (8.1) | 7.8 (9.5) | 8.6 (10.3) | 10.4 (12.1) |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
In case of explosion proof type with indicator, add 5 mm (0.2 inch) to it.

*2: Depending on the selection of grounding ring code and optional code, add the following value to "L" (face-to-face length) and "t" (thickness of flange).

| | | L | t | L | t | L | t |
|---|---|---|---|---|---|---|---|
| Grounding Ring Code | | S, L, H, V | | P, T | | N | |
| Option Code | None | +0 | +0 | +26(1.02) | +13(0.51) | -2(0.08) | -1(0.04) |
| | GA, GC, GD (Special Gaskets) | +8(0.31) | +4(0.16) | +30(1.18) | +15(0.59) | - | - |

*3: When submersible type or option code DHC is selected, waterproof glands and a 30m long cable are attached.
Add 9.5kg(20.9lb) to the weight in the table.

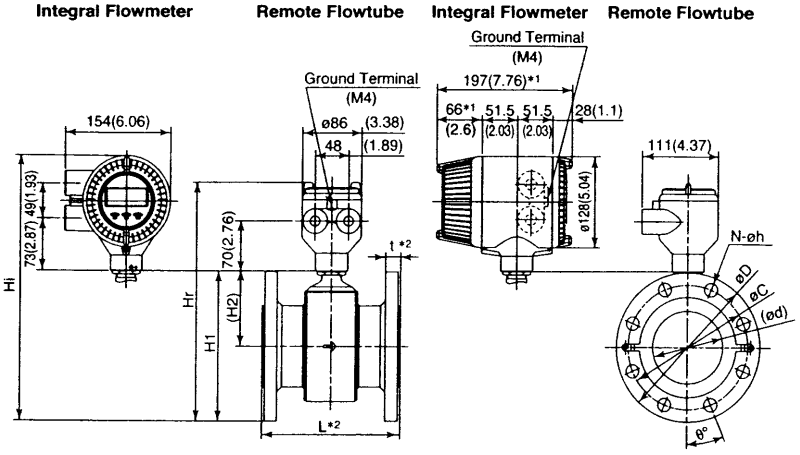
F30.EPS

## ● AXF Standard, AXF065-AXF125, JIS/ANSI/DIN Flange Type, PFA /Polyurethane Rubber /Natural Soft Rubber /EPDM Rubber Lining

Unit : mm (approx. inch)

AXF065 AXF080 AXF100 AXF125 — G W C — *4 D E N P — 1 2 N — A U D G — □ 1 □ 2 □ — B A □ / B D 2 / B J □ / B G 1 / C A □ / C D 2 / C J □ / C G 1 — 1

*4: D, E; Integral Flowmeter, N, P; Remote Flowtube




| Model | Process Connection | | BJ1/CJ1(JIS10K) | | | | BJ2/CJ2(JIS20K) | | | | BG1/CG1(JIS F12) | | | BA1/CA1(ANSI Class 150) | | | | BA2/CA2(ANSI Class 300) | | | | BD2/CD2(DIN PN16) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size code | | 065 | 080 | 100 | 125 | 065 | 080 | 100 | 125 | 080 | 100 | 125 | 065 | 080 | 100 | 125 | 065 | 080 | 100 | 125 | 065 | 080 | 100 | 125 |
| | Size | | 65 (2.5) | 80 (3) | 100 (4) | 125 (5) | 65 (2.5) | 80 (3) | 100 (4) | 125 (5) | 80 (3) | 100 (4) | 125 (5) | 65 (2.5) | 80 (3) | 100 (4) | 125 (5) | 65 (2.5) | 80 (3) | 100 (4) | 125 (5) | 65 (2.5) | 80 (3) | 100 (4) | 125 (5) |
| | Lining code | | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G |
| Remote flowtube | Face-to-face length | L *1 *2 | 200 (7.87) | 200 (7.87) | 250 (9.84) | 250 (9.84) | 200 (7.87) | 200 (7.87) | 250 (9.84) | 250 (9.84) | 200 (7.87) | 250 (9.84) | 250 (9.84) | 200 (7.87) | 200 (7.87) | 250 (9.84) | 250 (9.84) | 200 (7.87) | 200 (7.87) | 250 (9.84) | 250 (9.84) | 200 (7.87) | 200 (7.87) | 250 (9.84) | 250 (9.84) |
| | Outside dia. | øD | 175 (6.89) | 185 (7.28) | 210 (8.27) | 250 (9.84) | 175 (6.89) | 200 (7.87) | 225 (8.86) | 270 (10.63) | 211 (8.31) | 238 (9.37) | 263 (10.35) | 177.8 (7.00) | 190.5 (7.50) | 228.6 (9.00) | 254.0 (10.00) | 190.5 (7.50) | 209.6 (8.25) | 254.0 (10.00) | 279.4 (11.00) | 185 (7.28) | 200 (7.87) | 220 (8.66) | 250 (9.84) |
| | Thickness | t *2 | 22 (0.87) | 22 (0.87) | 22 (0.87) | 24 (0.94) | 24 (0.94) | 26 (1.02) | 28 (1.10) | 30 (1.18) | 22 (0.87) | 22 (0.87) | 24 (0.94) | 26.4 (1.04) | 27.9 (1.10) | 27.9 (1.10) | 27.9 (1.10) | 29.4 (1.16) | 32.4 (1.28) | 35.8 (1.41) | 39.1 (1.54) | 22 (0.87) | 24 (0.94) | 24 (0.94) | 26 (1.02) |
| | Inner diameter of Grounding ring | ød | 66 (2.60) | 77 (3.03) | 102 (4.02) | 128 (5.04) | 66 (2.60) | 77 (3.03) | 102 (4.02) | 128 (5.04) | 77 (3.03) | 102 (4.02) | 128 (5.04) | 66 (2.60) | 77 (3.03) | 102 (4.02) | 128 (5.04) | 66 (2.60) | 77 (3.03) | 102 (4.02) | 128 (5.04) | 66 (2.60) | 77 (3.03) | 102 (4.02) | 128 (5.04) |
| | Pitch circle dia. | øC | 140 (5.51) | 150 (5.91) | 175 (6.89) | 210 (8.27) | 140 (5.51) | 160 (6.30) | 185 (7.28) | 225 (8.86) | 168 (6.61) | 195 (7.68) | 220 (8.66) | 139.7 (5.50) | 152.4 (6.00) | 190.5 (7.50) | 215.9 (8.50) | 149.4 (5.88) | 168.1 (6.62) | 200.2 (7.88) | 235.0 (9.25) | 145 (5.71) | 160 (6.30) | 180 (7.09) | 210 (8.27) |
| Integral flowmeter | Bolt hole interval | θ° | 45 | 22.5 | 22.5 | 22.5 | 22.5 | 22.5 | 22.5 | 22.5 | 45 | 45 | 30 | 45 | 45 | 22.5 | 22.5 | 22.5 | 22.5 | 22.5 | 22.5 | 45 | 22.5 | 22.5 | 22.5 |
| | Hole dia. | øh | 19 (0.75) | 19 (0.75) | 19 (0.75) | 23 (0.91) | 19 (0.75) | 23 (0.91) | 23 (0.91) | 25 (0.98) | 19 (0.75) | 19 (0.75) | 19 (0.75) | 19.1 (0.75) | 19.1 (0.75) | 19.1 (0.75) | 22.4 (0.88) | 22.4 (0.88) | 22.4 (0.88) | 22.4 (0.88) | 22.4 (0.88) | 18 (0.71) | 18 (0.71) | 18 (0.71) | 18 (0.71) |
| | Number of holes | N | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 4 | 4 | 6 | 4 | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 4 | 8 | 8 | 8 |
| | Height | H1 | 176 (6.93) | 187 (7.36) | 211 (8.30) | 245 (9.65) | 176 (6.93) | 195 (7.68) | 218 (8.59) | 255 (10.04) | 200 (7.87) | 225 (8.85) | 252 (9.90) | 177 (6.97) | 190 (7.48) | 220 (8.66) | 247 (9.72) | 184 (7.24) | 200 (7.87) | 233 (9.16) | 260 (10.22) | 181 (7.13) | 195 (7.68) | 216 (8.49) | 245 (9.65) |
| | Height | H2 | 89 (3.50) | 95 (3.74) | 106 (4.16) | 120 (4.73) | 89 (3.50) | 95 (3.74) | 106 (4.16) | 120 (4.73) | 95 (3.74) | 106 (4.16) | 120 (4.73) | 89 (3.50) | 95 (3.74) | 106 (4.16) | 120 (4.72) | 89 (3.50) | 95 (3.74) | 106 (4.16) | 120 (4.72) | 89 (3.50) | 95 (3.74) | 106 (4.16) | 120 (4.72) |
| Remote flowtube | Max. Height | Hr | 300 (11.81) | 311 (12.24) | 335 (13.18) | 369 (14.53) | 300 (11.81) | 319 (12.56) | 342 (13.47) | 379 (14.92) | 324 (12.76) | 349 (13.73) | 376 (14.79) | 301 (11.85) | 314 (12.36) | 344 (13.54) | 371 (14.61) | 308 (12.13) | 324 (12.76) | 357 (14.04) | 384 (15.11) | 305 (12.01) | 319 (12.56) | 340 (13.37) | 369 (14.53) |
| | Weight kg (lb) *3 | | 9.0 (11.2) | 9.6 (11.8) | 12.4 (14.6) | 17.4 (38.3) | 9.3 (11.5) | 12.4 (14.6) | 16.9 (19.1) | 24.7 (54.5) | 12.2 (14.4) | 15.5 (17.7) | 19.5 (43.1) | 10.8 (23.7) | 12.9 (28.5) | 17.7 (39.1) | 20.8 (45.9) | 12.6 (27.7) | 16.6 (36.6) | 26.8 (59.1) | 34.9 (76.9) | 9.8 (21.6) | 11.9 (26.2) | 14.5 (32.0) | 19.3 (42.5) |
| Integral flowmeter | Max. Height | Hi | 338 (13.31) | 349 (13.74) | 372 (14.65) | 407 (16.01) | 338 (13.31) | 357 (14.06) | 380 (14.95) | 417 (16.40) | 362 (14.25) | 386 (15.21) | 413 (16.26) | 339 (13.35) | 352 (13.86) | 382 (15.02) | 409 (16.08) | 346 (13.62) | 362 (14.25) | 394 (13.52) | 421 (16.58) | 343 (13.50) | 357 (14.06) | 377 (14.85) | 407 (16.00) |
| | Weight kg (lb) | | 10.7 (23.5) | 11.3 (25.0) | 14.1 (31.0) | 19.1 (42.1) | 11.0 (24.3) | 14.1 (31.0) | 18.6 (41.0) | 26.4 (58.3) | 13.9 (30.7) | 17.2 (37.8) | 21.2 (46.8) | 12.5 (27.5) | 14.6 (32.2) | 19.4 (42.8) | 22.5 (49.6) | 14.3 (31.4) | 18.3 (40.4) | 28.5 (62.8) | 36.6 (80.7) | 11.5 (25.4) | 13.6 (29.9) | 16.2 (35.7) | 21.0 (46.2) |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
In case of explosion proof type with indicator, add 5 mm (0.2 inch) to it.

*2: Depending on the selection of grounding ring code and optional code, add the following value to "L" (face-to-face length) and "t" (thickness of flange).

| | | L | t | L | t | L | t |
|---|---|---|---|---|---|---|---|
| Grounding Ring Code | | S, L, H, V | | P, T | | N | |
| Option Code | None | +0 | +0 | +26(1.02) | +13(0.51) | -2(0.08) | -1(0.04) |
| | GA, GC, GD (Special Gaskets) | +8(0.31) | +4(0.16) | +30(1.18) | +15(0.59) | - | - |

*3: When submersible type or option code DHC is selected, waterproof glands and a 30m long cable are attached.
Add 9.5kg(20.9lb) to the weight in the table.

F31.EPS

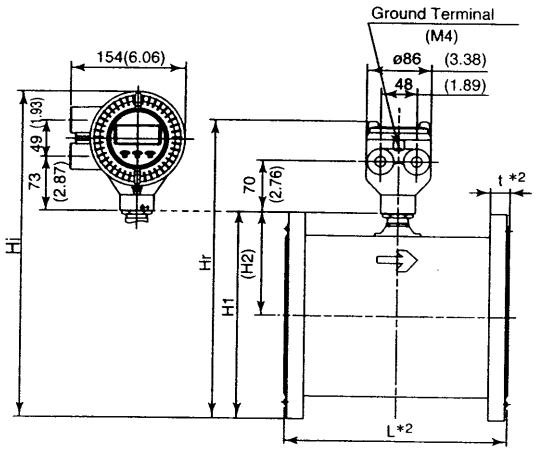
## ● AXF Standard, AXF150, AXF200, JIS/ANSI/DIN Flange Type, PFA /Polyurethane Rubber /Natural Soft Rubber /EPDM Rubber Lining

Unit : mm (approx. inch)

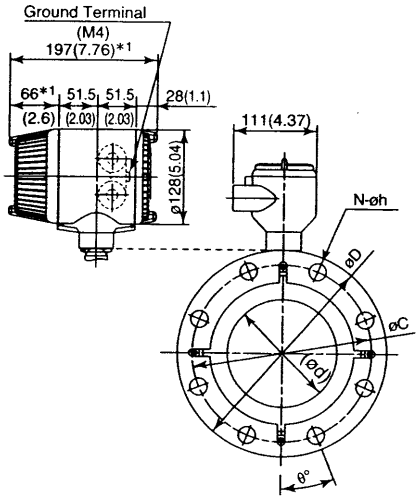
AXF150 G W C — *4 D E N P 1 2 N A U D G □ 1 2 □ — B A □ B D □ B J □ B G 1 C A □ C D □ C J □ C G 1 1

*4: D, E; Integral Flowmeter,
N, P; Remote Flowtube

**Integral Flowmeter** **Remote Flowtube**




**Integral Flowmeter** **Remote Flowtube**




| Model | Process Connection | | BJ1/CJ1(JIS10K) | | BJ2/CJ2(JIS20K) | | BG1/CG1(JIS F12) | | BA1/CA1(ANSI Class 150) | | BA2/CA2(ANSI Class 300) | | BD1/CD1(DIN PN10) | BD2/CD2(DIN PN16) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size code | | 150 | 200 | 150 | 200 | 150 | 200 | 150 | 200 | 150 | 200 | 200 | 150 | 200 |
| | Size | | 150 (6) | 200 (8) | 150 (6) | 200 (8) | 150 (6) | 200 (8) | 150 (6) | 200 (8) | 150 (6) | 200 (8) | 200 (8) | 150 (6) | 200 (8) |
| | Lining code | | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G |
| Remote flowtube / Integral flowmeter | Face-to-face length | L *2 *3 | 300 (11.81) | 350 (13.78) | 300 (11.81) | 350 (13.78) | 300 (11.81) | 350 (13.78) | 300 (11.81) | 350 (13.78) | 300 (11.81) | 350 (13.78) | 350 (13.78) | 300 (11.81) | 350 (13.78) |
| | Outside dia. | øD | 280 (11.02) | 330 (12.99) | 305 (12.01) | 350 (13.78) | 290 (11.42) | 342 (13.46) | 279.4 (11.00) | 342.9 (13.50) | 317.5 (12.50) | 381.0 (15.00) | 340 (13.39) | 285 (11.22) | 340 (13.39) |
| | Thickness | t *2 | 27 (1.06) | 27 (1.06) | 33 (1.30) | 35 (1.38) | 27 (1.06) | 29 (1.14) | 30.4 (1.20) | 33.4 (1.31) | 43.5 (1.71) | 46.1 (1.81) | 29 (1.14) | 27 (1.06) | 29 (1.14) |
| | Inner diameter of Grounding ring | ød | 146.1 (5.75) | 193.6 (7.62) | 146.1 (5.75) | 193.6 (7.62) | 146.1 (5.75) | 193.6 (7.62) | 146.1 (5.75) | 193.6 (7.62) | 146.1 (5.75) | 193.6 (7.62) | 193.6 (7.62) | 146.1 (5.75) | 193.6 (7.62) |
| | Pitch circle dia. | øC | 240 (9.45) | 290 (11.42) | 260 (10.24) | 305 (12.01) | 247 (9.72) | 299 (11.77) | 241.3 (9.50) | 298.5 (11.75) | 269.7 (10.62) | 330.2 (13.00) | 295 (11.61) | 240 (9.45) | 295 (11.61) |
| | Bolt hole interval | θ° | 22.5 | 15 | 15 | 15 | 30 | 22.5 | 22.5 | 22.5 | 15 | 15 | 22.5 | 22.5 | 15 |
| | Hole dia. | øh | 23 (0.91) | 23 (0.91) | 25 (0.98) | 25 (0.98) | 19 (0.75) | 19 (0.75) | 22.4 (0.88) | 22.4 (0.88) | 22.4 (0.88) | 25.4 (1.00) | 22 (0.87) | 22 (0.87) | 22 (0.87) |
| | Number of holes | N | 8 | 12 | 12 | 12 | 6 | 8 | 8 | 8 | 12 | 12 | 8 | 8 | 12 |
| | Height | H1 | 281 (11.06) | 331 (13.03) | 294 (11.56) | 341 (13.43) | 286 (11.26) | 337 (13.27) | 281 (11.05) | 337 (13.29) | 300 (11.80) | 357 (14.04) | 336 (13.23) | 284 (11.16) | 336 (13.23) |
| | Height | H2 | 141 (5.55) | 166 (6.54) | 141 (5.55) | 166 (6.54) | 141 (5.55) | 166 (6.54) | 141 (5.55) | 166 (6.54) | 141 (5.55) | 166 (6.54) | 166 (6.54) | 141 (5.55) | 166 (6.54) |
| Remote flowtube | Max. Height | Hr | 405 (15.94) | 455 (17.91) | 418 (16.44) | 465 (18.31) | 410 (16.14) | 461 (18.15) | 405 (15.93) | 461 (18.17) | 424 (16.68) | 481 (18.92) | 460 (18.11) | 408 (16.04) | 460 (18.11) |
| | Weight kg (lb) *3 | | 27.8 (61.3) | 37.3 (82.2) | 37.1 (81.8) | 51.9 (114.4) | 29.9 (65.9) | 43.2 (95.3) | 30.9 (68.0) | 49.2 (108.4) | 52.5 (115.7) | 78.8 (173.7) | 42.5 (93.7) | 28.7 (63.2) | 41.9 (92.5) |
| Integral flowmeter | Max. Height | Hi | 443 (17.42) | 493 (19.39) | 456 (17.95) | 503 (19.80) | 448 (17.64) | 499 (19.65) | 443 (17.43) | 499 (19.66) | 462 (18.18) | 519 (20.41) | 498 (19.61) | 446 (17.54) | 498 (19.61) |
| | Weight kg (lb) | | 29.5 (65.0) | 39.0 (86.0) | 38.8 (85.5) | 53.6 (118.2) | 31.6 (69.7) | 44.9 (99.0) | 32.6 (71.8) | 50.9 (112.2) | 54.2 (119.5) | 80.5 (177.5) | 44.2 (97.5) | 30.4 (66.9) | 43.6 (96.2) |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
In case of explosion proof type with indicator, add 5 mm (0.2 inch) to it.

*2: Depending on the selection of grounding ring code and optional code, add the following value to "L" (face-to-face length) and "t" (thickness of flange).

| | | L | t | L | t | L | t |
|---|---|---|---|---|---|---|---|
| Grounding Ring Code | | S, L, H, V | | P, T | | N | |
| Option Code | None | +0 | +0 | +32(1.26) | +16(0.63) | -2(0.08) | -1(0.04) |
| | GA, GC, GD (Special Gaskets) | +10(0.39) | +5(0.20) | +38(1.5) | +19(0.75) | - | - |

*3: When submersible type or option code DHC is selected, waterproof glands and a 30m long cable are attached.
Add 9.5kg(20.9lb) to the weight in the table.

F32.EPS

105



19.1.2

## ● AXF Standard, AXF250-AXF400, JIS/ANSI/DIN Flange Type, PFA /Polyurethane Rubber /Natural Soft Rubber /EPDM Rubber Lining

Unit : mm (approx. inch)

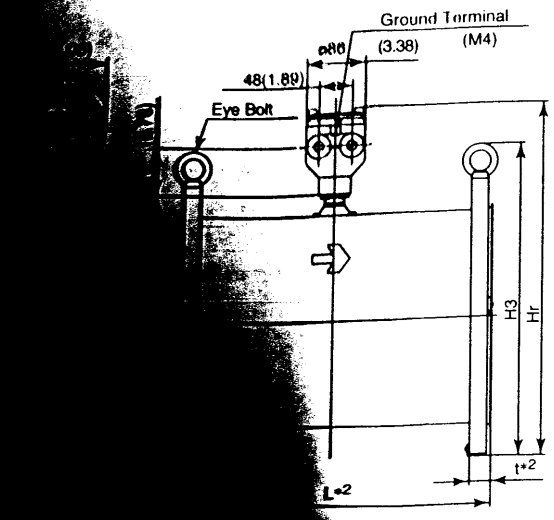
| | *4 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| AXF250 | G | D | 1 | A | | | | B | A | □ |
| AXF300 | W | E | 2 | U | □ | 1 | □ | B | D | □ |
| AXF350 | N | N | | D | | 2 | | B | J | □ |
| AXF400 | C | P | | G | | | – | B | G | 1 |
| | | | | | | | | C | A | □ |
| | | | | | | | | C | D | □ |
| | | | | | | | | C | J | □ |
| | | | | | | | | C | G | 1 |

*4: D, E; Integral Flowmeter,
N, P; Remote Flowtube

1

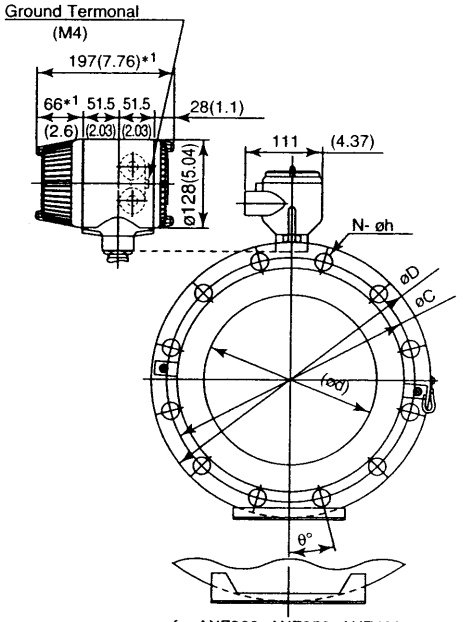
Integral Flowmeter

Remote Flowtube




Integral Flowmeter

Remote Flowtube




for AXF300, AXF350, AXF400

| | BG1/CG1(JIS F12) | | | | BA1/CA1(ANSI Class 150) | | | | BA2/CA2 (ANSI Class 300) | | BD1/CD1(DIN PN10) | | | | BD2/CD2 (DIN PN16) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 250 | 300 | 350 | 400 | 250 | 300 | 350 | 400 | 250 | 300 | 250 | 300 | 350 | 400 | 250 | 300 | |
| 250 | 300 (12) | 350 (14) | 400 (16) | 250 (10) | 300 (12) | 350 (14) | 400 (16) | 250 (10) | 300 (12) | 250 (10) | 300 (12) | 350 (14) | 400 (16) | 250 (10) | 300 (12) | |
| A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | A,U D,G | |
| 450 (17.72) | 500 (19.69) | 550 (21.65) | 600 (23.62) | 450 (17.72) | 500 (19.69) | 550 (21.65) | 600 (23.62) | 450 (17.72) | 500 (19.69) | 450 (17.72) | 500 (19.69) | 550 (21.65) | 600 (23.62) | 450 (17.72) | 500 (19.69) | |
| 410 (16.14) | 464 (18.27) | 530 (20.87) | 582 (22.91) | 406.4 (16.00) | 482.6 (19.00) | 533.4 (21.00) | 596.9 (23.50) | 444.5 (17.50) | 520.7 (20.50) | 395 (15.55) | 445 (17.52) | 505 (19.88) | 565 (22.24) | 405 (15.94) | 460 (18.11) | |
| 32 (1.26) | 34 (1.34) | 36 (1.42) | 36 (1.42) | 38.2 (1.50) | 39.8 (1.57) | 45.1 (1.78) | 46.6 (1.83) | 55.7 (2.19) | 58.8 (2.31) | 34 (1.34) | 34 (1.34) | 36 (1.42) | 36 (1.42) | 34 (1.34) | 36 (1.42) | |
| 345 (13.57) | 291.3 (11.47) | 323.4 (12.73) | 373.5 (14.70) | 243 (9.57) | 291.3 (11.47) | 323.4 (12.73) | 373.5 (14.70) | 243 (9.56) | 291.3 (11.47) | 243 (9.57) | 291.3 (11.47) | 323.4 (12.73) | 373.5 (14.70) | 243 (9.57) | 291.3 (11.47) | |
| 460 (18.11) | 414 (16.30) | 472 (18.58) | 524 (20.63) | 362.0 (14.25) | 431.8 (17.00) | 476.3 (18.75) | 539.8 (21.25) | 387.4 (15.25) | 450.9 (17.75) | 350 (13.78) | 400 (15.75) | 460 (18.11) | 515 (20.28) | 355 (13.98) | 410 (16.14) | |
| 22.5 | 18 | 18 | 15 | 15 | 15 | 15 | 11.25 | 11.25 | 11.25 | 15 | 15 | 11.25 | 11.25 | 15 | 15 | |
| 23 (0.91) | 25 (0.98) | 25 (0.98) | 25 (0.98) | 25.4 (1.00) | 25.4 (1.00) | 28.4 (1.12) | 28.4 (1.12) | 28.4 (1.12) | 31.8 (1.25) | 22 (0.87) | 22 (0.87) | 22 (0.87) | 26 (1.02) | 26 (1.02) | 26 (1.02) | |
| 8 | 10 | 10 | 12 | 12 | 12 | 12 | 16 | 16 | 16 | 12 | 12 | 16 | 16 | 12 | 12 | |
| 456 (17.95) | 511 (20.12) | 564 (22.20) | 403 (15.87) | 466 (18.35) | 512 (20.16) | 572 (22.52) | 422 (16.61) | 485 (19.09) | 397 (15.63) | 447 (17.60) | 498 (19.61) | 556 (21.89) | 402 (15.83) | 454 (17.87) | | |
| 221 (8.70) | 243 (9.57) | 270 (10.63) | 197 (7.76) | 221 (8.70) | 243 (9.57) | 270 (10.63) | 197 (7.76) | 221 (8.70) | 197 (7.76) | 221 (8.70) | 243 (9.57) | 270 (10.63) | 197 (7.76) | 221 (8.70) | | |
| 518 (20.39) | 593 (23.35) | 645 (25.39) | 460 (18.11) | 537 (21.14) | 596 (23.46) | 660 (25.98) | 499 (19.65) | 575 (22.64) | 449 (17.68) | 499 (19.65) | 568 (22.36) | 628 (24.72) | 459 (18.07) | 514 (20.24) | | |
| 580 (22.83) | 635 (25.00) | 688 (27.09) | 527 (20.75) | 590 (23.23) | 636 (25.04) | 696 (27.40) | 546 (21.50) | 609 (23.98) | 521 (20.51) | 571 (22.48) | 622 (24.49) | 680 (26.77) | 526 (20.71) | 578 (22.76) | | |
| 85.0 (187.4) | 121.2 (267.2) | 137.0 (301.9) | 83.4 (183.8) | 104.8 (231.0) | 151.8 (334.7) | 185.3 (408.5) | 133.0 (293.1) | 176.7 (389.5) | 73.0 (161.0) | 79.4 (174.9) | 112.5 (248.0) | 129.7 (285.9) | 74.8 (164.9) | 87.9 (193.8) | | |
| 618 (24.33) | 673 (26.50) | 726 (28.58) | 565 (22.24) | 628 (24.72) | 674 (26.54) | 734 (28.90) | 584 (22.99) | 647 (25.47) | 559 (22.01) | 609 (23.98) | 660 (25.98) | 718 (28.27) | 564 (22.20) | 616 (24.25) | | |
| 86.7 (191.2) | 122.9 (270.9) | 138.7 (305.7) | 85.1 (187.6) | 106.5 (234.8) | 153.5 (338.4) | 187.0 (412.3) | 134.7 (296.9) | 178.4 (393.3) | 74.7 (164.7) | 81.1 (178.7) | 114.2 (251.7) | 131.4 (289.6) | 76.5 (168.7) | 89.6 (197.6) | | |

m (0.47 inch) from the value in the figure.
8 mm (0.2 inch) to it.
le and optional code, add the following value to "L" (face-to-face length)

| Nominal Size: 350 mm to 400 mm | | | | |
|---|---|---|---|---|
| | L | t | L | t |
| Grounding Ring Code | S, L, H, V | | N | |
| ish Code is "None" | +0 | +0 | -10(0.39) | -5(0.20) |

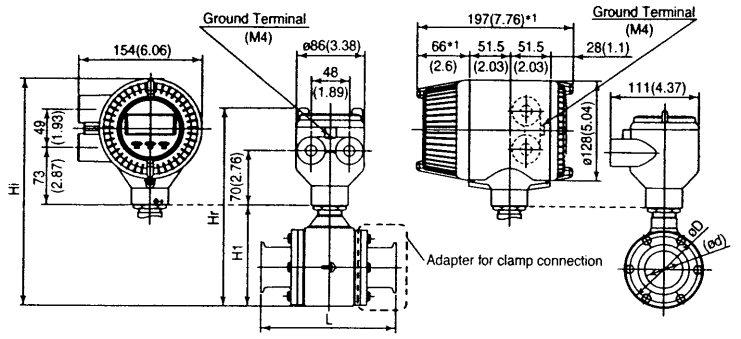
lected, waterproof glands and a 30m long cable are attached.

F33.EPS

## ● AXF Standard, AXF015-AXF125, Sanitary for Clamp Connection, PFA Lining

Unit : mm (approx. inch)

**Integral Flowmeter** **Remote Flowtube** **Integral Flowmeter** **Remote Flowtube**

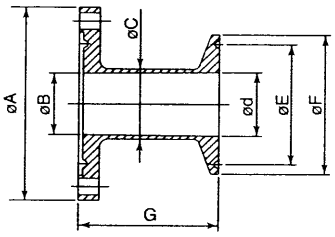



| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AXF015 | | | | | | | | | | | |
| AXF025 | | | | | | | | | | | |
| AXF032 | *3 | | | | | | | | | | |
| AXF040 | D | 1 | | | | | | H | A | B | |
| AXF050 H — | E | 2 | A | L | 1 | N | — | H | D | B | 1 |
| AXF065 | N | N | | | | | | H | K | B | |
| AXF080 | P | | | | | | | | | | |
| AXF100 | | | | | | | | | | | |
| AXF125 | | | | | | | | | | | |

*3: D, E; Integral Flowmeter,
N, P; Remote Flowtube

| Model | Process Connection | | | HAB / HDB / HKB | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size code | | | 015 | 025 | 032 | 040 | 050 | 065 | 080 | 100 | 125 |
| | Size | | | 15 (0.5) | 25 (1) | 32 (1.3) | 40 (1.5) | 50 (2) | 65 (2.6) | 80 (3) | 100 (4) | 125 (5) |
| | Lining code | | | A | A | A | A | A | A | A | A | A |
| Remote Flowtube / Integral Flowmeter | Face-to-face length | L | | 166 (6.55) | 166 (6.55) | 166 (6.55) | 166 (6.55) | 176 (6.94) | 196 (7.73) | 216 (8.52) | 246 (9.70) | 316 (12.46) |
| | Outside dia. | øD | | 73 (2.87) | 73 (2.87) | 73 (2.87) | 86 (3.39) | 99 (3.90) | 117 (4.61) | 129 (5.08) | 155 (6.10) | 183 (7.20) |
| | Inner dia. | ød | HAB | 15.7 (0.62) | 22.1 (0.87) | – | 34.8 (1.37) | 47.5 (1.87) | 60.2 (2.37) | 72.9 (2.87) | 97.4 (3.83) | – |
| | | | HDB | 16 (0.63) | 26 (1.02) | 32 (1.26) | 38 (1.50) | 50 (1.97) | 66 (2.60) | 81 (3.19) | 100 (3.94) | 125 (4.92) |
| | | | HKB | 15.2 (0.60) | 22.6 (0.89) | 31.3 (1.23) | 35.6 (1.40) | 48.6 (1.91) | 60.3 (2.37) | 72.9 (2.87) | 97.6 (3.84) | 135.7 (5.34) |
| | Height | H1 | | 98 (3.86) | 98 (3.86) | 98 (3.86) | 111 (4.37) | 129 (5.08) | 147 (5.79) | 157 (6.18) | 183 (7.20) | 212 (8.35) |
| Remote Flowtube | Max. Height | Hr | | 222 (8.74) | 222 (8.74) | 222 (8.74) | 235 (9.25) | 253 (9.96) | 271 (10.67) | 281 (11.06) | 307 (12.09) | 336 (13.23) |
| | Weight kg (lb)*2 | | | 2.7 (6.0) | 2.5 (5.5) | 2.6 (5.7) | 2.9 (6.4) | 3.6 (7.9) | 4.8 (10.6) | 5.7 (12.6) | 8.1 (17.9) | 12.1 (26.7) |
| Integral Flowmeter | Max. Height | Hi | | 260 (10.22) | 260 (10.22) | 260 (10.22) | 273 (10.73) | 291 (11.44) | 309 (12.15) | 319 (12.54) | 345 (13.56) | 374 (14.70) |
| | Weight kg (lb) | | | 4.4 (9.7) | 4.2 (9.3) | 4.3 (9.5) | 4.6 (10.1) | 5.3 (11.7) | 6.5 (14.3) | 7.4 (16.3) | 9.8 (21.6) | 13.8 (30.4) |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
*2: When option code DHC is selected, waterproof glands and a 30m long cable are attached. Add 9.5kg(20.9lb) to the weight in the table.




**Adapter for clamp connection**

| Process Connection | HAB (Tri-Clamp) | | | | | | | HDB (DIN 32676 Clamp) | | | | | | | | | HKB (ISO2852 Clamp) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Size | 15 | 25 | 40 | 50 | 65 | 80 | 100 | 15 | 25 | 32 | 40 | 50 | 65 | 80 | 100 | 125 | 15 | 25 | 32 | 40 | 50 | 65 | 80 | 100 | 125 |
| øA | 70 (2.76) | 70 (2.76) | 83 (3.27) | 96 (3.78) | 114 (4.49) | 126 (4.96) | 152 (5.98) | 70 (2.76) | 70 (2.76) | 70 (2.76) | 83 (3.27) | 96 (3.78) | 114 (4.49) | 126 (4.96) | 152 (5.98) | 180 (7.09) | 70 (2.76) | 70 (2.76) | 70 (2.76) | 83 (3.27) | 96 (3.78) | 114 (4.49) | 126 (4.96) | 152 (5.98) | 180 (7.09) |
| øB | 16 (0.63) | 22.2 (0.87) | 34.6 (1.36) | 47.6 (1.87) | 59.5 (2.34) | 72.3 (2.85) | 97 (3.82) | 16 (0.63) | 22.2 (0.87) | 29.4 (1.16) | 34.6 (1.36) | 47.6 (1.87) | 59.5 (2.34) | 72.3 (2.85) | 97 (3.82) | 123 (4.84) | 16 (0.63) | 22.2 (0.87) | 29.4 (1.16) | 34.6 (1.36) | 47.6 (1.87) | 59.5 (2.34) | 72.3 (2.85) | 97 (3.82) | 123 (4.84) |
| øC | 19.2 (0.76) | 25.4 (1.00) | 38.1 (1.50) | 50.8 (2.00) | 63.5 (2.50) | 76.2 (3.00) | 101.6 (4.00) | 20 (0.79) | 30 (1.18) | 36 (1.42) | 42 (1.65) | 54 (2.13) | 70 (2.76) | 85 (3.35) | 104 (4.09) | 129 (5.08) | 18 (0.71) | 25.6 (1.01) | 34.3 (1.35) | 38.6 (1.52) | 51.6 (2.03) | 64.1 (2.52) | 76.7 (3.02) | 102.5 (4.04) | 141.2 (5.56) |
| ød | 15.7 (0.62) | 22.1 (0.87) | 34.8 (1.37) | 47.5 (1.87) | 60.2 (2.37) | 72.9 (2.87) | 97.4 (3.83) | 16 (0.63) | 26 (1.02) | 32 (1.26) | 38 (1.50) | 50 (1.97) | 66 (2.60) | 81 (3.19) | 100 (3.94) | 125 (4.92) | 15.2 (0.60) | 22.6 (0.89) | 31.3 (1.23) | 35.6 (1.40) | 48.6 (1.91) | 60.3 (2.37) | 72.9 (2.87) | 97.6 (3.84) | 135.7 (5.34) |
| øE | — | 43.6 (1.72) | 43.6 (1.72) | 56.3 (2.22) | 70.6 (2.78) | 83.3 (3.28) | 110.3 (4.34) | 27.5 (1.08) | 43.5 (1.71) | 43.5 (1.71) | 43.5 (1.71) | 56.5 (2.22) | 83.5 (3.29) | 97 (3.82) | 110 (4.33) | 146 (5.75) | 27.5 (1.08) | 43.5 (1.71) | 43.5 (1.71) | 43.5 (1.71) | 56.5 (2.22) | 70.5 (2.78) | 83.5 (3.29) | 110 (4.33) | 146 (5.75) |
| øF | 25 (0.98) | 50.4 (1.98) | 50.4 (1.98) | 64 (2.52) | 77.4 (3.05) | 91 (3.58) | 118.9 (4.68) | 34 (1.34) | 50.5 (1.99) | 50.5 (1.99) | 50.5 (1.99) | 64 (2.52) | 91 (3.58) | 106 (4.17) | 119 (4.69) | 155 (6.10) | 34 (1.34) | 50.5 (1.99) | 50.5 (1.99) | 50.5 (1.99) | 64 (2.52) | 77.5 (3.05) | 91 (3.58) | 119 (4.69) | 155 (6.10) |
| G | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 60 (2.36) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 60 (2.36) |
| Parts No. | F9811 HU | F9811 HV | F9811 HX | F9811 HY | F9811 HZ | F9811 JA | F9811 JB | F9811 JD | F9811 JE | F9811 JF | F9811 JG | F9811 JH | F9811 JJ | F9811 JK | F9811 JL | F9811 JM | F9811 JN | F9811 JP | F9811 JQ | F9811 JR | F9811 JS | F9811 JT | F9811 JU | F9811 JV | F9811 JW |

F34.EPS

## ● AXF Standard, AXF015-AXF125, Sanitary for Union Connection, PFA Lining

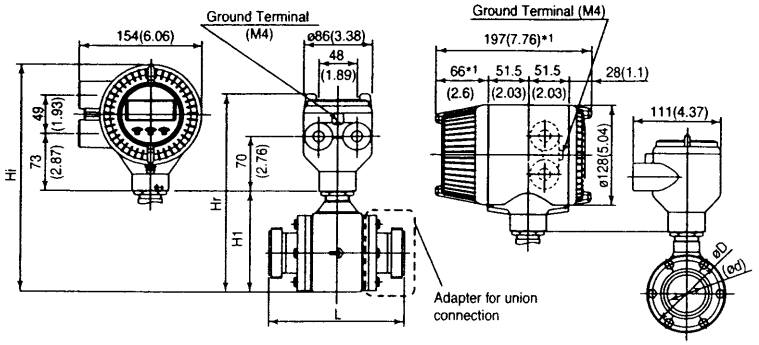
Unit : mm (approx. inch)

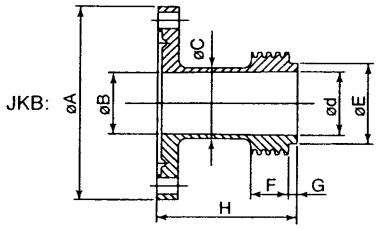
**Integral Flowmeter · Remote Flowtube** **Integral Flowmeter Remote Flowtube**

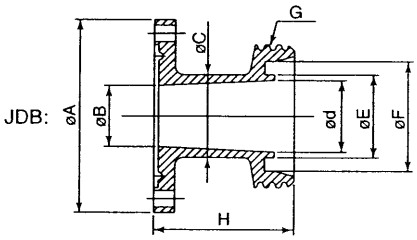
AXF015
AXF025
AXF032
AXF040
AXF050 H — D E N P 1 2 N A L 1 N — J K B J D B 1 J S B
AXF065
AXF080
AXF100
AXF125

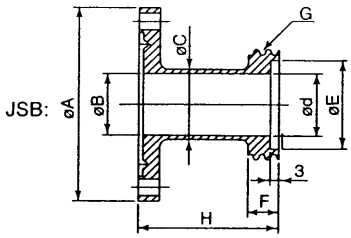
*3

*3: D, E; Integral Flowmeter,
N, P; Remote Flowtube




**Adapters for union connection**

| Model | Process Connection | | | JKB / JDB / JSB | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size code | | | 015 | 025 | 032 | 040 | 050 | 065 | 080 | 100 | 125 |
| | Size | | | 15 (0.5) | 25 (1) | 32 (1.3) | 40 (1.5) | 50 (2) | 65 (2.6) | 80 (3) | 100 (4) | 125 (5) |
| | Lining code | | | A | A | A | A | A | A | A | A | A |
| Remote Flowtube | Face-to-face length | L | JKB | 166 (6.55) | 166 (6.55) | 166 (6.55) | 166 (6.55) | 176 (6.94) | 196 (7.73) | 216 (8.52) | 246 (9.70) | – |
| | | | JDB | 166 (6.55) | 166 (6.55) | 166 (6.55) | 166 (6.55) | 176 (6.94) | 196 (7.73) | 236 (9.31) | 266 (10.49) | 326 (12.85) |
| | | | JSB | – | 166 (6.55) | 166 (6.55) | 166 (6.55) | 176 (6.94) | 196 (7.73) | 216 (8.52) | 276 (10.88) | – |
| | Outside dia. | øD | | 73 (2.87) | 73 (2.87) | 73 (2.87) | 86 (3.39) | 99 (3.90) | 117 (4.61) | 129 (5.08) | 155 (6.10) | 183 (7.20) |
| Integral Flowmeter | Inside dia. | ød | JKB | 15.2 (0.60) | 22.6 (0.89) | 31.3 (1.23) | 35.6 (1.40) | 48.6 (1.91) | 60.3 (2.37) | 72.9 (2.87) | 97.6 (3.84) | – |
| | | | JDB | 16 (0.63) | 26 (1.02) | 32 (1.26) | 38 (1.50) | 50 (1.97) | 66 (2.60) | 81 (3.19) | 100 (3.94) | 125 (4.92) |
| | | | JSB | – | 22.5 (0.89) | 29.6 (1.17) | 35.5 (1.40) | 48.5 (1.91) | 60.5 (2.38) | 72.9 (2.87) | 97.6 (3.84) | – |
| | Height | H1 | | 98 (3.86) | 98 (3.86) | 98 (3.86) | 111 (4.37) | 129 (5.08) | 147 (5.79) | 157 (6.18) | 183 (7.20) | 212 (8.35) |
| Remote Flowtube | Max. Height | Hr | | 222 (8.74) | 222 (8.74) | 222 (8.74) | 235 (9.25) | 253 (9.96) | 271 (10.67) | 281 (11.06) | 307 (12.09) | 336 (13.23) |
| | Weight kg (lb)*2 | | | 2.6 (5.7) | 2.6 (5.7) | 2.7 (6.0) | 3 (6.6) | 3.8 (8.4) | 4.9 (10.8) | 5.9 (13.0) | 8.2 (18.1) | 13 (28.7) |
| Integral Flowmeter | Max. Height | Hi | | 260 (10.24) | 260 (10.24) | 260 (10.24) | 273 (10.73) | 291 (11.44) | 309 (12.17) | 319 (12.54) | 345 (13.56) | 374 (14.70) |
| | Weight kg (lb) | | | 4.3 (9.5) | 4.3 (9.5) | 4.4 (9.7) | 4.7 (10.4) | 5.5 (12.1) | 6.6 (14.6) | 7.6 (16.8) | 9.9 (21.8) | 14.7 (32.4) |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
*2: When option code DHC is selected, waterproof glands and a 30m long cable are attached. Add 9.5kg (20.9lb) to the weight in the table.

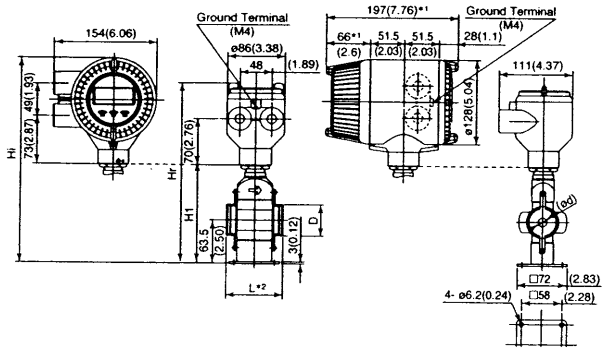
| Process Connection | JKB (ISO2853 Union) | | | | | | | | JDB (DIN 11851 Union) | | | | | | | | | JSB (SMS1145 Union) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Size | 15 | 25 | 32 | 40 | 50 | 65 | 80 | 100 | 15 | 25 | 32 | 40 | 50 | 65 | 80 | 100 | 125 | 25 | 32 | 40 | 50 | 65 | 80 | 100 |
| øA | 70 (2.76) | 70 (2.76) | 70 (2.76) | 83 (3.27) | 96 (3.78) | 114 (4.49) | 126 (4.96) | 152 (5.98) | 70 (2.76) | 70 (2.76) | 70 (2.76) | 83 (3.27) | 96 (3.78) | 114 (4.49) | 126 (4.96) | 152 (5.98) | 180 (7.09) | 70 (2.76) | 70 (2.76) | 83 (3.27) | 96 (3.78) | 114 (4.49) | 126 (4.96) | 152 (5.98) |
| øB | 16 (0.63) | 22.2 (0.87) | 29.4 (1.16) | 34.6 (1.36) | 47.6 (1.87) | 59.5 (2.34) | 72.3 (2.85) | 97 (3.82) | 16 (0.63) | 22.2 (0.87) | 29.4 (1.16) | 34.6 (1.36) | 47.6 (1.87) | 59.5 (2.34) | 72.3 (2.85) | 97 (3.82) | 123 (4.84) | 22.2 (0.87) | 29.4 (1.16) | 34.6 (1.36) | 47.6 (1.87) | 59.5 (2.34) | 72.3 (2.85) | 97 (3.82) |
| øC | 18 (0.71) | 25.6 (1.01) | 34.3 (1.35) | 38.6 (1.52) | 51.6 (2.03) | 64.1 (2.52) | 76.7 (3.02) | 102.5 (4.04) | 20 (0.79) | 30 (1.18) | 36 (1.42) | 42 (1.65) | 54 (2.13) | 70 (2.76) | 85 (3.35) | 104 (4.09) | 129 (5.08) | 25.4 (1.00) | 32 (1.26) | 38.1 (1.50) | 51 (2.01) | 63.5 (2.50) | 76.2 (3.00) | 102.5 (4.04) |
| ød | 15.2 (0.60) | 22.6 (0.89) | 31.3 (1.23) | 35.6 (1.40) | 48.6 (1.91) | 60.3 (2.37) | 72.9 (2.87) | 97.6 (3.84) | 16 (0.63) | 26 (1.02) | 32 (1.26) | 38 (1.50) | 50 (1.97) | 66 (2.60) | 81 (3.19) | 100 (3.94) | 125 (4.92) | 22.5 (0.89) | 29.6 (1.17) | 35.5 (1.40) | 48.5 (1.91) | 60.5 (2.38) | 72.9 (2.87) | 97.6 (3.84) |
| øE | 21.2 (0.83) | 29.2 (1.15) | 38.2 (1.50) | 42.7 (1.68) | 56.2 (2.21) | 69.9 (2.75) | 82.6 (3.25) | 108.7 (4.28) | 18 (0.71) | 30 (1.18) | 36 (1.42) | 42 (1.65) | 54 (2.13) | 71 (2.80) | 85 (3.35) | 104 (4.09) | 130 (5.12) | 32 (1.26) | 40 (1.57) | 48 (1.89) | 61 (2.40) | 73.5 (2.89) | 86 (3.39) | 120 (4.72) |
| øF | 13.5 (0.53) | 13.5 (0.53) | 13.5 (0.53) | 13.5 (0.53) | 13.5 (0.53) | 13.5 (0.53) | 13.5 (0.53) | 13.5 (0.53) | 25.8 (1.02) | 39.8 (1.57) | 45.8 (1.80) | 51.8 (2.04) | 63.8 (2.51) | 80.8 (3.18) | 94.8 (3.73) | 113.8 (4.48) | 141.8 (5.58) | 11 (0.43) | 13 (0.51) | 15 (0.59) | 15 (0.59) | 19 (0.75) | 19 (0.75) | 30 (1.18) |
| G | 3 (0.12) | 3 (0.12) | 3 (0.12) | 3 (0.12) | 3 (0.12) | 3 (0.12) | 3 (0.12) | 3 (0.12) | RD34 ×1/8" | RD52 ×1/6" | RD58 ×1/6" | RD65 ×1/6" | RD78 ×1/6" | RD95 ×1/6" | RD110 ×1/4" | RD130 ×1/4" | RD160 ×1/4" | RD40 ×1/6" | RD48 ×1/6" | RD60 ×1/6" | RD70 ×1/6" | RD85 ×1/6" | RD98 ×1/6" | RD132 ×1/6" |
| H | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 60 (2.36) | 60 (2.36) | 65 (2.56) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 50 (1.97) | 65 (2.56) |
| Parts No. | F9811 LA | F9811 LB | F9811 LC | F9811 LD | F9811 LE | F9811 LF | F9811 LG | F9811 LH | F9811 KR | F9811 KS | F9811 KT | F9811 KU | F9811 KV | F9811 KW | F9811 KX | F9811 KY | F9811 KZ | F9811 LK | F9811 LL | F9811 LM | F9811 LN | F9811 LP | F9811 LQ | F9811 LR |

F35.EPS

## ● Replacement model for Earlier ADMAG or ADMAG AE, AXF002-AXF015, Wafer Type, PFA Lining

Unit : mm (approx. inch)

**Integral Flowmeter** **Remote Flowtube** **Integral Flowmeter** **Remote Flowtube**




AXF002 G
AXF005 W — D E N P 1 2 N *4 A □ 1 □ — A □ □ 2
AXF010 C
AXF015

*4: D, E; Integral Flowmeter,
N, P; Remote Flowtube

| Model | Size code | | 002 | 005 | 010 | 015 |
|---|---|---|---|---|---|---|
| | Size | | 2.5(0.1) | 5(0.2) | 10(0.4) | 15(0.5) |
| | Lining code | | A | A | A | A |
| Remote Flowtube / Integral Flowmeter | Face-to-face length | L*2 | 85(3.35) | | | |
| | Outside dia. | D | 44(1.73) | | | |
| | Inner diameter of Grounding ring | Ød | 15(0.59) | | | |
| | Height | H1 | 144(5.67) | | | |
| Remote Flowtube | Max. Height | Hr | 265(10.43) | | | |
| | Weight kg (lb)*3 | | 2.4(5.3) | | | |
| Integral Flowmeter | Max. Height | Hi | 306(12.03) | | | |
| | Weight kg (lb) | | 4.1(9.0) | | | |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
In case of explosion proof type with indicator, add 5 mm (0.2 inch) to it.

*2: Depending on the selection of grounding ring code and optional code, add the following value to L (face-to-face length).

| Grounding Ring Code | | S, L, H, V | P, T | N |
|---|---|---|---|---|
| Option Code | None | +0 | +22(0.87) | -6(0.24) |
| | GA, GC, GD (Special Gaskets) | +2(0.08) | +24(0.94) | - |

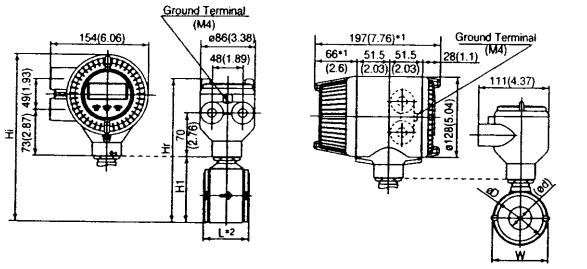
*3: When submersible type or option code DHC is selected, waterproof glands and a 30m long cable are attached.
Add 9.5kg(20.9lb) to the weight in the table.

F37.EPS

## ● Replacement model for Earlier ADMAG or ADMAG AE, AXF025-AXF100, Wafer Type, PFA /Polyurethane Rubber Lining

Unit : mm (approx. inch)

**Integral Flowmeter** **Remote Flowtube** **Integral Flowmeter** **Remote Flowtube**




AXF025
AXF040 G
AXF050 W — D E N P 1 2 N *4 A U □ 1 □ — A □ □ 2
AXF080 C
AXF100

*4: D, E; Integral Flowmeter,
N, P; Remote Flowtube

| Model | Size code | | 025 | 040 | 050 | 080 | 100 |
|---|---|---|---|---|---|---|---|
| | Size | | 25(1) | 40(1.5) | 50(2) | 80(3) | 100(4) |
| | Lining code | | A,U | A,U | A,U | A,U | A,U |
| Remote Flowtube / Integral Flowmeter | Face-to-face length | L*2 | 93(3.66) | 106(4.17) | 120(4.72) | 160(6.30) | 180(7.09) |
| Remote Flowtube | Outside dia. | ØD | 67.5(2.66) | 86(3.39) | 99(3.90) | 129(5.08) | 155(6.10) |
| | Inner diameter of Grounding ring | Ød | 27(1.06) | 40(1.57) | 52(2.05) | 81(3.19) | 98(3.86) |
| Integral Flowmeter | Width | W | 67.5(2.66) | 86(3.39) | 99(3.90) | 129(5.08) | 155(6.10) |
| | Height | H1 | 92(3.62) | 111(4.37) | 129(5.08) | 157(6.18) | 183(7.20) |
| Remote Flowtube | Max. Height | Hr | 216(8.50) | 235(9.25) | 253(9.96) | 281(11.06) | 307(12.09) |
| | Weight kg (lb)*3 | | 3.1(6.7) | 3.5(7.7) | 4.2(9.3) | 6.4(14.1) | 8.0(17.6) |
| Integral Flowmeter | Max. Height | Hi | 254(9.98) | 273(10.73) | 291(11.44) | 319(12.54) | 345(13.56) |
| | Weight kg (lb) | | 4.8(10.5) | 5.2(11.4) | 5.9(13.1) | 8.1(17.9) | 9.7(21.3) |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
In case of explosion proof type with indicator, add 5 mm (0.2 inch) to it.

*2: Depending on the selection of grounding ring code and optional

| Grounding Ring Code | | S, L, H, V | P, T | N |
|---|---|---|---|---|
| Option Code | None | +0 | +22(0.87) | -6(0.24) |
| | GA, GC, GD (Special Gaskets) | +2(0.08) | +24(0.94) | - |

*3: When submersible type or option code DHC is selected, waterproof glands and a 30m long cable are attached.
Add 9.5kg(20.9lb) to the weight in the table.

F38.EPS

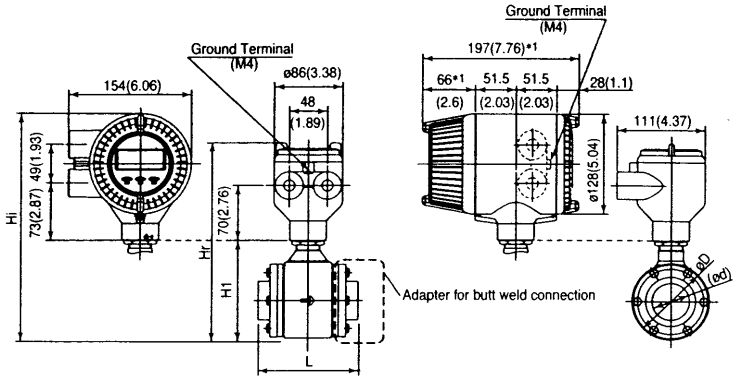
## ● AXF Standard, AXF015-AXF125, Sanitary for Butt Weld, PFA Lining

Unit : mm (approx. inch)

AXF015
AXF025
AXF032
AXF040
AXF050 H — *3 — 1 A L 1 N — K K B 1
AXF065 — D E N P — 2 N — K D B
AXF080
AXF100
AXF125

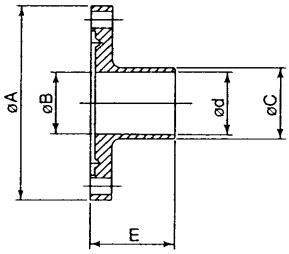
*3: D, E; Integral Flowmeter,
N, P; Remote Flowtube

**Integral Flowmeter** ***Remote Flowtube** **Integral Flowmeter** **Remote Flowtube**




| Model | Process Connection | | | KKB / KDB | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size code | | | 015 | 025 | 032 | 040 | 050 | 065 | 080 | 100 | 125 |
| | Size | | | 15 (0.5) | 25 (1) | 32 (1.3) | 40 (1.5) | 50 (2) | 65 (2.6) | 80 (3) | 100 (4) | 125 (5) |
| | Lining code | | | A | A | A | A | A | A | A | A | A |
| Remote Flowtube / Integral Flowmeter | Face-to-face length | L | | 126 (4.98) | 126 (4.98) | 126 (4.98) | 126 (4.98) | 136 (5.37) | 156 (6.16) | 176 (6.94) | 206 (8.13) | 276 (10.88) |
| | Outside dia. | øD | | 73 (2.87) | 73 (2.87) | 73 (2.87) | 86 (3.39) | 99 (3.90) | 117 (4.61) | 129 (5.08) | 155 (6.10) | 183 (7.20) |
| | Inner dia. | ød | KKB | 15.2 (0.60) | 22.6 (0.89) | 31.3 (1.23) | 35.6 (1.40) | 48.6 (1.91) | 60.3 (2.37) | 72.9 (2.87) | 97.6 (3.84) | 135.7 (5.34) |
| | | | KDB | 16 (0.63) | 26 (1.02) | 32 (1.26) | 38 (1.50) | 50 (1.97) | 66 (2.60) | 81 (3.19) | 100 (3.94) | 125 (4.92) |
| | Height | H1 | | 98 (3.86) | 98 (3.86) | 98 (3.86) | 111 (4.37) | 129 (5.08) | 147 (5.79) | 157 (6.18) | 183 (7.20) | 212 (8.35) |
| Remote Flowtube | Max. Height | Hr | | 222 (8.74) | 222 (8.74) | 222 (8.74) | 235 (9.25) | 253 (9.96) | 271 (10.67) | 281 (11.06) | 307 (12.09) | 336 (13.23) |
| | Weight kg (lb)*2 | | | 2.6 (5.7) | 2.3 (5.1) | 2.5 (5.5) | 2.8 (6.2) | 3.4 (7.5) | 4.5 (9.9) | 5.3 (11.7) | 7.1 (15.7) | 11 (24.3) |
| Integral Flowmeter | Max. Height | Hi | | 260 (10.24) | 260 (10.24) | 260 (10.24) | 273 (10.73) | 291 (11.44) | 309 (12.17) | 319 (12.54) | 345 (13.56) | 374 (14.70) |
| | Weight kg (lb) | | | 4.3 (9.5) | 4 (8.8) | 4.2 (9.3) | 4.5 (9.9) | 5.1 (11.2) | 6.2 (13.7) | 7 (15.4) | 8.8 (19.4) | 12.7 (28.0) |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
*2: When option code DHC is selected, waterproof glands and a 30m long cable are attached. Add 9.5kg (20.9lb) to the weight in the table.




**Adapter for butt weld connection**

| Process Connection | KKB (ISO2037 Butt Weld) | | | | | | | | | KDB (DIN 1185 Butt Weld) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Size | 15 | 25 | 32 | 40 | 50 | 65 | 80 | 100 | 125 | 15 | 25 | 32 | 40 | 50 | 65 | 80 | 100 | 125 |
| øA | 70 (2.76) | 70 (2.76) | 70 (2.76) | 83 (3.27) | 96 (3.78) | 114 (4.49) | 126 (4.96) | 152 (5.98) | 180 (7.09) | 70 (2.76) | 70 (2.76) | 70 (2.76) | 83 (3.27) | 96 (3.78) | 114 (4.49) | 126 (4.96) | 152 (5.98) | 180 (7.09) |
| øB | 16 (0.63) | 22.2 (0.87) | 29.4 (1.16) | 34.6 (1.36) | 47.6 (1.87) | 59.5 (2.34) | 72.3 (2.85) | 97 (3.82) | 123 (4.84) | 16 (0.63) | 22.2 (0.87) | 29.4 (1.16) | 34.6 (1.36) | 47.6 (1.87) | 59.5 (2.34) | 72.3 (2.85) | 97 (3.82) | 123 (4.84) |
| øC | 18 (0.71) | 25.6 (1.01) | 34.3 (1.35) | 38.6 (1.52) | 51.6 (2.03) | 64.1 (2.52) | 76.7 (3.02) | 102.5 (4.04) | 141.2 (5.56) | 20 (0.79) | 30 (1.18) | 36 (1.42) | 42 (1.65) | 54 (2.13) | 70 (2.76) | 85 (3.35) | 104 (4.09) | 129 (5.08) |
| ød | 15.2 (0.60) | 22.6 (0.89) | 31.3 (1.23) | 35.6 (1.40) | 48.6 (1.91) | 60.3 (2.37) | 72.9 (2.87) | 97.6 (3.84) | 135.7 (5.34) | 16 (0.63) | 26 (1.02) | 32 (1.26) | 38 (1.50) | 50 (1.97) | 66 (2.60) | 81 (3.19) | 100 (3.94) | 125 (4.92) |
| E | 30 (1.18) | 30 (1.18) | 30 (1.18) | 30 (1.18) | 30 (1.18) | 30 (1.18) | 30 (1.18) | 30 (1.18) | 40 (1.57) | 30 (1.18) | 30 (1.18) | 30 (1.18) | 30 (1.18) | 30 (1.18) | 30 (1.18) | 30 (1.18) | 30 (1.18) | 40 (1.57) |
| Parts No. | F9811 NN | F9811 NP | F9811 NQ | F9811 NR | F9811 NS | F9811 NT | F9811 NU | F9811 NV | F9811 NW | F9811 ND | F9811 NE | F9811 NF | F9811 NG | F9811 NH | F9811 NJ | F9811 NK | F9811 NL | F9811 NM |

F36.EPS

## ● Replacement model for Earlier ADMAG or ADMAG AE, AXF150-AXF250, JIS/ANSI/DIN Flange Type, PFA /Polyurethane Rubber Lining

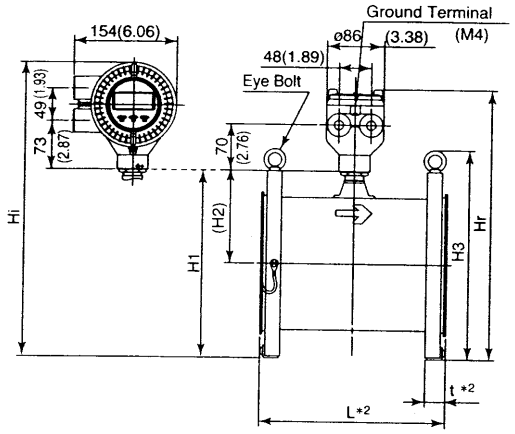
*4

AXF150G
AXF200W — D E N P 1 2 N A U □ 1 2 □ — C A □ C D □ C J □ C G 1 2
AXF250C

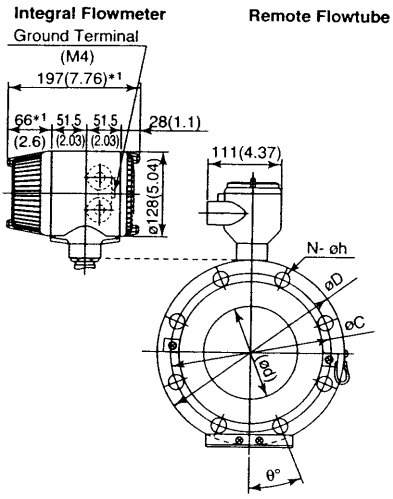
*4: D, E; Integral Flowmeter,
N, P; Remote Flowtube

Unit : mm (approx. inch)

**Integral Flowmeter** **Remote Flowtube**




**Integral Flowmeter** **Remote Flowtube**




| Model | Process Connection | | CJ1(JIS10K) | | | CJ2(JIS20K) | | | CG1(JIS F12) | | | CA1(ANSI Class 150) | | | CA2(ANSI Class 300) | | | CD1(DIN PN10) | | CD2(DIN PN16) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size code | | 150 | 200 | 250 | 150 | 200 | 250 | 150 | 200 | 250 | 150 | 200 | 250 | 150 | 200 | 250 | 200 | 250 | 150 | 200 | 250 |
| | Size | | 150 (6) | 200 (8) | 250 (10) | 150 (6) | 200 (8) | 250 (10) | 150 (6) | 200 (8) | 250 (10) | 150 (6) | 200 (8) | 250 (10) | 150 (6) | 200 (8) | 250 (10) | 200 (8) | 250 (10) | 150 (6) | 200 (8) | 250 (10) |
| | Lining code | | A,U | A,U | A,U | A,U | A,U | A,U | A,U | A,U | A,U | A,U | A,U | A,U | A,U | A,U | A,U | A,U | A,U | A,U | A,U | A,U |
| Remote flowtube Integral flowmeter | Face-to-face length | L*2 | 270 (10.63) | 340 (13.39) | 430 (16.93) | 270 (10.63) | 340 (13.39) | 430 (16.93) | 270 (10.63) | 340 (13.39) | 430 (16.93) | 270 (10.63) | 340 (13.39) | 430 (16.93) | 270 (10.63) | 340 (13.39) | 430 (16.93) | 340 (13.39) | 430 (16.93) | 270 (10.63) | 340 (13.39) | 430 (16.93) |
| | Outside dia. | øD | 280 (11.02) | 330 (12.99) | 400 (15.75) | 305 (12.01) | 350 (13.78) | 430 (16.93) | 290 (11.42) | 342 (13.46) | 410 (16.14) | 279.4 (11.00) | 342.9 (13.50) | 406.4 (16.00) | 317.5 (12.50) | 381.0 (15.00) | 444.5 (17.50) | 340 (13.39) | 395 (15.55) | 285 (11.22) | 340 (13.39) | 405 (15.94) |
| | Thickness | t *2 | 31 (1.22) | 31 (1.22) | 33 (1.30) | 37 (1.46) | 39 (1.54) | 43 (1.69) | 31 (1.22) | 33 (1.30) | 33 (1.30) | 34.4 (1.35) | 37.4 (1.47) | 39.2 (1.54) | 47.5 (1.87) | 50.1 (1.97) | 56.7 (2.23) | 33 (1.30) | 35 (1.38) | 31 (1.22) | 33 (1.30) | 35 (1.38) |
| | Inner diameter of Grounding ring | ød | 140.7 (5.54) | 188.9 (7.44) | 239.1 (9.41) | 140.7 (5.54) | 188.9 (7.44) | 239.1 (9.41) | 145.4 (5.72) | 192.9 (7.59) | 239.1 (9.41) | 140.7 (5.54) | 188.9 (7.44) | 239.1 (9.41) | 140.7 (5.54) | 188.9 (7.44) | 239.1 (9.41) | 188.9 (7.44) | 239.1 (9.41) | 140.7 (5.54) | 188.9 (7.44) | 239.1 (9.41) |
| | Pitch circle dia. | øC | 240 (9.45) | 290 (11.42) | 355 (13.98) | 260 (10.24) | 305 (12.01) | 380 (14.96) | 247 (9.72) | 299 (11.77) | 360 (14.17) | 241.3 (9.50) | 298.5 (11.75) | 362.0 (14.25) | 269.7 (10.62) | 330.2 (13.00) | 387.4 (15.25) | 295 (11.61) | 350 (13.78) | 240 (9.45) | 295 (11.61) | 355 (13.98) |
| | Bolt hole interval | θ° | 22.5 | 15 | 15 | 15 | 15 | 15 | 30 | 22.5 | 22.5 | 22.5 | 22.5 | 15 | 15 | 15 | 11.25 | 22.5 | 15 | 22.5 | 15 | 15 |
| | Hole dia. | øh | 23 (0.91) | 23 (0.91) | 25 (0.98) | 25 (0.98) | 25 (0.98) | 27 (1.06) | 19 (0.75) | 19 (0.75) | 23 (0.91) | 22.4 (0.88) | 22.4 (0.88) | 25.4 (1.00) | 22.4 (0.88) | 25.4 (1.00) | 28.4 (1.12) | 22 (0.87) | 22 (0.87) | 22 (0.87) | 22 (0.87) | 26 (1.02) |
| | Number of holes | N | 8 | 12 | 12 | 12 | 12 | 12 | 6 | 8 | 8 | 8 | 8 | 12 | 12 | 12 | 16 | 8 | 12 | 8 | 12 | 12 |
| | Height | H1 | 284 (11.18) | 334 (13.15) | 400 (15.75) | 297 (11.69) | 344 (13.54) | 415 (16.34) | 289 (11.38) | 340 (13.39) | 405 (15.94) | 284 (11.18) | 340 (13.39) | 403 (15.87) | 303 (11.93) | 360 (14.17) | 422 (16.61) | 339 (13.35) | 397 (15.63) | 287 (11.30) | 339 (13.35) | 402 (15.83) |
| | Height | H2 | 141 (5.55) | 166 (6.54) | 197 (7.76) | 141 (5.55) | 166 (6.54) | 197 (7.76) | 141 (5.55) | 166 (6.54) | 197 (7.76) | 141 (5.55) | 166 (6.54) | 197 (7.76) | 141 (5.55) | 166 (6.54) | 197 (7.76) | 166 (6.54) | 197 (7.76) | 141 (5.55) | 166 (6.54) | 197 (7.76) |
| | Height | H3 | 325 (12.80) | 375 (14.76) | 454 (17.87) | 350 (13.78) | 395 (15.55) | 484 (19.06) | 335 (13.19) | 387 (15.24) | 464 (18.27) | 324 (12.76) | 387 (15.24) | 460 (18.11) | 362 (14.25) | 426 (16.77) | 499 (19.65) | 385 (15.16) | 449 (17.68) | 330 (12.99) | 385 (15.16) | 459 (18.07) |
| Remote flowtube | Max. Height | Hr | 408 (16.06) | 458 (18.03) | 524 (20.63) | 421 (16.57) | 468 (18.43) | 539 (21.22) | 413 (16.26) | 464 (18.27) | 529 (20.83) | 408 (16.06) | 464 (18.27) | 527 (20.75) | 427 (16.81) | 484 (19.06) | 546 (21.50) | 463 (18.23) | 521 (20.51) | 411 (16.18) | 463 (18.23) | 526 (20.71) |
| | Weight kg (lb)*3 | | 29 (63.9) | 39 (86.0) | 64 (141.1) | 38.3 (84.4) | 53.6 (118.2) | 92.5 (203.9) | 31.1 (68.6) | 44.6 (98.3) | 67.4 (148.6) | 32.1 (70.7) | 50.9 (112.2) | 77.4 (170.6) | 53.7 (118.4) | 80.5 (177.5) | 127.0 (279.9) | 44.2 (97.5) | 67.0 (147.7) | 29.9 (65.8) | 43.6 (96.2) | 68.8 (151.7) |
| Integral flowmeter | Max. Height | Hi | 446 (17.56) | 496 (19.53) | 562 (22.13) | 459 (18.07) | 506 (19.92) | 577 (22.72) | 451 (17.76) | 502 (19.76) | 567 (22.32) | 446 (17.56) | 502 (19.76) | 565 (22.24) | 465 (18.31) | 522 (20.55) | 584 (22.99) | 501 (19.72) | 559 (22.01) | 449 (17.68) | 501 (19.72) | 564 (22.20) |
| | Weight kg (lb) | | 30.7 (67.7) | 40.7 (89.7) | 65.7 (144.8) | 40.0 (88.2) | 55.3 (121.9) | 94.2 (207.7) | 32.8 (72.3) | 46.3 (102.1) | 69.1 (152.3) | 33.8 (74.4) | 52.6 (115.9) | 79.1 (174.4) | 55.4 (122.1) | 82.2 (181.2) | 128.7 (283.6) | 45.9 (101.2) | 68.7 (151.5) | 31.6 (69.6) | 45.3 (100.0) | 70.5 (155.5) |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
In case of explosion proof type with indicator, add 5 mm (0.2 inch) to it.

*2: Depending on the selection of grounding ring code and optional code, add the following value to "L" (face-to-face length) and "t" (thickness of flange).

| Nominal Size: 150, 200 mm | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | L | t | L | t | L | t |
| Grounding Ring Code | | S, L, H, V | | P, T | | N | |
| Option Code | None | +0 | +0 | +28(1.1) | +14(0.55) | -6(0.24) | -3(0.12) |
| | GA, GC, GD (Special Gaskets) | +2(0.08) | +1(0.04) | +30(1.81) | +15(0.59) | - | - |

| Nominal Size: 250 mm | | | | |
|---|---|---|---|---|
| | L | t | L | t |
| Grounding Ring Code | S, L, H, V | | N | |
| Option Code is "None" | +0 | +0 | -6(0.24) | -3(0.12) |

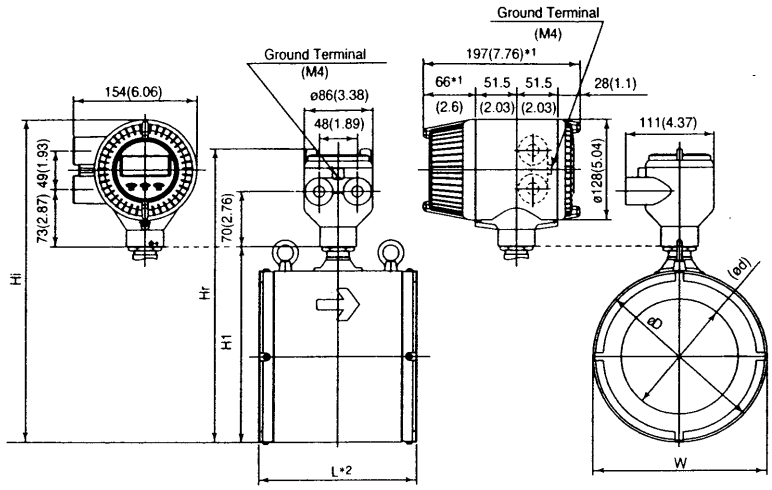
*3: When submersible type or option code DHC is selected, waterproof glands and a 30m long cable are attached.
Add 9.5kg(20.9lb) to the weight in the table.

F40.EPS

## ● Replacement model for Earlier ADMAG or ADMAG AE, AXF150, AXF200, Wafer Type, PFA /Polyurethane Rubber Lining

Unit : mm (approx. inch)

**Integral Flowmeter** **Remote Flowtube** **Integral Flowmeter** **Remote Flowtube**




AXF150 AXF200 G W C — *4 D E N P 1 2 N A U □1□ — A□□2

*4: D, E; Integral Flowmeter,
N, P; Remote Flowtube

| Model | Size code | | 150 | 200 |
|---|---|---|---|---|
| | Size | | 150(6) | 200(8) |
| | Lining code | | A,U | A,U |
| Remote flowtube / Integral flowmeter | Face-to-face length | L*2 | 230(9.06) | 300(11.81) |
| Remote flowtube | Outside dia. | ØD | 202(7.95) | 252(9.92) |
| Remote flowtube / Integral flowmeter | Inner diameter of Grounding ring | ød | 140.7(5.54) | 188.9(7.44) |
| Remote flowtube / Integral flowmeter | Width | W | 202(7.95) | 252(9.92) |
| Remote flowtube / Integral flowmeter | Height | H1 | 243(9.57) | 293(11.54) |
| Remote flowtube | Max. Height | Hr | 367(14.45) | 417(16.42) |
| Remote flowtube | Weight kg (lb)*3 | | 17.9(39.5) | 26.8(59.1) |
| Integral flowmeter | Max. Height | Hi | 405(15.93) | 455(17.89) |
| Integral flowmeter | Weight kg (lb) | | 19.6(43.2) | 28.5(62.8) |

*1: When indicator code N is selected, subtract 12 mm (0.47 inch) from the value in the figure.
In case of explosion proof type with indicator, add 5 mm (0.2 inch) to it.

*2: Depending on the selection of grounding ring code and optional code, add the following value to L (face-to-face length).

| Grounding Ring Code | | S, L, H, V | P, T | N |
|---|---|---|---|---|
| Option Code | None | +0 | +28(1.1) | -6(0.24) |
| | GA, GC, GD (Special Gaskets) | +2(0.08) | +30(1.18) | – |

*3: When submersible type or option code DHC is selected, waterproof glands and a 30m long cable are attached. Add 9.5kg(20.9lb) to the weight in the table.

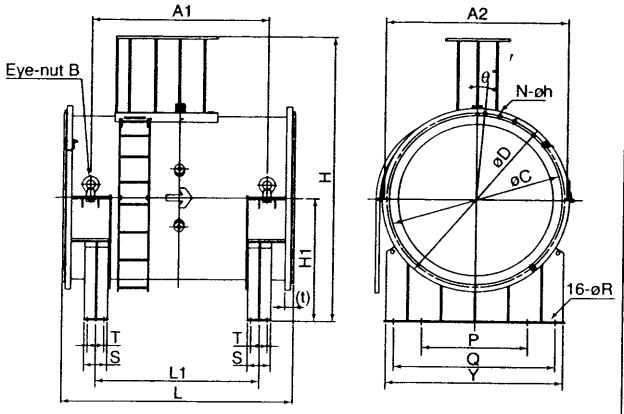
F39.EPS

117

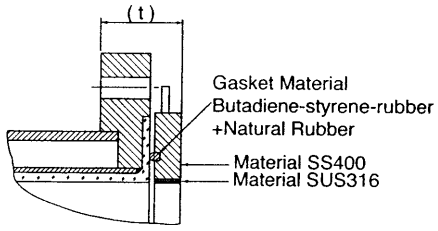
## ● AXF Standard, AXF16L-AXF26L, JIS Flange Type, Polyurethane Rubber Lining

**AXF16L**
**AXF18L**
**AXF20L G**
**AXF22L W** — **NNUL 1S — CG11**
**AXF24L**
**AXF26L**

Unit : mm (approx. inch)




**Flange Detail**



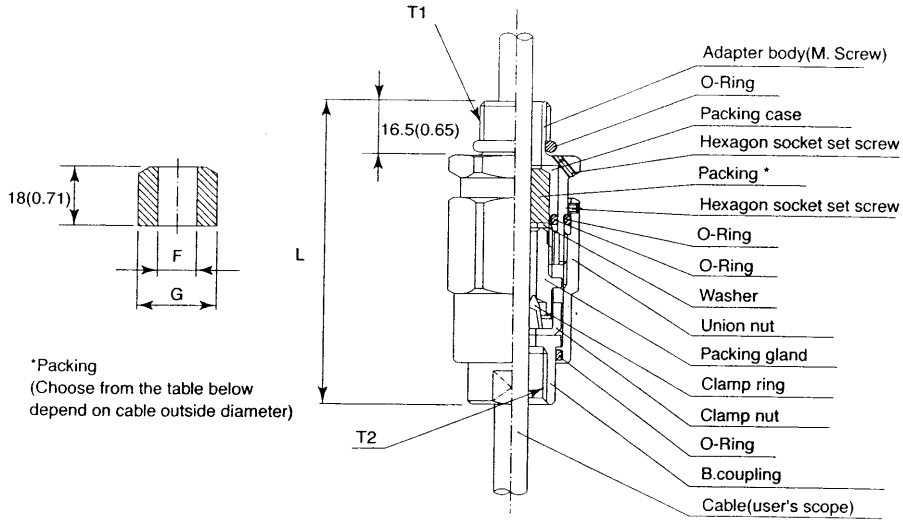

| Model | Process Connection | | CG1(JIS F12) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Size code | | 16L | 18L | 20L | 22L | 24L | 26L |
| | Size | | 1600 (64) | 1800 (72) | 2000 (80) | 2200 (88) | 2400 (96) | 2600 (104) |
| | Lining code | | U | U | U | U | U | U |
| Remote Flowtube | Face-to-face length | L | 2400 0 -10 (94.49) | 2610 0 -10 (102.76) | 2800 0 -10 (110.24) | 2970 0 -10 (116.93) | 3120 0 -10 (122.83) | 3300 0 -10 (129.92) |
| | Eye-nut Interval 1 | A1 | 1834 (72.20) | 2022 (79.61) | 2191 (86.26) | 2325 (91.54) | 2421 (95.31) | 2550 (100.39) |
| | Eye-nut Interval 2 | A2 | 1872 (73.70) | 2078 (81.81) | 2300 (90.55) | 2520 (99.21) | 2724 (107.24) | 2946 (115.98) |
| | Eye-nut Size | B | M48 | M48 | M48 | M48 | M64 | M64 |
| | Support Width | S | 250 (9.84) | 250 (9.84) | 250 (9.84) | 300 (11.81) | 300 (11.81) | 300 (11.81) |
| | Support Length | Y | 1850 (72.83) | 2000 (78.74) | 2220 (87.40) | 2420 (95.28) | 2620 (103.15) | 2820 (111.02) |
| | Support Interval | L1 | 1698 (66.85) | 1864 (73.39) | 2010 (79.13) | 2172 (85.51) | 2218 (87.32) | 2300 (90.55) |
| | Mounting Bolt Interval | P | 1080±3 (42.52) | 1180±3 (46.46) | 1300±3 (51.18) | 1430±3 (56.30) | 1560±3 (61.42) | 1700±3 (66.93) |
| | | Q | 1650±3 (64.96) | 1800±3 (70.87) | 2000±3 (78.74) | 2200±3 (86.61) | 2400±3 (94.49) | 2600±3 (102.36) |
| | | T | 170±1 (6.69) | 170±1 (6.69) | 170±1 (6.69) | 200±1 (7.87) | 200±1 (7.87) | 200±1 (7.87) |
| | Mounting Bolt Hole dia. | øR | 22 (0.87) | 22 (0.87) | 22 (0.87) | 22 (0.87) | 22 (0.87) | 22 (0.87) |
| | Outside dia. | øD | 1915 (75.39) | 2115 (83.27) | 2325 (91.54) | 2550 (100.39) | 2760 (108.66) | 2960 (116.54) |
| | Thickness | t*1 | 88 (3.46) | 90 (3.54) | 92 (3.62) | 95 (3.74) | 97 (3.82) | 101 (3.98) |
| | Pitch circle dia. | øC | 1820 (71.65) | 2020 (79.53) | 2230 (87.80) | 2440 (96.06) | 2650 (104.33) | 2850 (112.20) |
| | Bolt hole interval | θ° | 5 | 4.1 | 3.75 | 3.5 | 3.2 | 3.2 |
| | Hole dia. | øh | 39 (1.54) | 39 (1.54) | 46 (1.81) | 46 (1.81) | 46 (1.81) | 52 (2.05) |
| | Number of holes | N | 36 (1.42) | 44 (1.73) | 48 (1.89) | 52 (2.05) | 56 (2.20) | 56 (2.20) |
| | Height | H1 | 1280 +16 0 (50.39) | 1350 +16 0 (53.15) | 1450 +16 0 (57.09) | 1550 +16 0 (61.02) | 1700 +16 0 (66.93) | 1700 +16 0 (66.93) |
| | Max. Height | H | 2972 (117.01) | 3153 (124.13) | 3347 (131.77) | 3554 (139.92) | 3813 (150.12) | 3917 (154.21) |
| | Weight kg (lb) *2 | | 3650 (8046.9) | 5270 (11618.3) | approx. 6500 (14330.0) | approx. 8400 (18518.8) | approx. 10000 (22046.2) | approx. 14500 (31967.0) |

*1: The value before the gasket is tightened.
*2: When submersible type or option code DHC is selected, waterproof glands and a 30m long cable are attached.
Add 9.5kg(20.9lb) to the weight in the table.

F47.EPS

## ● Flame proof Packing Adapter for TIIS Flame proof Type (Optional code G12 or G11)

Unit : mm
(Approx. inch)




*Packing
(Choose from the table below depend on cable outside diameter)

F43.EPS

| Dimension | | | | | Cable outer diameter | Packing diameter | | Identification mark | Weight kg (lb) |
|---|---|---|---|---|---|---|---|---|---|
| T1 | T2 | C | D | L | | F | G | | |
| G 1/2 | G 1/2 | 35 (1.38) | 39 (1.54) | 94.5 (3.72) | ϕ8.0 to ϕ10.0 (0.31 to 0.39) | ϕ10.0(0.39) | ϕ20.0 (0.79) | 16 8-10 | 0.26 (0.57) |
| | | | | | ϕ10.0 to ϕ12.0 (0.39 to 0.47) | ϕ12.0(0.47) | | 16 10-12 | |

T31.EPS

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● **Unless otherwise specified, difference in the dimensions are refer to the following table.**

General tolerance in the dimensional outline drawing.

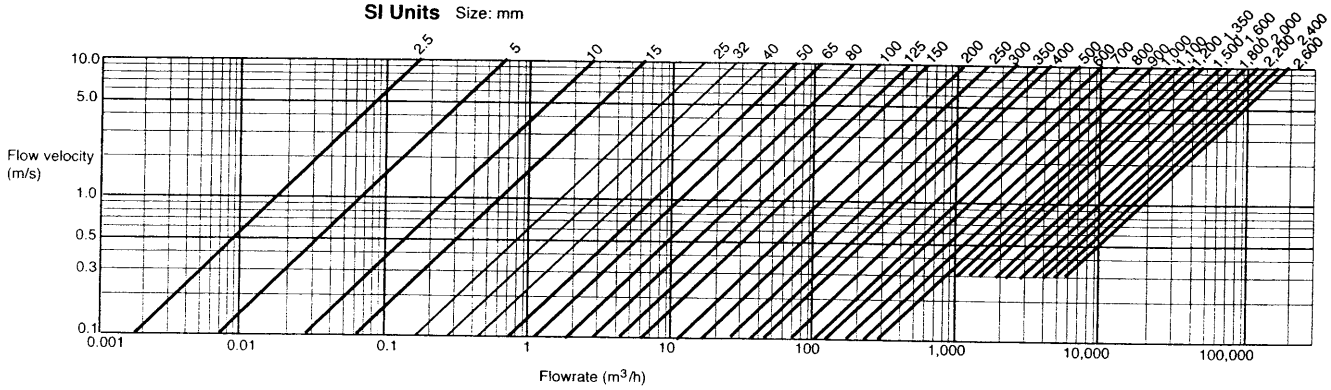
Unit : mm (approx.inch)

| Category of basic dimension | | Tolerance | Category of basic dimension | | Tolerance |
|---|---|---|---|---|---|
| Above | Equal or below | | Above | Equal or below | |
| | 3 (0.12) | ±0.7 (±0.03) | 500 (19.69) | 630 (24.80) | ±5.5 (±2.17) |
| 3 (0.12) | 6 (0.24) | ±0.9 (±0.04) | 630 (24.80) | 800 (31.50) | ±6.25 (±0.25) |
| 6 (0.24) | 10 (0.39) | ±1.1 (±0.04) | 800 (31.50) | 1000 (39.37) | ±7.0 (±0.28) |
| 10 (0.39) | 18 (0.71) | ±1.35 (±0.05) | 1000 (39.37) | 1250 (49.21) | ±8.25 (±0.32) |
| 18 (0.71) | 30 (1.18) | ±1.65 (±0.06) | 1250 (49.21) | 1600 (62.99) | ±9.75 (±0.38) |
| 30 (1.18) | 50 (1.97) | ±1.95 (±0.08) | 1600 (62.99) | 2000 (78.74) | ±11.5 (±0.45) |
| 50 (1.97) | 80 (3.15) | ±2.3 (±0.09) | 2000 (78.74) | 2500 (98.43) | ±14.0 (±0.55) |
| 80 (3.15) | 120 (4.72) | ±2.7 (±0.11) | 2500 (98.43) | 3150 (124.02) | ±16.5 (±0.65) |
| 120 (4.72) | 180 (7.09) | ±3.15 (±0.12) | | | |
| 180 (7.09) | 250 (9.84) | ±3.6 (±0.14) | | | |
| 250 (9.84) | 315 (12.40) | ±4.05 (±0.16) | | | |
| 315 (12.40) | 400 (15.75) | ±4.45 (±0.18) | | | |
| 400 (15.75) | 500 (19.69) | ±4.85 (±0.19) | | | |

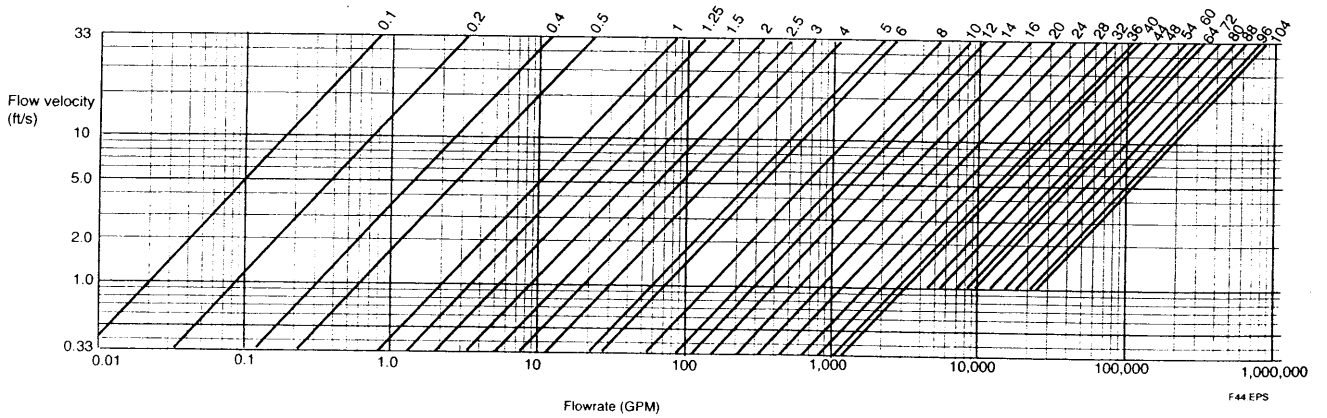
Remarks: The numeric is based on criteria of tolerance class IT18 in JIS B 0401.

## ■ SIZING DATA (Measurable flow velocity is from 0 m/s.)

**SI Units** Size: mm




**English Units** Size: inch




* Measurable flow velocity is from 0 m/s.

## ■ RECOMMENDED GASKETS BETWEEN FLOWTUBES AND USER'S FLANGES

Use compressed non-asbestos fiber gaskets, PTFE gaskets or gaskets which have equivalent elasticity. For optional codes GA, GC, and GD, use rubber gaskets or others which have equivalent elasticity (such as Teflon-coated rubber gaskets).

# 7. PED (PRESSURE EQUIPMENT DIRECTIVE)

This chapter describes further requirements and notices concerning the PED (Pressure Equipment Directive). The description in this chapter is prior to other description in this User's Manual.

## (1) Technical Data

Module: H
Type of Equipment: Piping
Type of Fluid: Liquids and gas
Group of Fluid: 1 and 2

**General-purpose Use / Submersible Type / Explosion Proof Type**

| MODEL | DN (mm) (*1) | PS (MPa) (*1) | PS DN (MPa · mm) | CATEGORY(*2) |
|---|---|---|---|---|
| AXF002G/C | 2.5 | 4 | 10 | Article 3, (*3) paragraph 3 |
| AXF005G/C | 5 | 4 | 20 | Article 3, (*3) paragraph 3 |
| AXF010G/C | 10 | 4 | 40 | Article 3, (*3) paragraph 3 |
| AXF015G/W/C | 15 | 4 | 60 | Article 3, (*3) paragraph 3 |
| AXF025G/W/C | 25 | 4 | 100 | Article 3, (*3) paragraph 3 |
| AXF032G/W/C | 32 | 4 | 128 | II |
| AXF040G/W/C | 40 | 4 | 160 | II |
| AXF050G/W/C | 50 | 4 | 200 | II |
| AXF065G/W/C | 65 | 2 | 130 | II |
| AXF080G/W/C | 80 | 2 | 160 | II |
| AXF100G/W/C | 100 | 2 | 200 | II |
| AXF125G/W/C | 125 | 2 | 250 | II |
| AXF150G/W/C | 150 | 2 | 300 | II |
| AXF200G/W/C | 200 | 2 | 400 | III |
| AXF250G/W/C | 250 | 2 | 500 | III |
| AXF300G/W/C | 300 | 2 | 600 | III |
| AXF350G/W/C | 350 | 1 | 700 | III |
| AXF400G/W/C | 400 | 1 | 800 | III |

T0701.EPS

**Sanitary Type**

| MODEL | DN (mm) (*1) | PS (MPa) (*1) | PS D (MPa · mm) | CATEGORY (*2) |
|---|---|---|---|---|
| AXF015H | 15 | 1 | 15 | Article 3, (*3) paragraph 3 |
| AXF025H | 25 | 1 | 25 | Article 3, (*3) paragraph 3 |
| AXF032H | 32 | 1 | 32 | I |
| AXF040H | 40 | 1 | 40 | I |
| AXF050H | 50 | 1 | 50 | I |
| AXF065H | 65 | 1 | 65 | I |
| AXF080H | 80 | 1 | 80 | I |
| AXF100H | 100 | 1 | 100 | I |
| AXF125H | 125 | 1 | 125 | I |

T0702.EPS

Note : The sizes of 500 to 2600 mm (20 to 104 in.) are not attached CE marking of PED.
*1: PS: Maximum allowable pressure for Flowtube
DN: Nominal size
*2: For details, see "Table 6 covered by ANNEX II of EC Directive on Pressure Equipment Directive 97/23/EC."
*3: AXF002G/C to AXF025G/W/C, AXF015H and AXF025H are outside the scope of CE marking of PED.

## (2) Installation

**⚠ WARNING**

- Tighten the bolts of the piping joints according to the prescribed torque values.
- Take measures to protect the flowmeters from forces caused by vibration channeled through the piping.

## (3) Operation

**⚠ WARNING**

- The instrument should be operated with the temperature and pressure of the fluid under normal operating conditions.
- The ambient temperature should be that of normal operating conditions.
- Take measures to prevent excessive pressure such as water hammer, etc. To avoid water hammer prevent the pressure from exceeding the PS (maximum allowable pressure) by setting the system's safety valves, etc. appropriately.
- Should external fire occur, take safety measures at the device itself or system-wide prevent it having an effect on the flowmeters.
- Avoid using fluids exceeding the corrosion proof limitations of the lining and electrodes.
- Take measures not to abrade the metal pipe, and avoid abrading the lining by using fluids such as slurry and sand are contained.

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19.1.2

# 8. EXPLOSION PROTECTED TYPE INSTRUMENT

In this section, further requirements and differences for explosion proof type instrument are described.

**WARNING**

- Magnetic flowmeters with the model name AXF□□□C are products which have been certified as explosion proof type instruments. Strict limitations are applied to the structures, installation locations, external wiring work, maintenance and repairs, etc. of these instruments. Sufficient care must be taken, as any violation of the limitations may cause dangerous situations.
  Be sure to read this chapter before handling the instruments.
  For explosion proof type instrument, the description in this chapter is prior to other description in this user's manual.
  For TIIS flame proof type instruments, be sure to read "INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAME PROOF EQUIPMENT" at the end of this manual.

**WARNING**

The terminal box cover and display cover is locked by special screw. In case of opening the cover, please use the hexagonal wrench attached.
The covers of explosion proof type products are locked. Use the attached hexagonal wrench to open and close the cover. Before opening the cover, be sure to check that the power of flowmeter has been turned off. Once the cover is closed, be sure to re-lock the product.
Be sure to lock the cover with the special screw using the hexagonal wrench attached after tightening the cover.

## 8.1 CENELEC ATEX (KEMA)

**WARNING**

Only trained persons use this instrument in industrial locations.

### (1) Technical Data

**No. KEMA 03ATEX2435**

*AXF002C – AXF400C

**(Integral Flowmeter)**

**CENELEC ATEX (KEMA) Flame proof Type**

Group category: II 2G
EEx dme [ia] IIC T6...T3
Electrode Circuit Um: 250 Vac/dc
Excitation Circuit: 140V max
Enclosure: IP66, IP67

| Temperature Class | Maximum Process Temperature | Minimum Process Temperature |
|---|---|---|
| T6 | +70°C (+158°F) | –40°C (–40°F) |
| T5 | +85°C (+185°F) | –40°C (–40°F) |
| T4 | +120°C (+248°F) | –40°C (–40°F) |
| T3 | +130°C (+266°F) | –40°C (–40°F) |

T0801.EPS

Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

**CENELEC ATEX (KEMA) Type of Protection "Dust"**

Group category: II 1D
Maximum surface temperature:

| Maximum Surface Temperature | Maximum Process Temperature |
|---|---|
| T75°C (+167°F) | +70°C (+158°F) |
| T85°C (+185°F) | +85°C (+185°F) |
| T100°C (+212°F) | +120°C (+248°F) |
| T110°C (+230°F) | +130°C (+266°F) |

T0802.EPS

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**(Remote Flowtube)**
**CENELEC ATEX (KEMA) Flame proof Type**

Group category: II 2G
EEx dme [ia] IIC T6...T3
Electrode Circuit Um: 250 Vac/dc
Excitation Circuit: 170V max
Enclosure: IP66, IP67

| Temperature Class | Maximum Process Temperature | Minimum Process Temperature |
|---|---|---|
| T6 | +70°C (+158°F) | –40°C (–40°F) |
| T5 | +85°C (+185°F) | –40°C (–40°F) |
| T4 | +120°C (+248°F) | –40°C (–40°F) |
| T3 | +150°C (+302°F) | –40°C (–40°F) |

T0803.EPS

Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

**CENELEC ATEX (KEMA) Type of Protection "Dust"**

Group category: II 1D
Maximum surface temperature:

| Maximum Surface Temperature | Maximum Process Temperature |
|---|---|
| T75°C (+167°F) | +70°C (+158°F) |
| T85°C (+185°F) | +85°C (+185°F) |
| T100°C (+212°F) | +120°C (+248°F) |
| T115°C (+239°F) | +150°C (+302°F) |

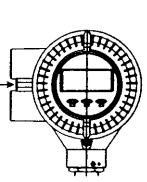
T0804.EPS

### (2) Electrical Connection

The type of electrical connection is stamped near the electrical connection port according to the following codes.

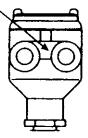
(Integral Flowmeter)

| Screw Size | Marking |
|---|---|
| ISO M20x1.5 female | ⚠M |
| ANSI 1/2NPT female | ⚠A |



(Remote Flowtube)

| Screw Size | Marking |
|---|---|
| ISO M20x1.5 female | ⚠M |
| ANSI 1/2NPT female | ⚠A |



F0801.EPS

### (3) Installation

**⚠ WARNING**

- All wiring shall comply with local installation requirements and local electrical code.
- In hazardous locations, the cable entry devices shall be of a certified ATEX flame proof type, suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with suitable flame proof certified blanking elements. (The plug attached is flame proof certified.)

### (4) Operation

**(Integral Flowmeter)**

**⚠ WARNING**

- After de-energizing, delay 20 minutes before opening.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

**(Remote Flowtube)**

**⚠ WARNING**

- De-energize before opening.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

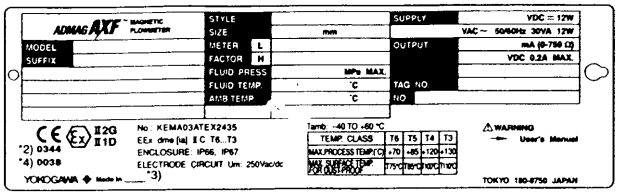
### (5) Maintenance and Repair

**⚠ WARNING**

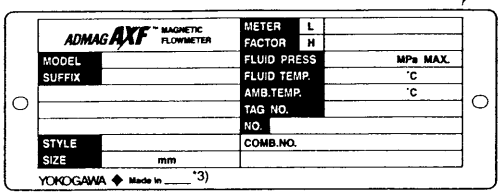
The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

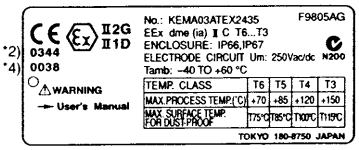
### (6) Data Plate

**(Integral Flowmeter)**




**(Remote Flowtube)**




MODEL: Specified model code
SUFFIX: Suffix codes of the model code
STYLE: Specified style code
SIZE: Nominal size of apparatus
METER FACTOR: Sensor constant number of apparatus
SUPPLY: Power supply voltage of apparatus
OUTPUT: Output signal of apparatus
FLUID TEMP.: Fluid temperature of apparatus
FLUID PRESS: Fluid pressure of apparatus
AMB. TEMP., Tamb: Ambient temperature
No.: Manufacturing serial number *1)
CE: CE marking
II 2G: Group II Category 2 Gas atmosphere
II 1D: Group II Category 1 Dust atmosphere
No.: KEMA 03ATEX2435:
EC Type Examination certificate number
EEx dme[ia]IIC T6...T3: Protection type and temp. class
ELECTRODE CIRCUIT Um: Voltage of electrode circuit
ENCLOSURE: Enclosure protection code

⚠ **WARNING**: Warning to apparatus
YOKOGAWA ◆ TOKYO 180-8750 JAPAN :
Name and address of manufacturer

*1) The third figure from the last shows the last one figure of the year of production. For example, the year of production of the product engraved as follows is year 2003.
No. F261GA091 313
↑
Produced in 2003

*2) The identification number of the notified body :
0344 KEMA Netherland

*3) The product-producing country

*4) In case of the sizes of 2.5 to 25mm (0.1 to 1.0 in.) , "0038" is not described.

# 8.2 FM

### (1) Technical Data

*AXF002C – AXF400C

**(Integral Flowmeter)**

Explosion proof for Class I, Division 1, Group A, B, C, & D.
Dust-ignition proof for Class II/III, Division1, Group E, F & G.
Intrinsically safe (electrodes) for Class I, Division 1, Group A, B, C, & D.
"SEAL ALL CONDUITS WITHIN 18 INCHES"
"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"
Electrode Circuit Um: 250 Vac/dc
Excitation Circuit: 140V max
Enclosure: NEMA 4X

| Temperature Code | Maximum Process Temperature | Minimum Process Temperature |
|---|---|---|
| T6 | +70°C (+158°F) | –40°C (–40°F) |
| T5 | +85°C (+185°F) | –40°C (–40°F) |
| T4 | +120°C (+248°F) | –40°C (–40°F) |
| T3 | +130°C (+266°F) | –40°C (–40°F) |

T0805.EPS

Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

**(Remote Flowtube)**

Explosion proof for Class I, Division 1, Group A, B, C, & D.
Dust-ignition proof for Class II/III, Division1, Group E, F & G.
Intrinsically safe (electrodes) for Class I, Division 1, Group A, B, C, & D.
"SEAL ALL CONDUITS WITHIN 18 INCHES"
"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"
Electrode Circuit Um: 250 Vac/dc
Excitation Circuit: 170V max
Enclosure: NEMA 4X

| Temperature Code | Maximum Process Temperature | Minimum Process Temperature |
|---|---|---|
| T6 | +70°C (+158°F) | –40°C (–40°F) |
| T5 | +85°C (+185°F) | –40°C (–40°F) |
| T4 | +120°C (+248°F) | –40°C (–40°F) |
| T3 | +150°C (+302°F) | –40°C (–40°F) |

T0806.EPS

Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

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### (2) Installation

**WARNING**

- All wiring shall comply with National Electrical Code ANSI/NFPA 70 and Local Electrical Code.
- In hazardous locations, wiring to be in conduit as shown in Figure 8.2.1.
- When installed in Division 2, "SEALS NOT REQUIRED"

### (3) Operation

**WARNING**

- "OPEN CIRCUIT BEFORE REMOVING COVERS."
- "SEALS ALL CONDUITS WITHIN 18 INCHES" in hazardous locations.
- When installed in Division 2, "SEALS NOT REQUIRED"
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

### (4) Maintenance and Repair

**WARNING**

The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the approval of Factory Mutual Research Corporation.

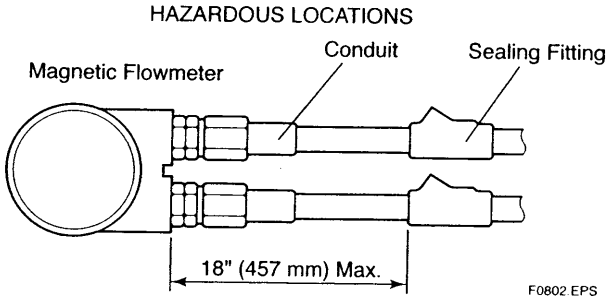


**Figure 8.2.1 Conduit Wiring**

# 8.3 CSA

### (1) Technical Data

. *AXF002C – AXF400C

**(Integral Flowmeter)**
**For CSA C22. 2 Series**

Explosion proof for Class I, Division 1, Group A, B, C, & D.
Dust-ignition proof for Class II/III, Division 1, Group E, F & G.
Intrinsically safe (electrodes) for Class I, Division 1, Group A, B, C, & D.
"SEAL ALL CONDUITS WITHIN 50 cm OF THE ENCLOSURE"
"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"

**For CSA E79 Series**

Flame proof for Zone 1, Ex dme [ia] IIC T6...T3
Intrinsically safe (electrodes) for Zone 0, Ex ia IIC T6...T3

Electrode Circuit Um: 250 Vac/dc
Excitation Circuit: 140V max
Enclosure: Type 4X, IP66, IP67

| Temperature Code | Maximum Process Temperature | Minimum Process Temperature |
|---|---|---|
| T6 | +70°C (+158°F) | –40°C (–40°F) |
| T5 | +85°C (+185°F) | –40°C (–40°F) |
| T4 | +120°C (+248°F) | –40°C (–40°F) |
| T3 | +130°C (+266°F) | –40°C (–40°F) |

T0807.EPS

Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

**(Remote Flowtube)**
**For CSA C22.2 Series**

Explosion proof for Class I, Division 1, Group A, B, C, & D.
Dust-ignition proof for Class II/III, Division 1, Group E, F & G.
Intrinsically safe (electrodes) for Class I, Division 1, Group A, B, C, & D.
"SEAL ALL CONDUITS WITHIN 50 cm OF THE ENCLOSURE"
"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"

**For CSA E79 Series**

Flame proof for Zone 1, Ex dme [ia] IIC T6...T3
Intrinsically safe (electrodes) for Zone 0,Ex ia IIC T6...T3

Electrode Circuit Um: 250 Vac/dc
Excitation Circuit: 170V max
Enclosure: Type 4X, IP66, IP67

| Temperature Code | Maximum Process Temperature | Minimum Process Temperature |
|---|---|---|
| T6 | +70°C (+158°F) | –40°C (–40°F) |
| T5 | +85°C (+185°F) | –40°C (–40°F) |
| T4 | +120°C (+248°F) | –40°C (–40°F) |
| T3 | +150°C (+302°F) | –40°C (–40°F) |

T0808.EPS

Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

### (2) Installation

**For CSA C22.2 Series**

**WARNING**

- All wiring shall comply with Canadian Electrical Code Part I and Local Electrical Codes.
- In hazardous location, wiring shall be in conduit as shown in Figure 8.3.1.

**WARNING** : SEAL ALL CONDUITS WITHIN 50cm OF THE ENCLOSURE'.
UN SCELLEMENT DOIT ÉTRE INSTALLÉ À MOINS DE 50cm DU BOÎTIER.

- When installed in Division 2, "SEALS NOT REQUIRED"

**For CSA E79 Series**

**WARNING**

- All wiring shall comply with local installation requirements and local electrical code.
- In hazadous locations, the cable entry devices shall be of a certified flame proof type, suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with suitable flame proof certified blanking elements. (The plug attached is flame proof certified.)

### (3) Operation

**For CSA C22.2 Series**

**WARNING**

**WARNING** : OPEN CIRCUIT BEFORE REMOVING COVER.
OUVRIR LE CIRCUIT AVANT D'ENLEVER LE COUVERCLE.

- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

**For CSA E79 Series**

**(Integral Flowmeter)**

**WARNING**

**WARNING** : AFTER DE-ENERGIZING, DELAY 20 MINUTES BEFORE OPENING.
APRÉS POWER-OFF, ATTENDRE 20 MINUTES AVANT D'OUVRIR.

- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

**(Remote Flowtube)**

**WARNING**

**WARNING** : DE-ENERGIZE BEFORE OPENING.
OUVRIR LE CIRCUIT AVANT D'ENLEVER LE COUVERCLE.

- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

### (4) Maintenance and Repair

**WARNING**

The instrument modification or parts replacement by other than authorized representative of YOKOGAWA Electric Corporation or YOKOGAWA Corporation of AMERICA is prohibited and will void Canadian Standards Explosionproof Certification.

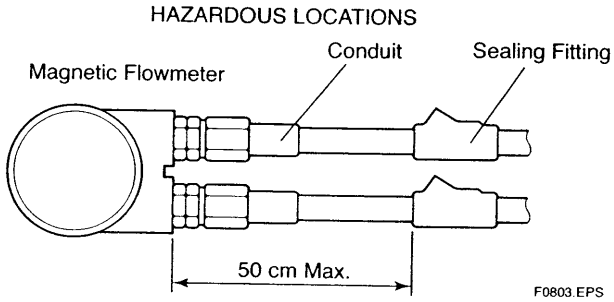


**Figure 8.3.1 Conduit Wiring**

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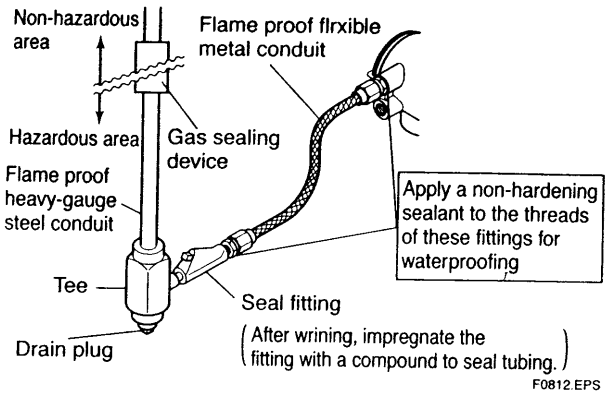


**Figure 8.4.4 Typical Wiring Using Flame proof Metal Conduit**

# INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAME PROOF EQUIPMENT

Apparatus Certified Under Technical Criteria
(IEC-compatible Standards)

## 1. General

The following describes precautions on electrical apparatus of flameproof construction (hereinafter referred to as flameproof apparatus) in explosion-protected apparatus.

Following the Labour Safety and Health Laws of Japan, flameproof apparatus is subjected to type tests to meet either the technical criteria for explosionproof electrical machinery and equipment (standards notification no. 556 from the Japanese Ministry of Labour) (hereinafter referred to as technical criteria), in conformity with the IEC Standards, or the "Recommended Practice for Explosion-Protected Electrical Installations in General Industries," published in 1979. These certified apparatus can be used in hazardous locations where explosive or inflammable gases or vapours may be present.

Certified apparatus includes a certification label and an equipment nameplate with the specifications necessary for explosion requirements as well as precautions on explosion protection. Please confirm these precautionary items and use them to meet specification requirements.

For electrical wiring and maintenance servicing, please refer to "Internal Wiring Rules" in the Electrical Installation Technical Standards as well as "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.

To meet flameproof requirements, equipment that can be termed "flameproof" must:

(1) Be certified by a Japanese public authority in accordance with the Labour Safety and Health Laws of Japan and have a certification label in an appropriate location on its case, and
(2) Be used in compliance with the specifications marked on its certification label, equipment nameplate and precautionary information furnished.

## 2. Electrical Apparatus of Flameproof Type of Explosion-Protected Construction

Electrical apparatus which is of flameproof construction is subjected to a type test and certified by the Japanese Ministry of Labour aiming at preventing explosion caused by electrical apparatus in a factory or any location where inflammable gases or vapours may be present. The flameproof construction is of completely enclosed type and its enclosure shall endure explosive pressures in cases where explosive gases or vapours entering the enclosure cause explosion. In addition, the enclosure construction shall be such that flame caused by explosion does not ignite gases or vapours outside the enclosure.

In this manual, the word "flameproof" is applied to the flameproof equipment combined with the types of protection "e", "o", "i", and "d" as well as flameproof equipment.

## 3. Terminology

### (1) Enclosure

An outer shell of an electrical apparatus, which encloses live parts and thus is needed to configure explosion-protected construction.

### (2) Shroud

A component part which is so designed that the fastening of joint surfaces cannot be loosened unless a special tool is used.

### (3) Enclosure internal volume

This is indicated by:— the total internal volume of the flameproof enclosure minus the volume of the internal components essential to equipment functions.

### (4) Path length of joint surface

On a joint surface, the length of the shortest path through which flame flows from the inside to outside of the flameproof enclosure. This definition cannot be applied to threaded joints.

### (5) Gaps between joint surfaces

The physical distance between two mating surfaces, or differences in diameters if the mating surfaces are cylindrical.

Note: The permissible sizes of gaps between joint surfaces, the path length of a joint surface and the number of joint threads are determined by such factors as the enclosure's internal volume, joint and mating surface construction, and the explosion classification of the specified gases and vapours.

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# 4. Installation of Flameproof Apparatus

## (1) Installation Area

Flameproof apparatus may be installed, in accordance with applicable gases, in a hazardous area in Zone 1 or 2, where the specified gases are present. Those apparatus shall not be installed in a hazardous area in Zone 0.

Note: Hazardous areas are classified in zones based upon the frequency of the appearance and the duration of an explosive gas atmosphere as follows:
Zone 0: An area in which an explosive gas atmosphere is present continuously or is present for long periods.
Zone 1: An area in which an explosive gas atmosphere is likely to occur in normal operation.
Zone 2: An area in which an explosive gas atmosphere is not likely to occur in normal operation and if it does occur it will exist for a short period only.

## (2) Environmental Conditions

The standard environmental condition for the installation of flameproof apparatus is limited to an ambient temperature range from –20°C to +40°C (for products certified under Technical Criteria). However, some field-mounted instruments may be certified at an ambient temperature up to +60°C as indicated on the instrument nameplates. If the flameproof apparatus are exposed to direct sunshine or radiant heat from plant facilities, appropriate thermal protection measures shall be taken.

# 5. External Wiring for Flameproof Apparatus

Flameproof apparatus require cable wiring or flameproof metal conduits for their electrical connections. For cable wiring, cable glands (cable entry devices for flameproof type) to wiring connections shall be attached. For metal conduits, attach sealing fittings as close to wiring connections as possible and completely seal the apparatus. All non-live metal parts such as the enclosure shall be securely grounded. For details, see the "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.

## (1) Cable Wiring

- For cable wiring, cable glands (cable entry devices for flameproof type) specified or supplied with the apparatus shall be directly attached to the wiring connections to complete sealing of the apparatus.
- Screws that connect cable glands to the apparatus are those for G-type parallel pipe threads (JIS B 0202) with no sealing property. To protect the apparatus from corrosive gases or moisture, apply nonhardening sealant such as liquid gaskets to those threads for waterproofing.
- Specific cables shall be used as recommended by the "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.
- In necessary, appropriate protective pipes (conduit or flexible pipes), ducts or trays shall be used for preventing the cable run (outside the cable glands) from damage.
- To prevent explosive atmosphere from being propagated form Zone 1 or 2 hazardous location to any different location or non-hazardous location through the protective pipe or duct, apply sealing of the protective pipes in the vicinity of individual boundaries, or fill the ducts with sand appropriately.
- When branch connections of cables, or cable connections with insulated cables inside the conduit pipes are made, a flameproof or increased-safety connection box shall be used. In this case, flameproof or increased-safety cable glands meeting the type of connection box must be used for cable connections to the box.

## (2) Flameproof Metal Conduit Wiring

- For the flameproof metal conduit wiring or insulated wires shall be used as recommended by the USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry, published in 1994.
- For conduit pipes, heavy-gauge steel conduits conforming to JIS C 8305 Standard shall be used.
- Flameproof sealing fittings shall be used in the vicinity of the wiring connections, and those fittings shall be filled with sealing compounds to complete sealing of the apparatus. In addition, to prevent explosive gases, moisture, or flame caused by explosion form being propagated through the conduit, always provide sealing fittings to complete sealing of the conduit in the following locations:
  (a) In the boundaries between the hazardous and non-hazardous locations.
  (b) In the boundaries where there is a different classification of hazardous location.
- For the connections of the apparatus with a conduit pipe or its associated accessories, G-type parallel pipe threads (JIS B 0202) shall be used to provide a minimum of five-thread engagement to complete tightness. In addition, since these parallel threads do not have sealing property, nonhardening sealant such as liquid gaskets shall thus be applied to those threads for ensuring waterproofness.
- If metal conduits need flexibility, use flameproof flexible fittings.

# 6. Maintenance of Flameproof Apparatus

To maintain the flameproof apparatus, do the following. (For details, see Chapter 10 "MAINTENANCE OF EXPLOSION-PROTECTED ELECTRICAL INSTALLATION" in the USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry.)

### (1) Maintenance servicing with the power on.

Flameproof apparatus shall not be maintenance-serviced with its power turned on. However, in cases where maintenance servicing is to be conducted with the power turned on, with the equipment cover removed, always use a gas detector to check that there is no explosive gas in that location. If it cannot be checked whether an explosive gas is present or not, maintenance servicing shall be limited to the following two items:

(a) Visual inspection
Visually inspect the flameproof apparatus, metal conduits, and cables for damage or corrosion, and other mechanical and structural defects.

(b) Zero and span adjustments
These adjustments should be made only to the extent that they can be conducted from the outside without opening the equipment cover. In doing this, great care must be taken not to cause mechanical sparks with tools.

### (2) Repair

If the flameproof apparatus requires repair, turn off the power and transport it to a safety (non-hazardous) location. Observe the following points before attempting to repair the apparatus.

(a) Make only such electrical and mechanical repairs as will restore the apparatus to its original condition. For the flameproof apparatus, the gaps and path lengths of joints and mating surfaces, and mechanical strength of enclosures are critical factors in explosion protection. Exercise great care not to damage the joints or shock the enclosure.

(b) If any damage occurs in threads, joints or mating surfaces, inspection windows, connections between the transmitter and terminal box, shrouds or clamps, or external wiring connections which are essential in flameproofness, contact Yokogawa Electric Corporation.

**⚠ CAUTION**

Do not attempt to re-process threaded connections or refinish joints or mating surfaces.

(c) Unless otherwise specified, the electrical circuitry and internal mechanisms may be repaired by component replacement, as this will not directly affect the requirements for flameproof apparatus (however, bear in mind that the apparatus must always be restored to its original condition). If you attempt to repair the flameproof apparatus, company-specified components shall be used.

(d) Before starting to service the apparatus, be sure to check all parts necessary for retaining the requirements for flameproof apparatus. For this, check that all screws, bolts, nuts, and threaded connections have properly been tightened.

### (3) Prohibition of specification changes and modifications

Do not attempt to change specifications or make modifications involving addition of or changes in external wiring connections.

# 7. Selection of Cable Entry Devices for Flameproof Type

**⚠ CAUTION**

The cable glands (cable entry devices for flameproof type) conforming to IEC Standards are certified in combination with the flameproof apparatus. So, Yokogawa-specified cable entry devices for flameproof type shall be used to meet this demand.

### References:

(1) Type Certificate Guide for Explosion-Protected Construction Electrical Machinery and Equipment (relating to Technical Standards Conforming to International Standards), issued by the Technical Institution of Industrial Safety, Japan

(2) USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry (1994), issued by the Japanese Ministry of Labour, the Research Institute of Industrial Safet

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