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

Iqaluit Wastewater Treatment Plant – Conversion & Expansion – Phase 1

Project History

The City of Iqaluit:	**City of Iqaluit Public Works & Engineering** **P.O. Box 460** **Iqaluit, NU X0A 0H0** **Mr. Geoff Baker** **Phone: (867) 975-8502** **Fax: (867) 975-8505**
Project Engineer:	**Earth Tech Canada Inc.** **17203-103 Ave** **Edmonton, Alberta T5S 1J4** **Mr. Glenn Prosko, P.Eng.** **Phone: (780) 488-6800** **Fax: (780) 488-2121**
General Contractor:	**Kudlik Construction Ltd.** **P.O. Box 727 1519 Federal Road** **Iqaluit, NU X0A 0H0** **Mr. Martin Simard** **Phone: (867) 979-1166** **Fax: (867) 979-1169**
Mechanical Subcontractor:	**Sifec North Inc.** **P.O. Box 727 1519 Federal Road** **Iqaluit, NU X0A 0H0** **Mr. Guy Fauteux, Pres. P.Eng.** **Phone: (866) 437-4001** **Fax: (450) 430-7106**
Electrical Subcontractor:	**Sifec North Inc.** **P.O. Box 727 1519 Federal Road** **Iqaluit, NU X0A 0H0** **Mr. Guy Fauteux, Pres. P.Eng.** **Phone: (866) 437-4001** **Fax: (450) 430-7106**
Instrumentation Subcontractor:	**Sifec North Inc.** **P.O. Box 727 1519 Federal Road** **Iqaluit, NU X0A 0H0** **Mr. Guy Fauteux, Pres. P.Eng.** **Phone: (866) 437-4001** **Fax: (450) 430-7106**

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| |   RSView ME Vol2.pdf
| |   RSView MEInstallation Guide.pdf
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| |   RSViewME-Tech Broch.pdf
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|       meusers2.pdf
|       RSView ME 3.20 Getting Starting Tips Rev 2.pdf
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|  \---AHU
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| | 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
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| | 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
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| s11_SER.pdf
| Toshiba S11 Instruction Manual.pdf
| VF-S11-Manual-EN.pdf
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\---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)

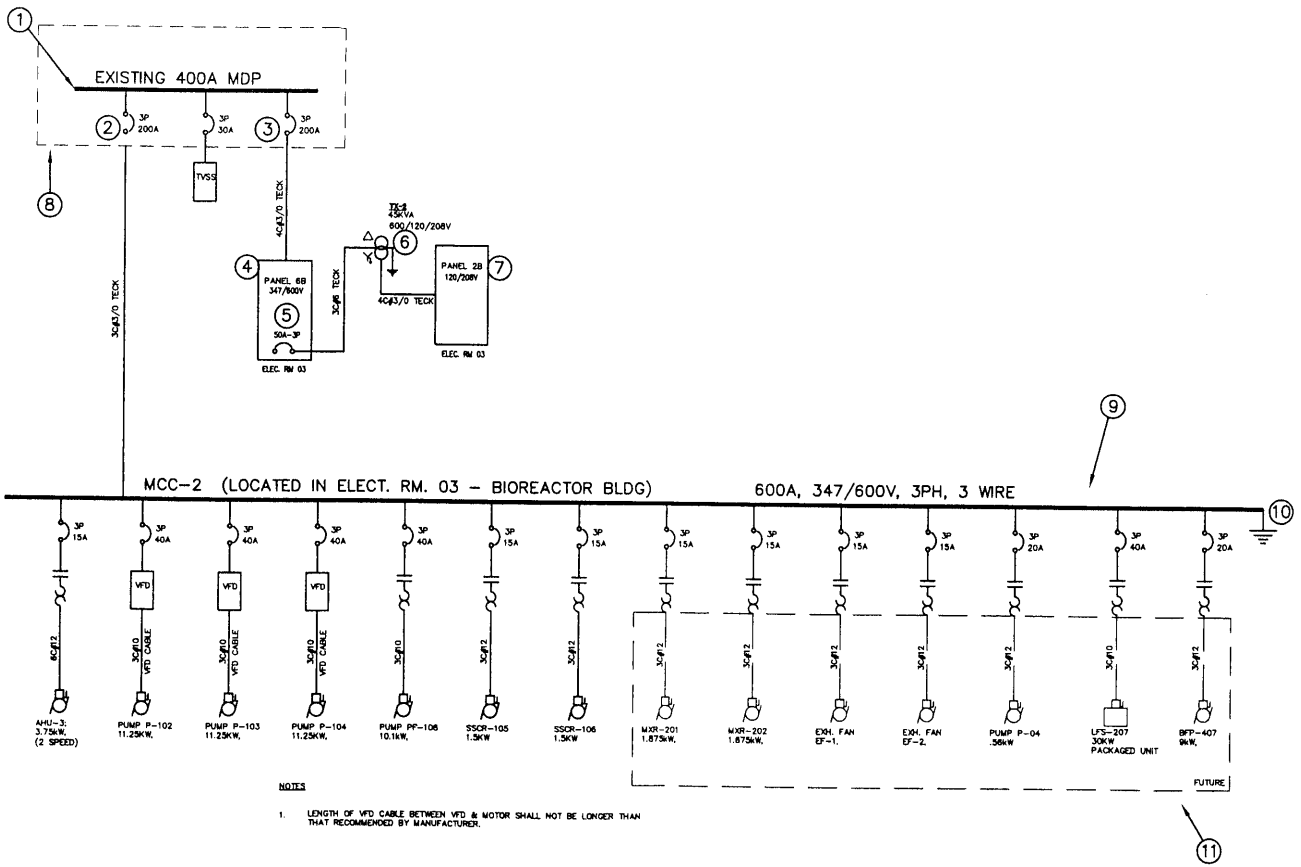
Motor Control Centre

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

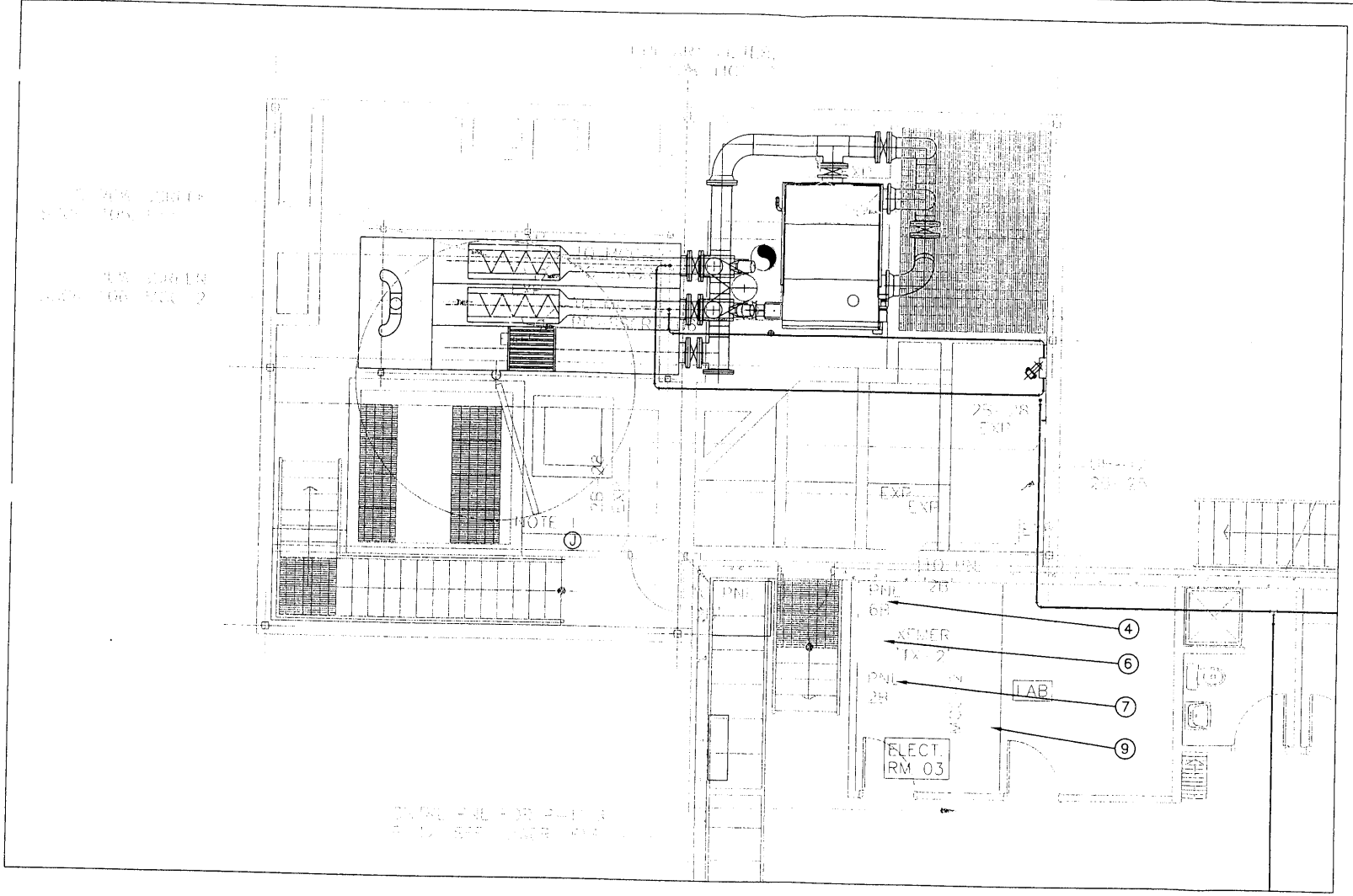


ELECTRICAL SINGLE LINE DIAGRAM.

Iqaluit

DRAWING
E-1

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



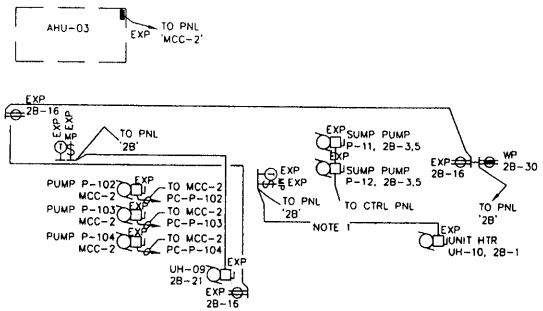
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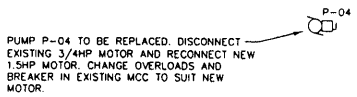
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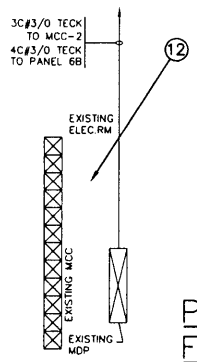
Iqaluit

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

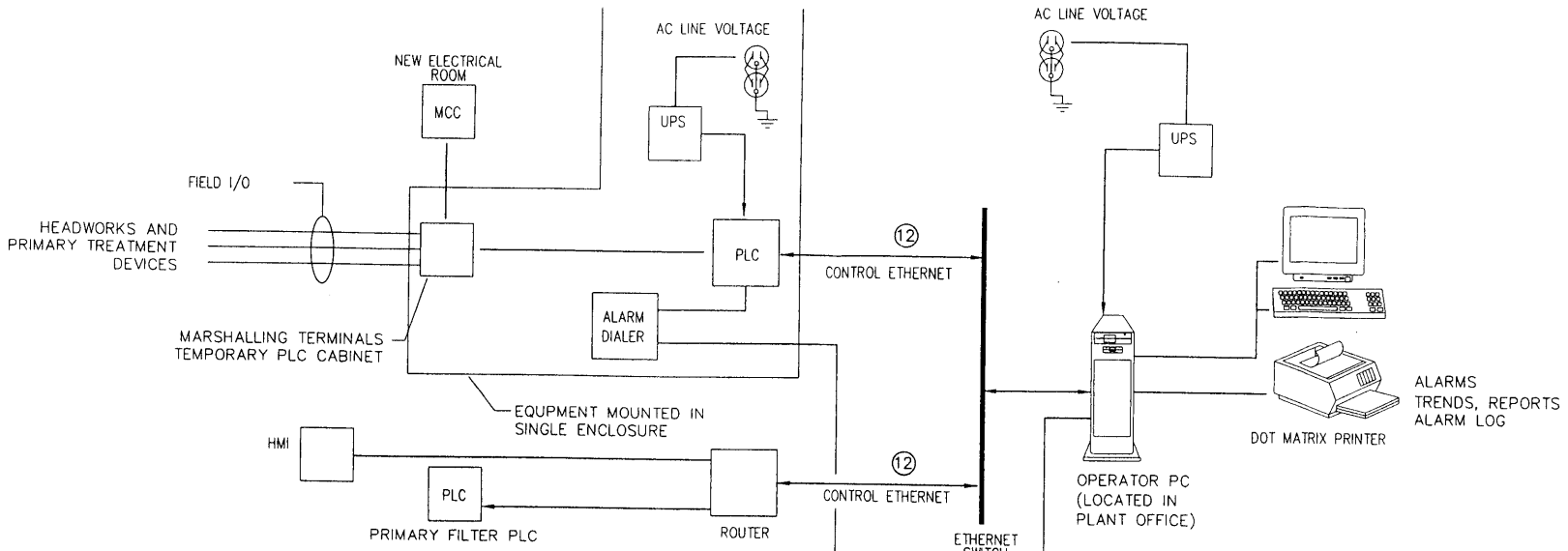
DRAWING

E-2

EARTH TECH

Earth Tech (Canada) Inc.

Edmonton, AB 780-486-6800
Yellowknife, NWT 867-873-6316



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)
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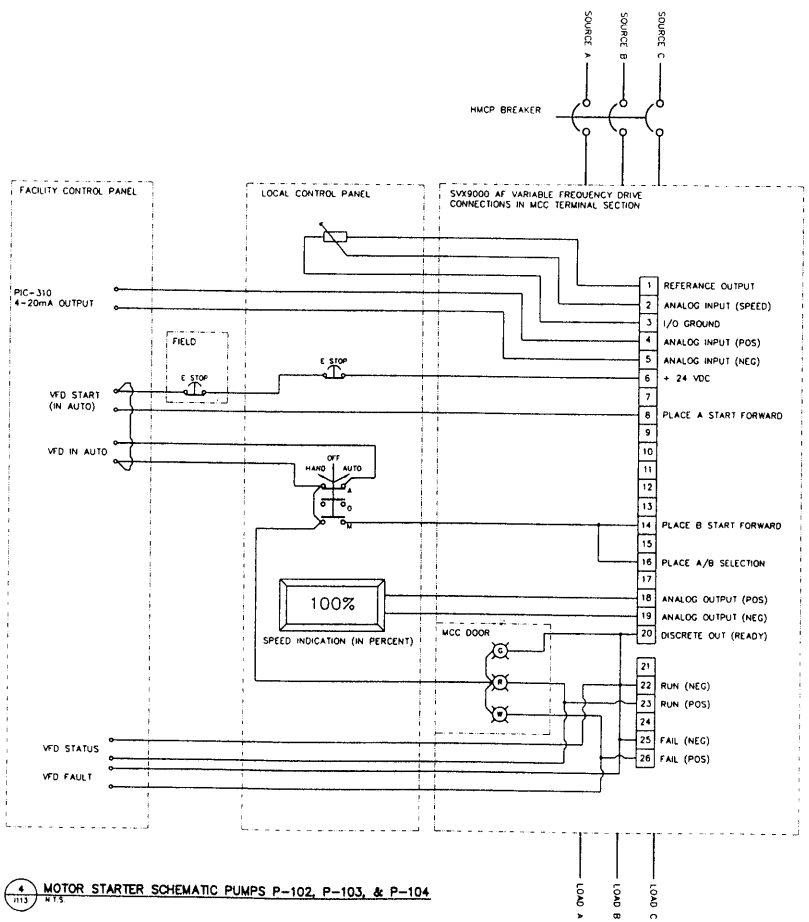
SCALE: N.T.S.

Iqaluit

DRAWING E-4

EARTH TECH

Earth Tech (Canada) Inc.
Edmonton, AB 780-468-6600
Yellowknife, NWT 867-873-6318



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.

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DRAWING E-5

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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.

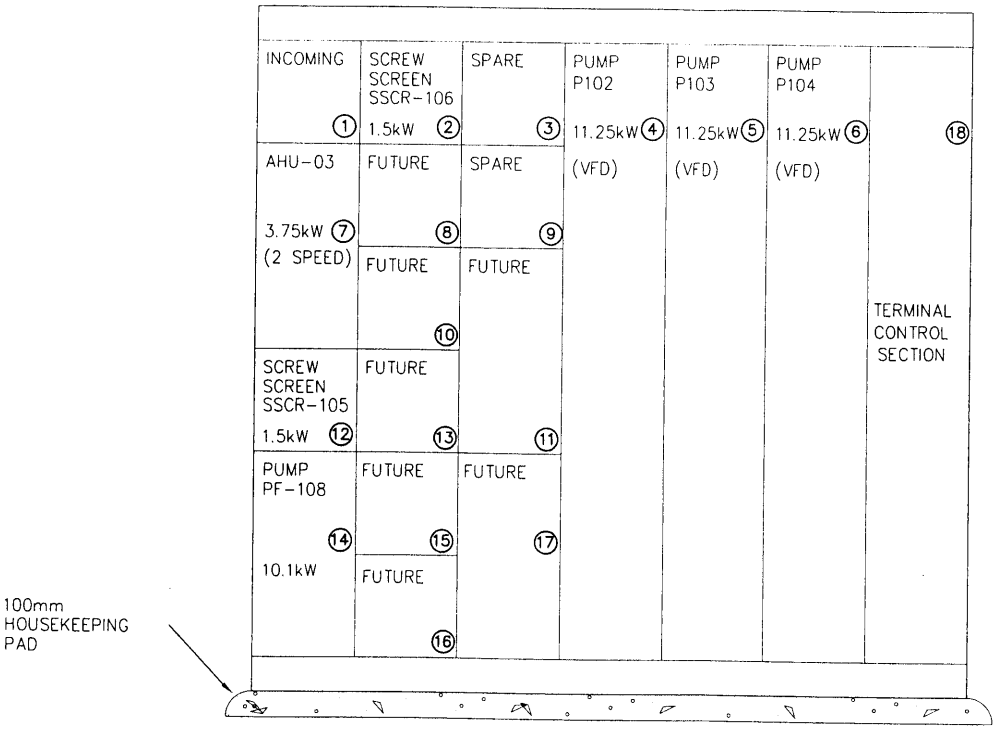
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DRAWING E-6

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MCC-2



MCC-2 ELEVATION DETAIL

N.T.S.

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DRAWING

E-7

EARTH TECH

Earth Tech (Canada) Inc.

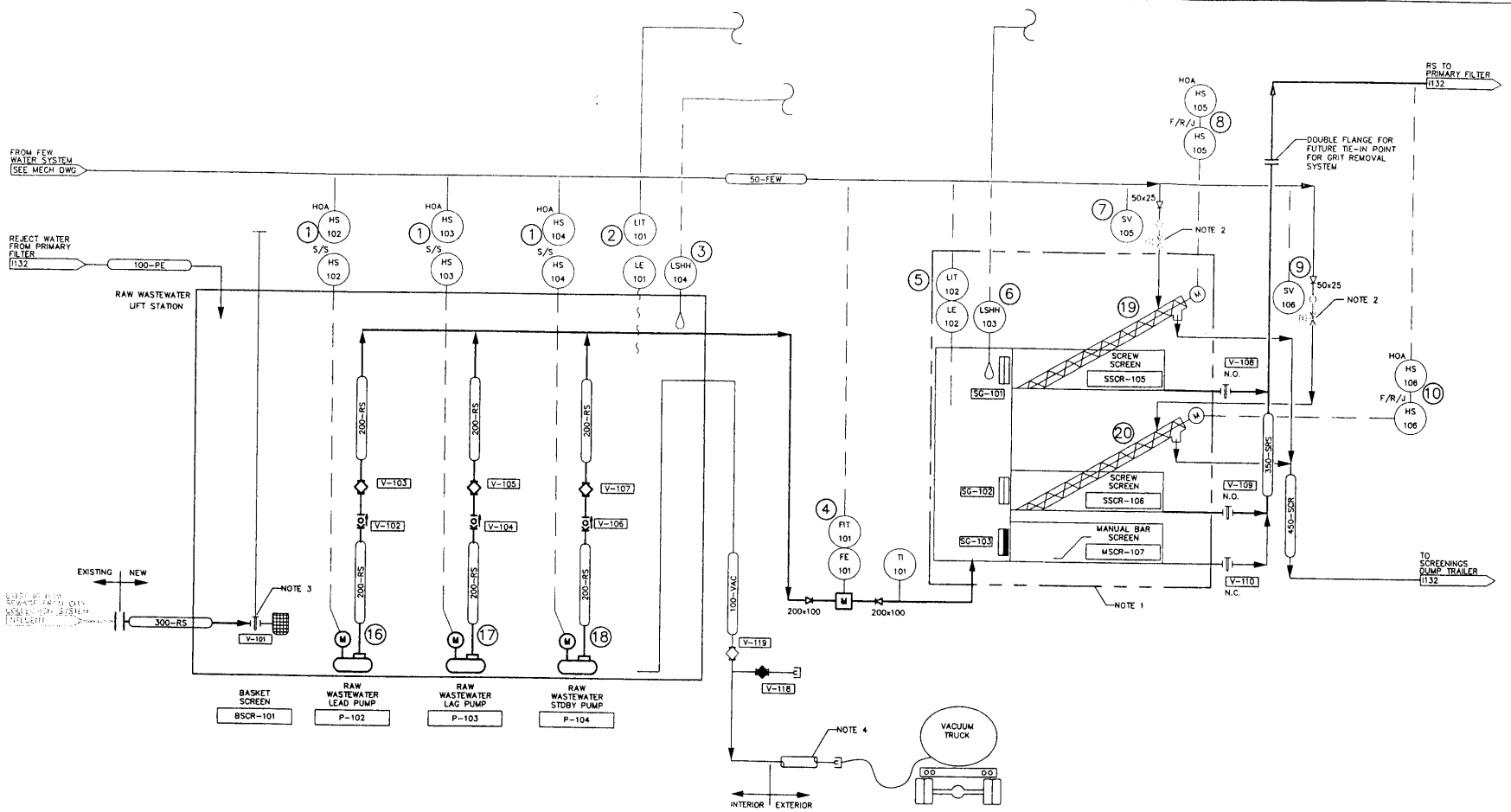
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MOTOR STARTER AND CONTROL SCHEDULE

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

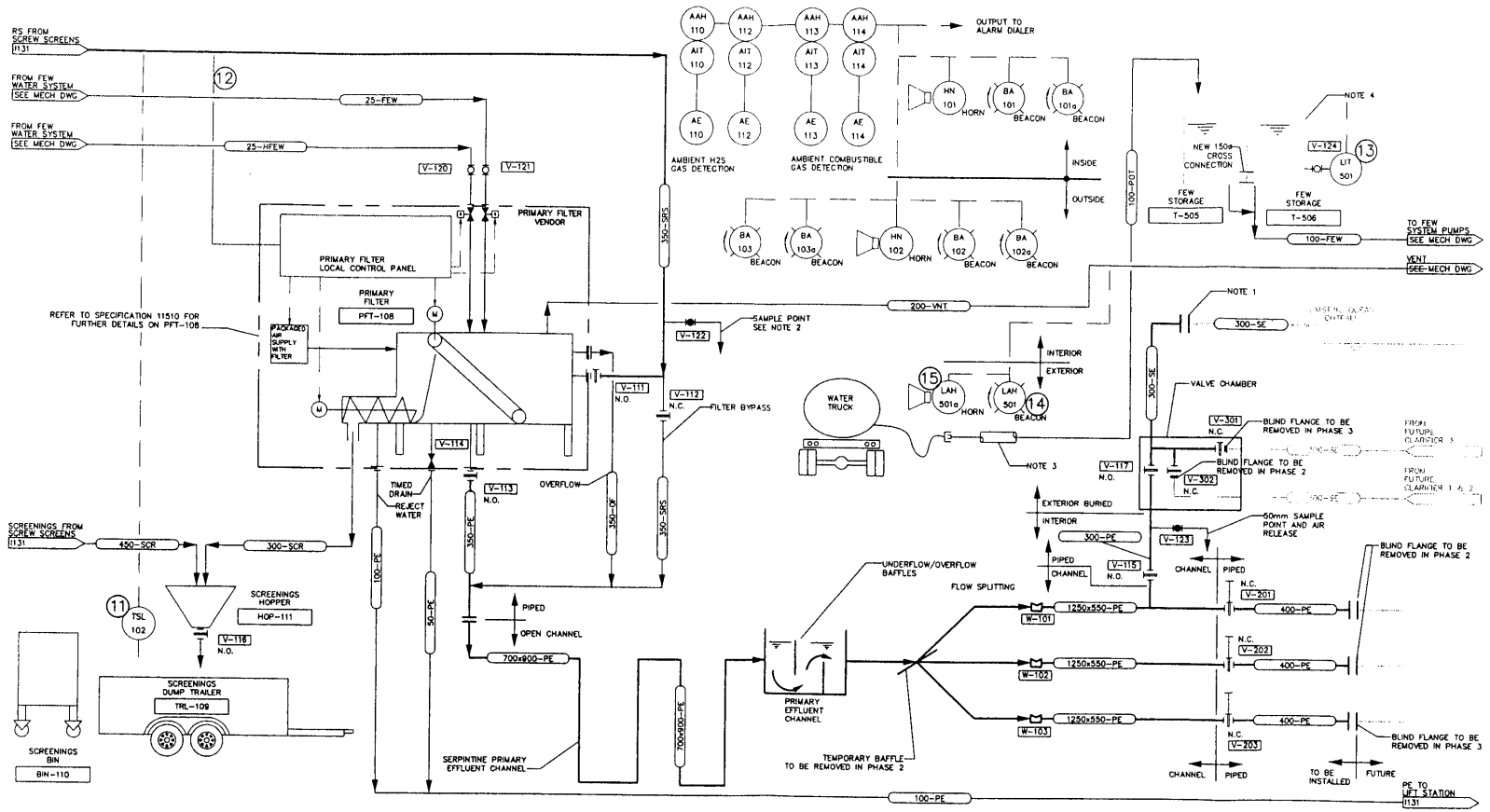
Iqaluit	DRAWING
	I–1

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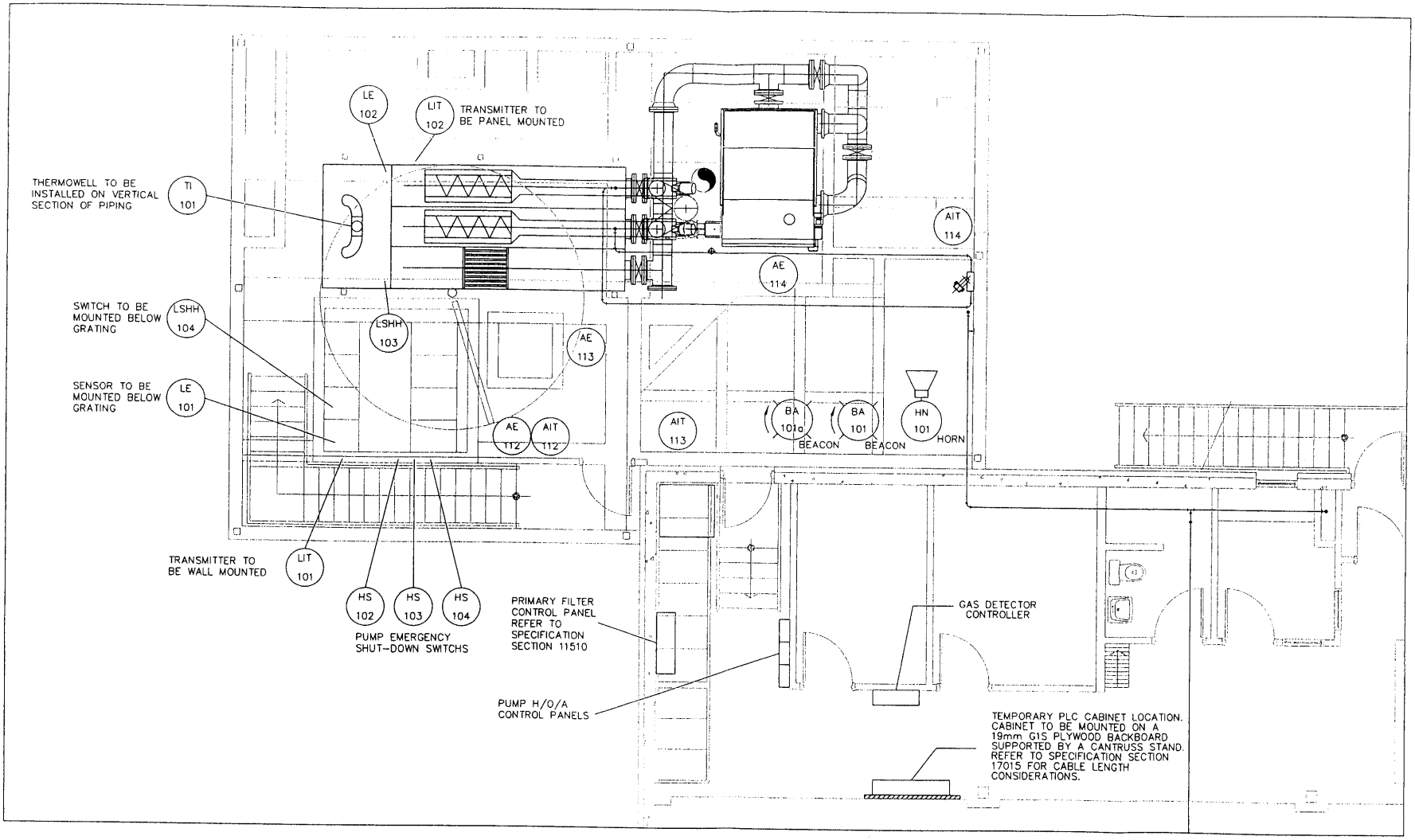


PFD __ SOLIDS HANDLING & OUTFALL P&ID.

SCALE: N.T.S.

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

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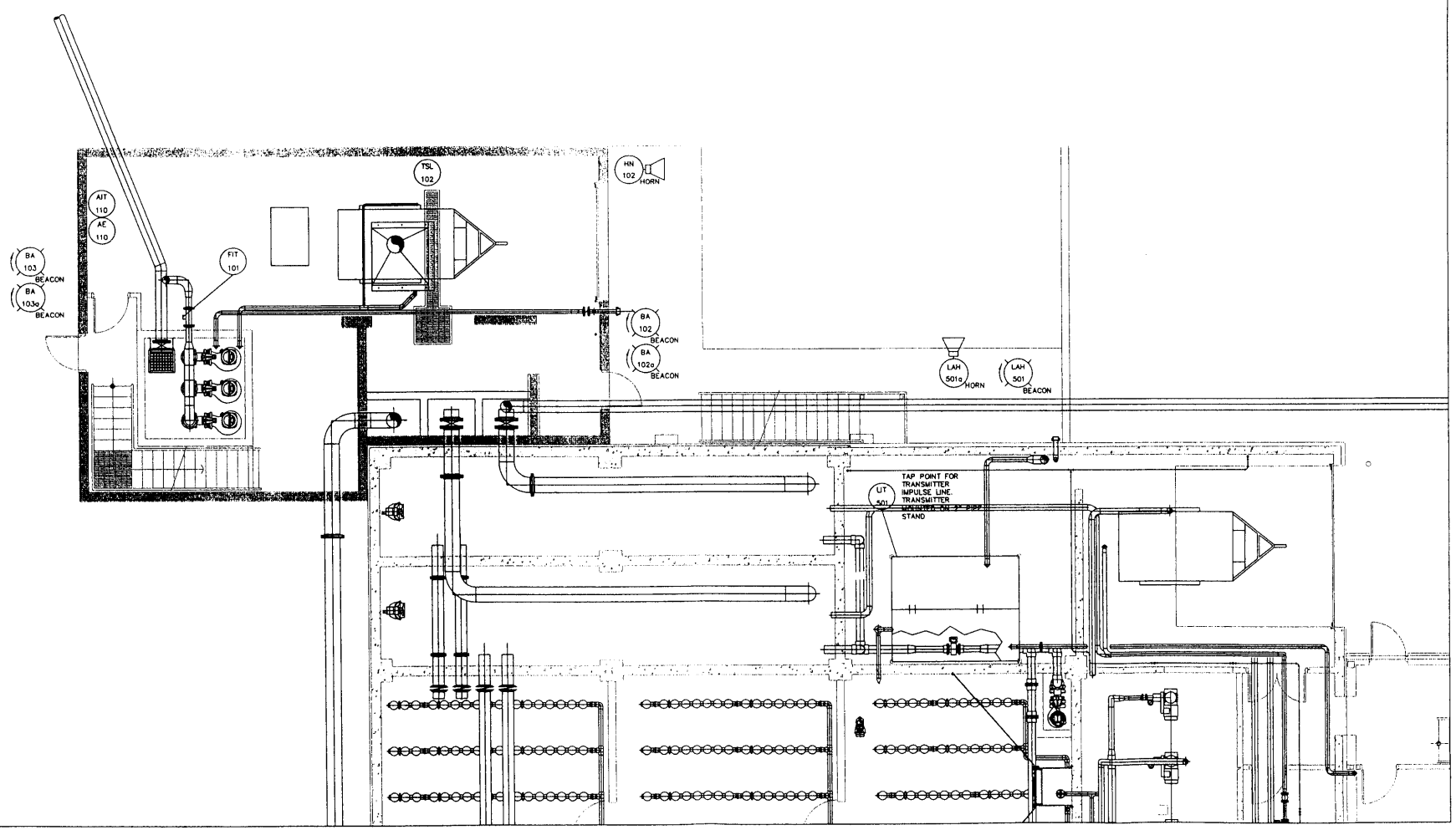


UPPER LEVEL INSTRUMENT LOCATION DRAWING.

SCALE: N.T.S.

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

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SCALE: N.T.S

LOWER LEVEL INSTRUMENT LOCATION DRAWING.

Iqaluit

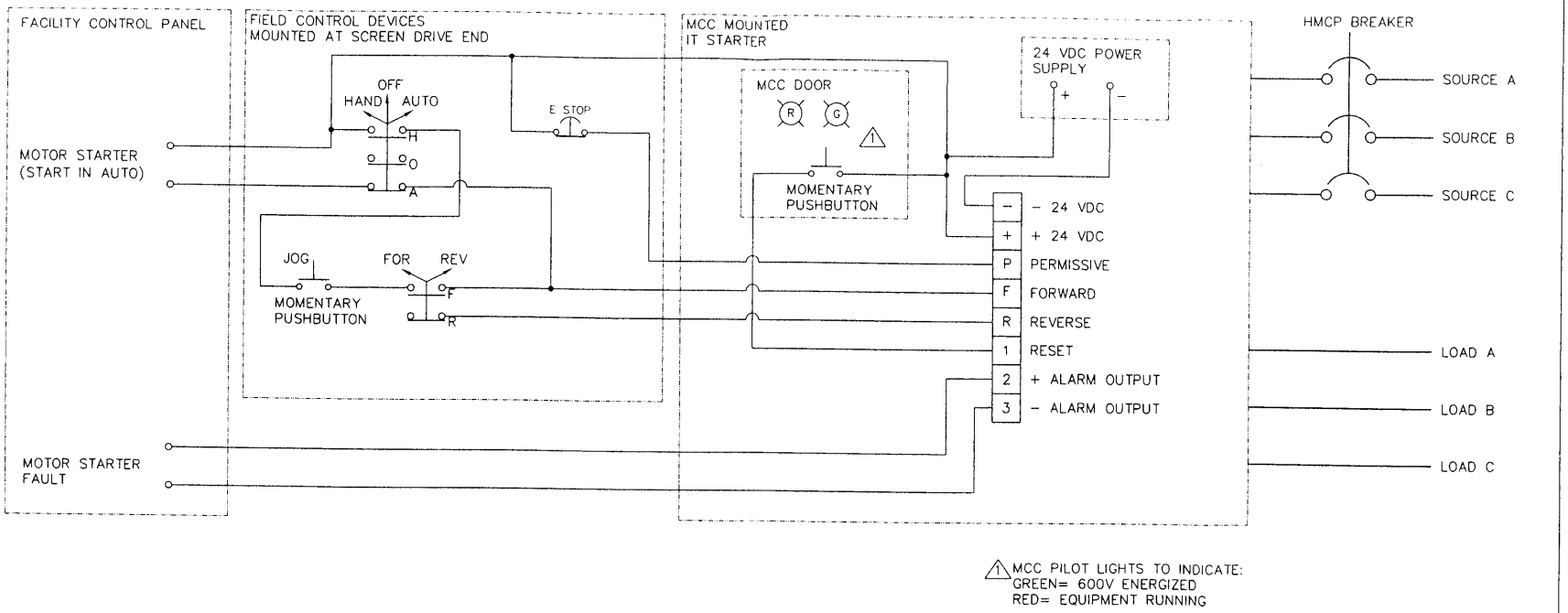
DRAWING 1-4

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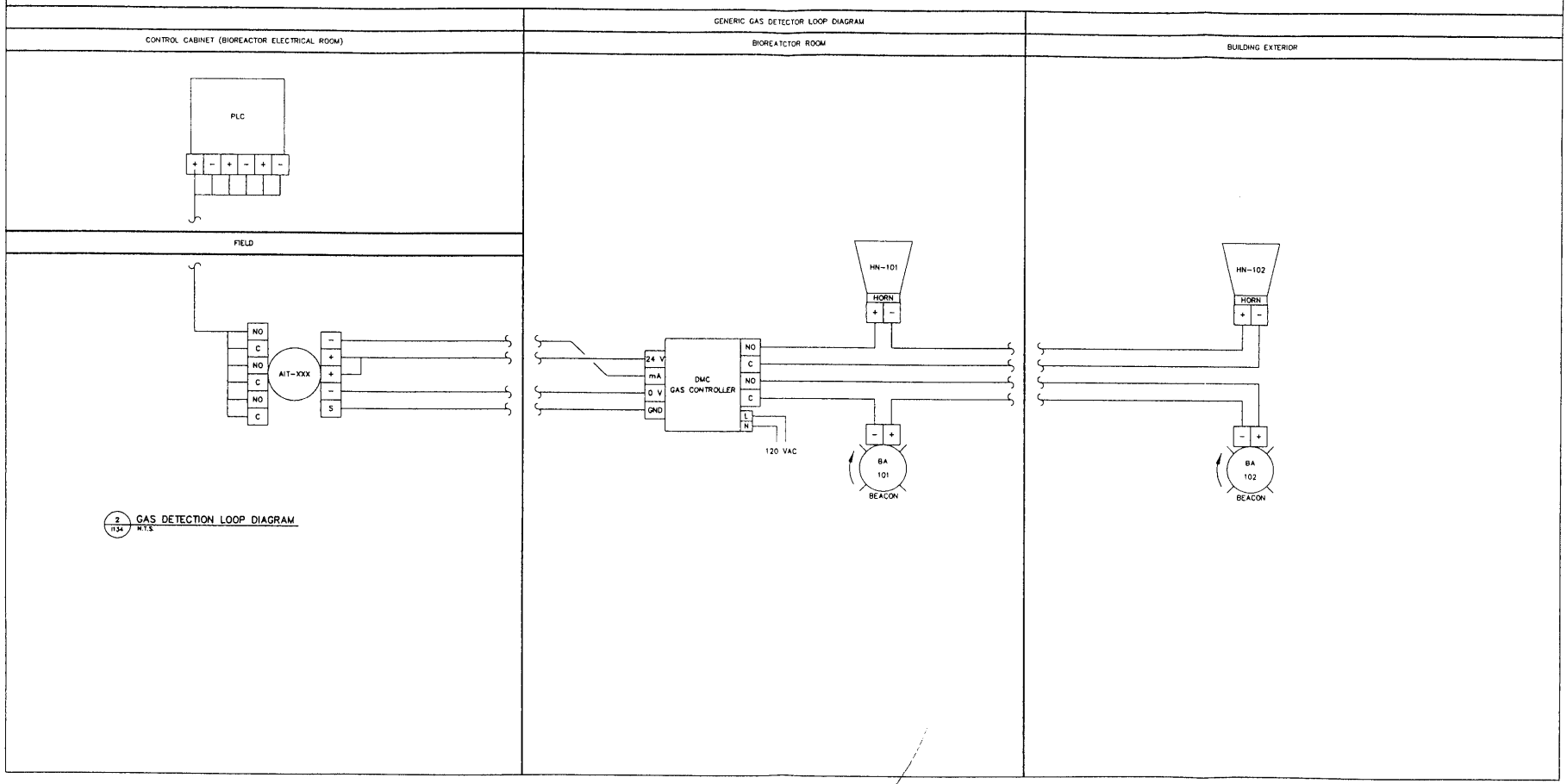
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SCREEN DRIVE MOTOR CONTROL SCHEMATIC.

SCALE: N.T.S

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ᐃᖃᓗᐃᑦ	I-5	Earth Tech (Canada) Inc Edmonton, AB 780-488-6800 Yellowknife, NWT 867-873-8316



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

GAS DETECTION LOOP DIAGRAM.

SCALE: N.T.S.

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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

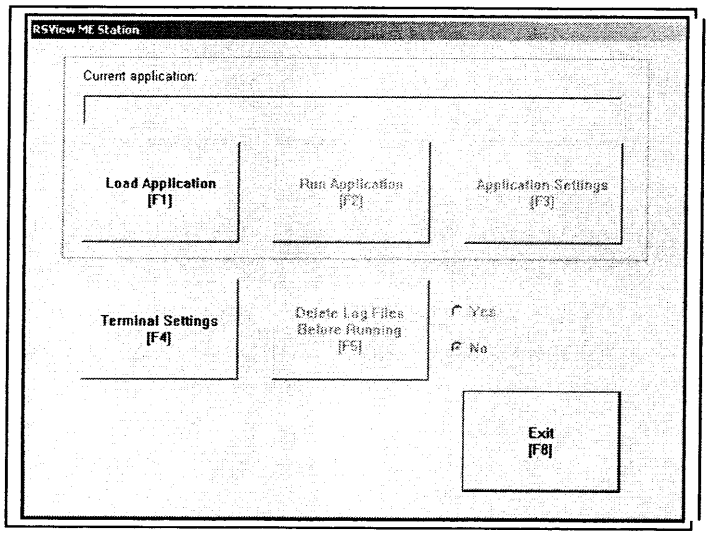
6.4.1.1 Starting RSView

RSView starts automatically when the computer is started.

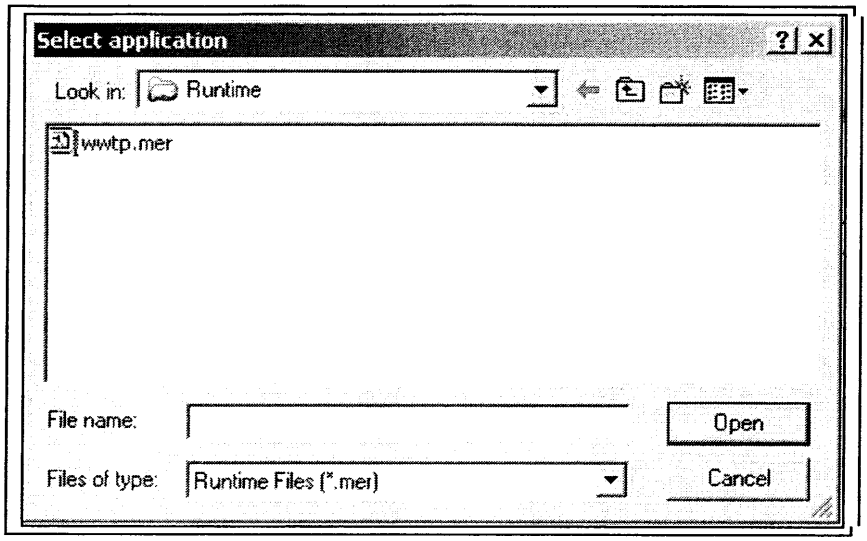
If the program is stopped for any reason, it can be restarted by rebooting the computer or by following the procedure below:

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

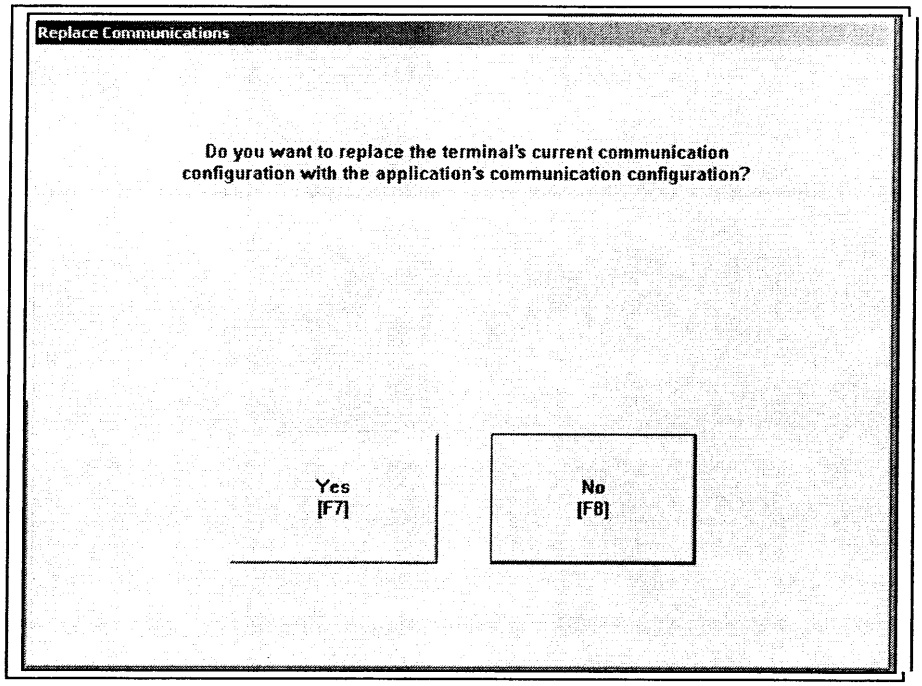
desktop.
2. Click on the Load Application button on the RSView Station pop-up.



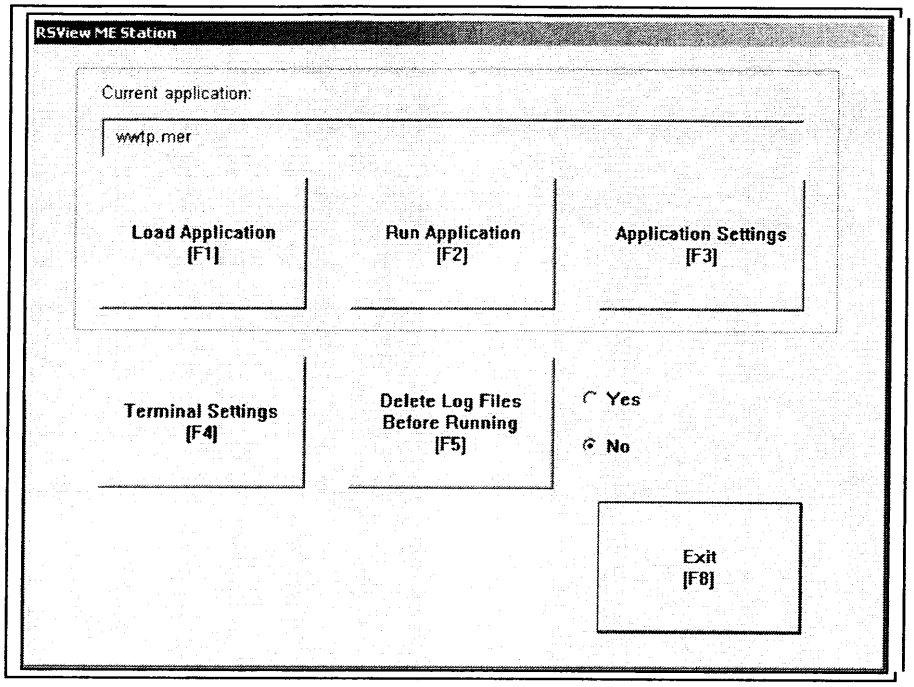
3. Select "wwtp.mer" and click on the Open button.



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



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



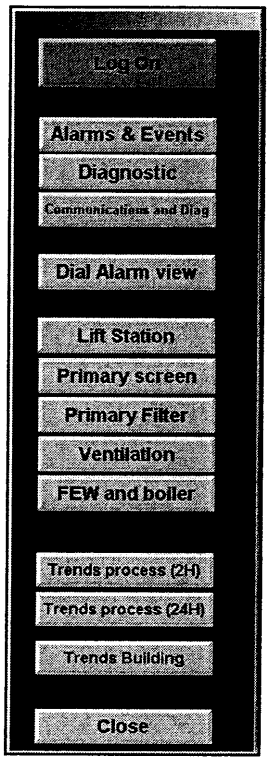
6.4.1.2 Navigation

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



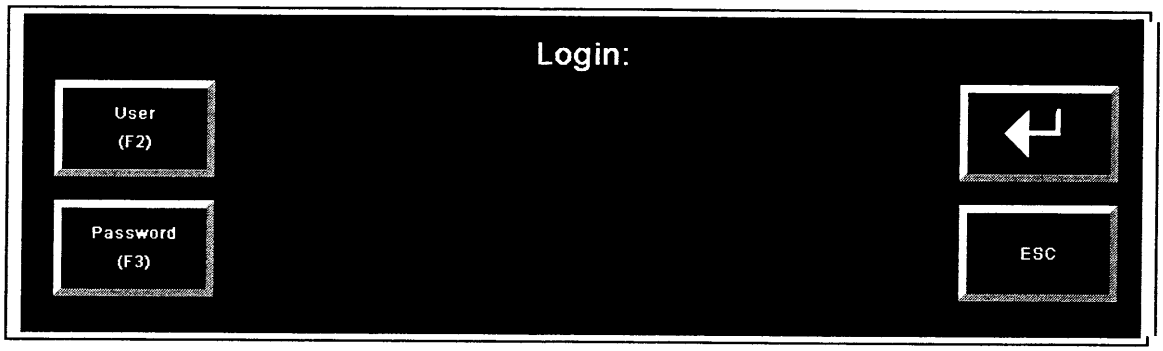
Clicking on "Previous" at any screen will return the display to the previous process screen.

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.

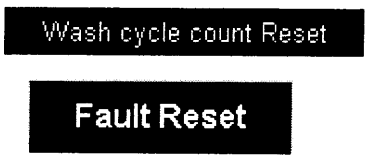
6.4.1.4 Controls

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.

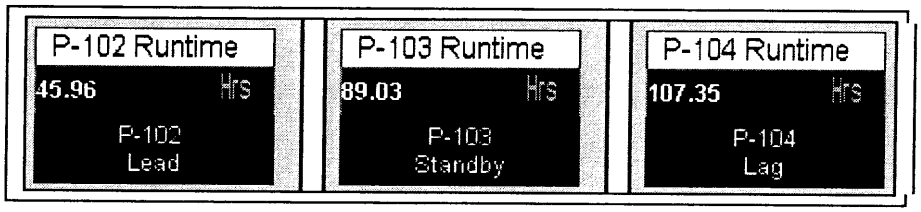
The action that will be performed by clicking the button is used as the button label.

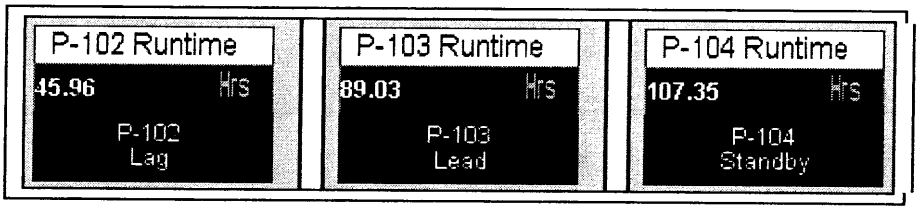


When a button is clicked, the label changes to the opposite action.



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.





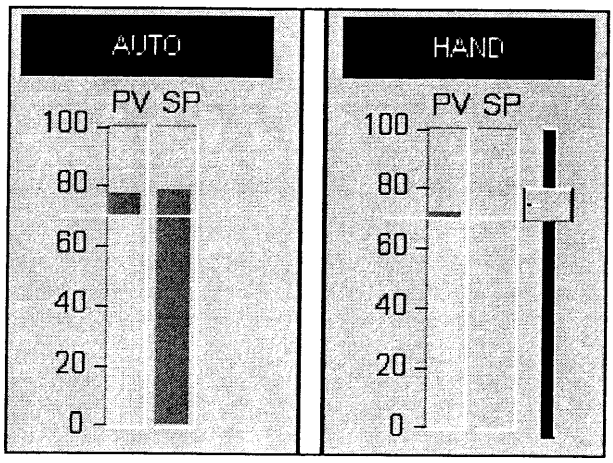
Data Entry Boxes

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.



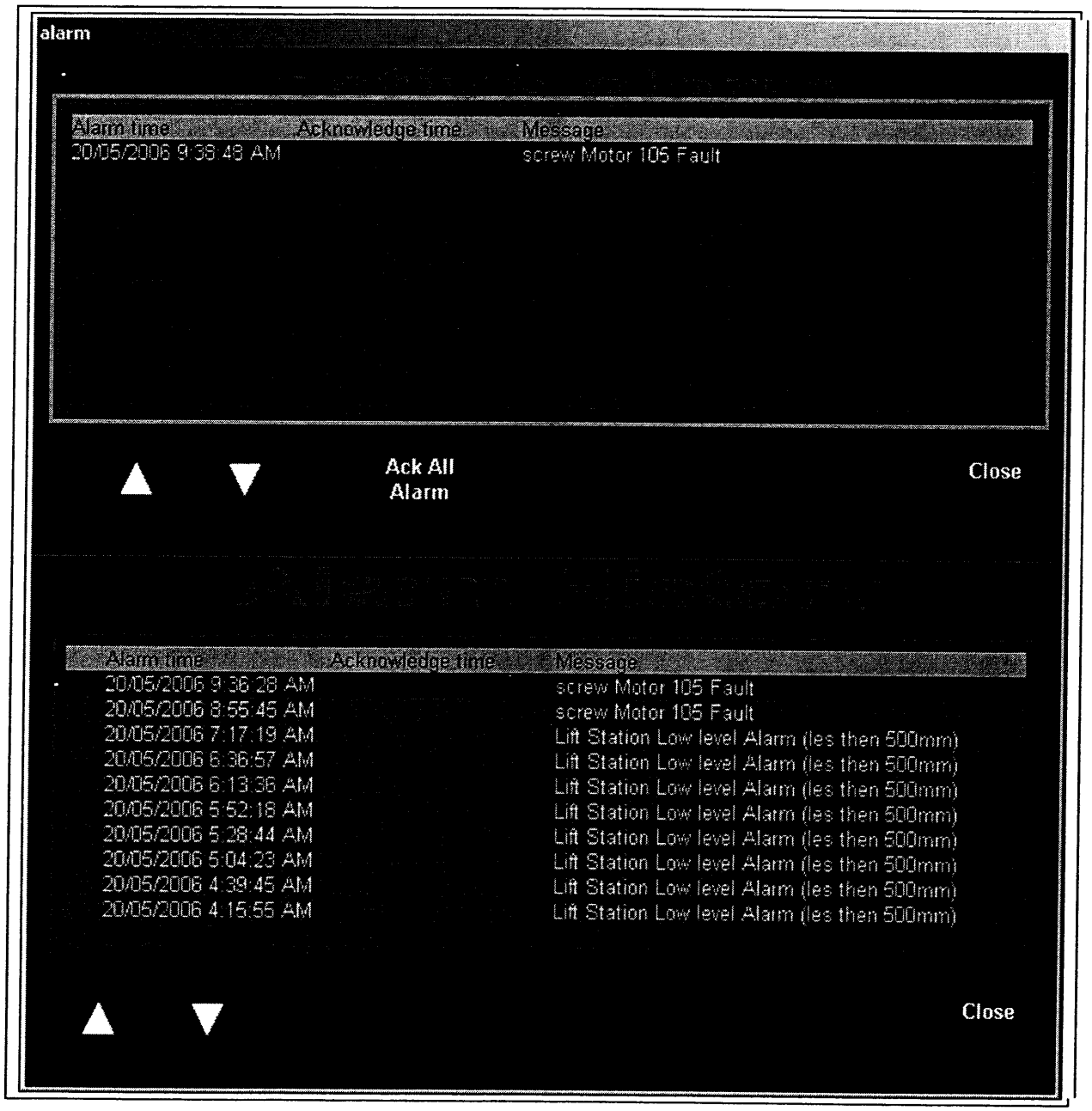
Sliders

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.

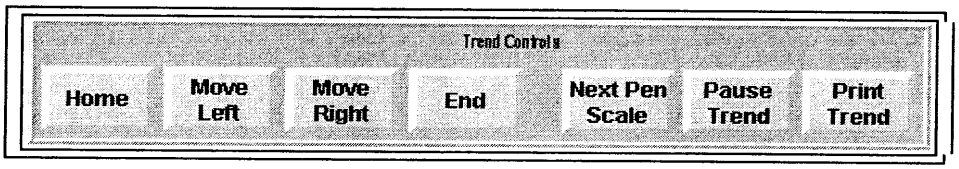
6.4.1.6 Trends

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.

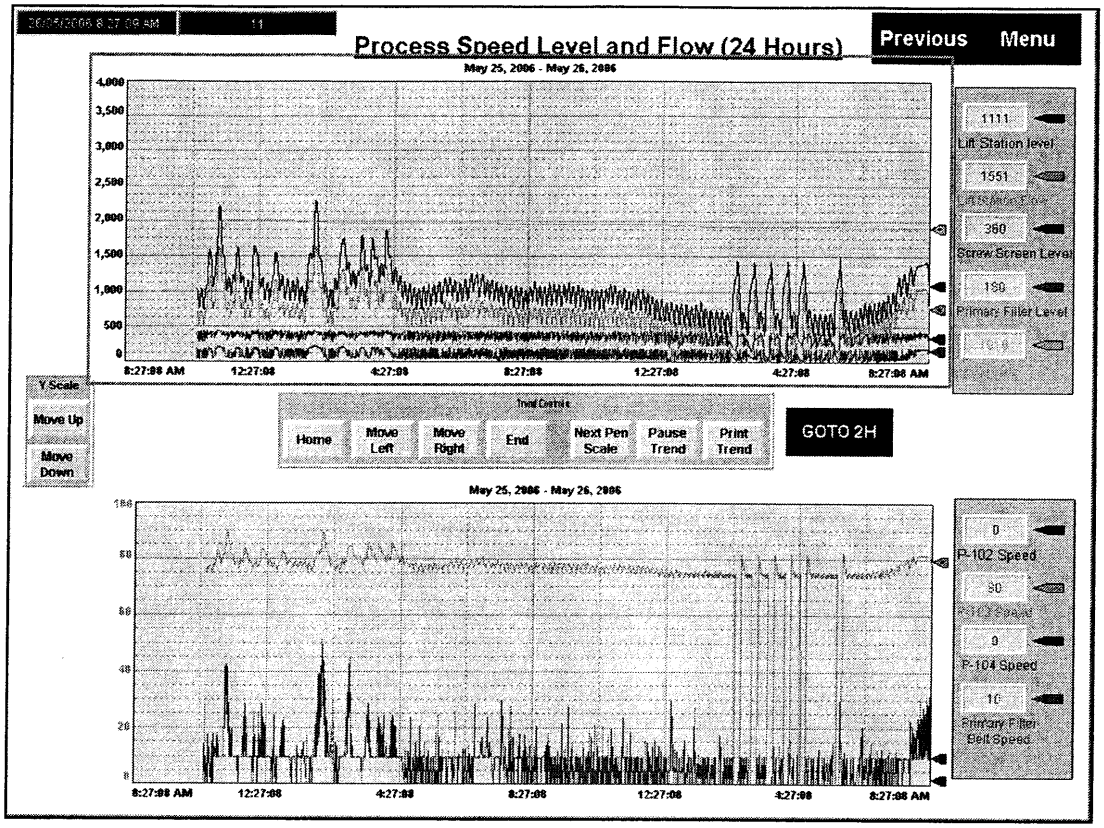
The End button sets the right hand edge of the trend to the present time.

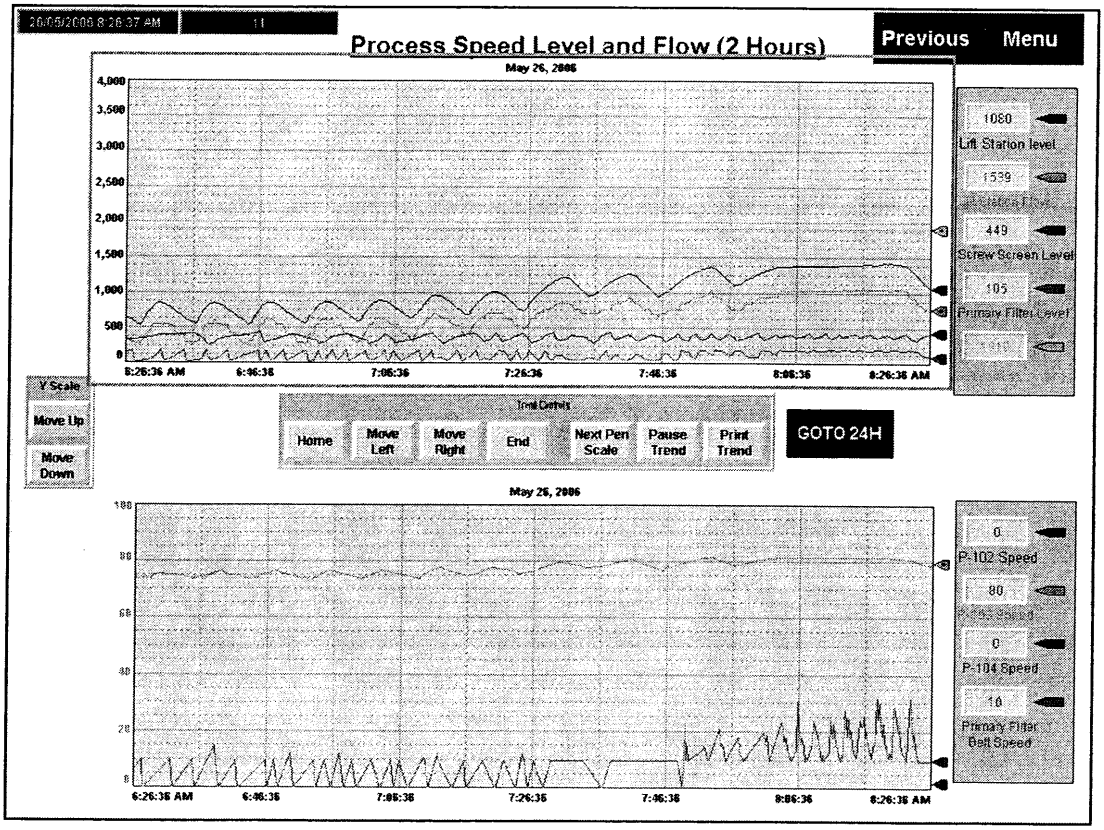
The pen scales are all the same for each trend group, so the Next Pen Scale button is not effective.

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

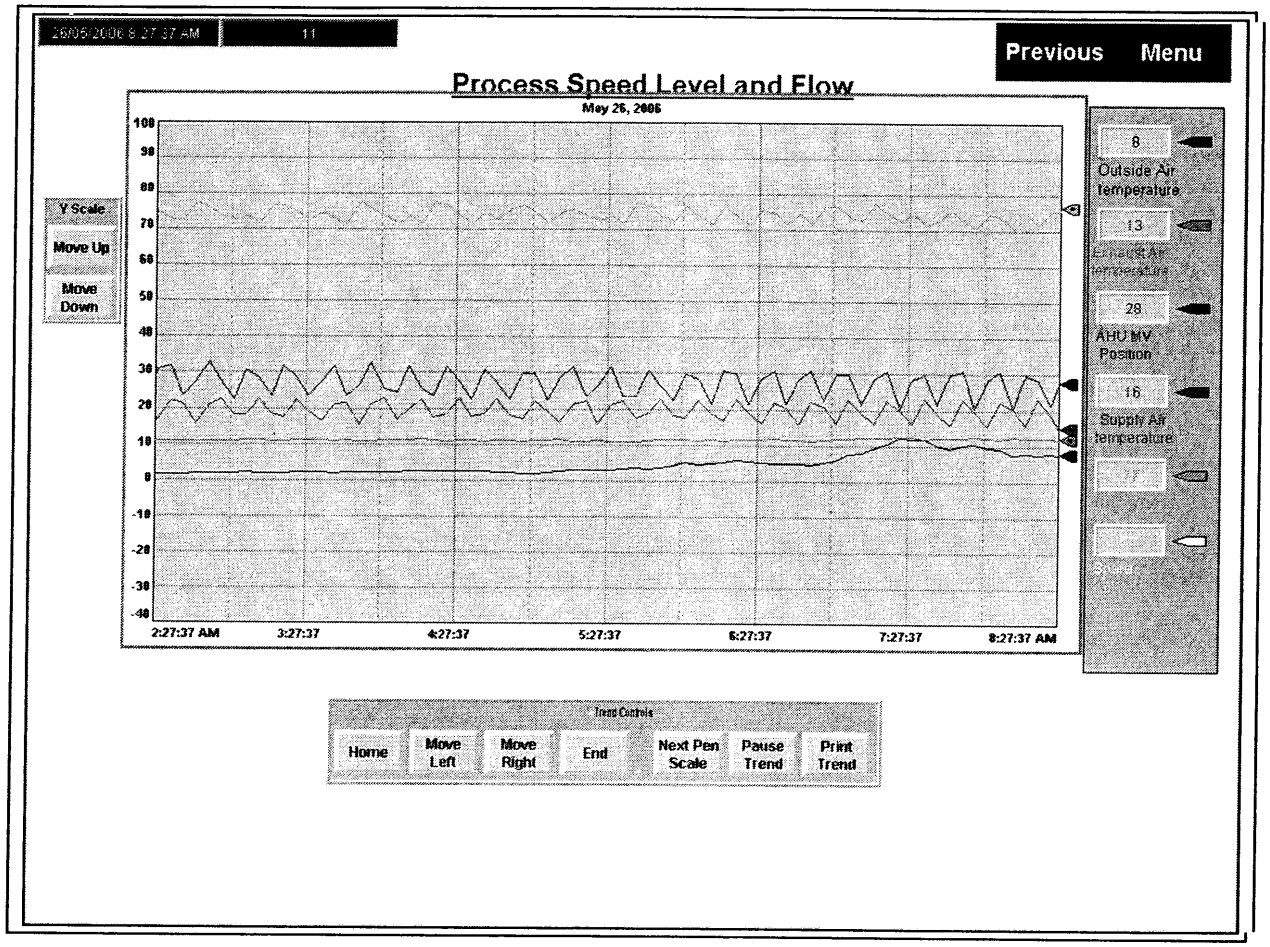
The Print Trend button prints a trend to a PDF file.

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

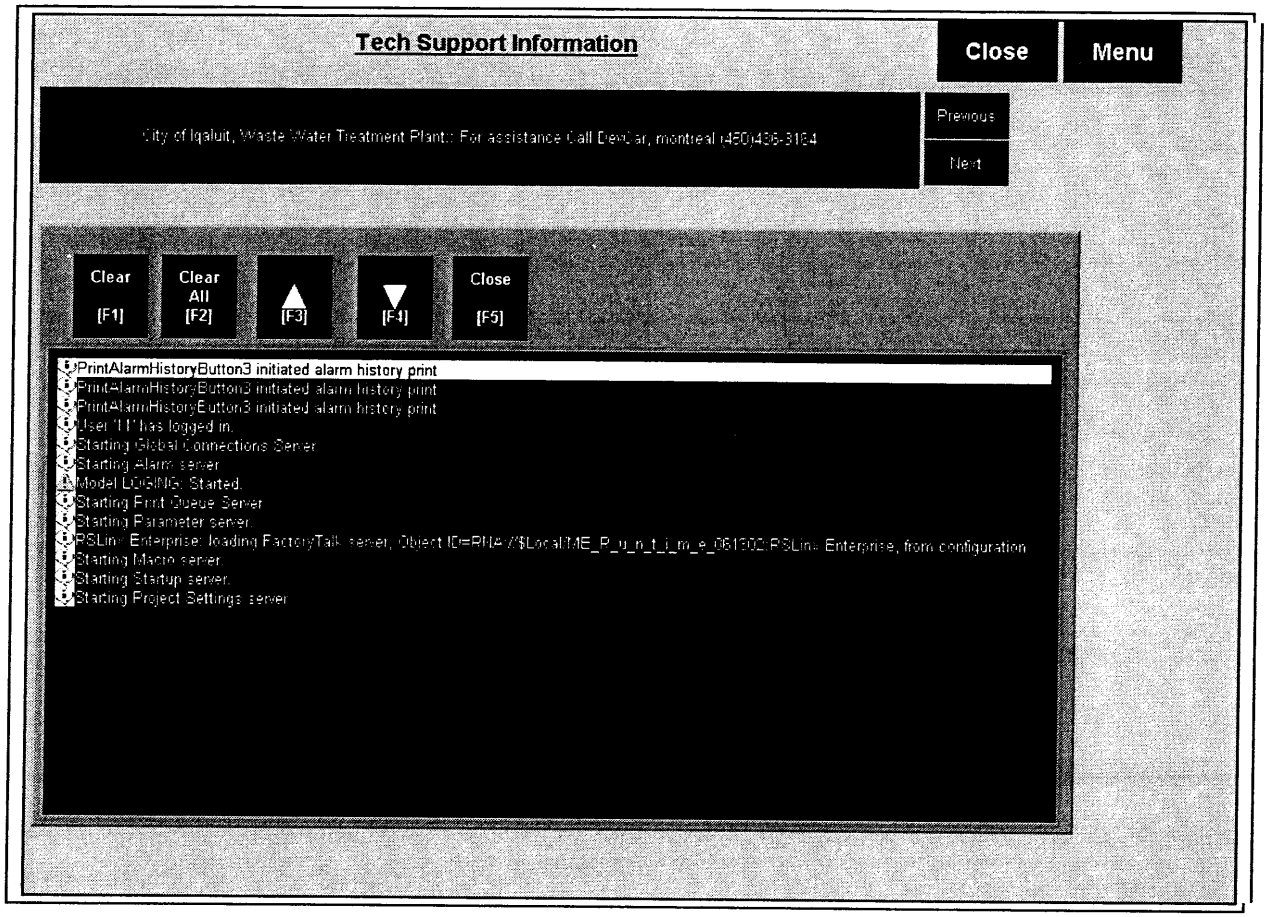

Process Speed Level and Flow (2 Hours)
Previous
Menu
May 26, 2006
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
8:26:36 AM
6:46:36
7:06:36
7:26:36
7:46:36
8:06:36
8:26:36 AM
1080
Lift Station level
1539
449
Screw Screen Level
105
Primary Filter Level
Y Scale
Move Up
Move Down
Trend Controls
Home
Move 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

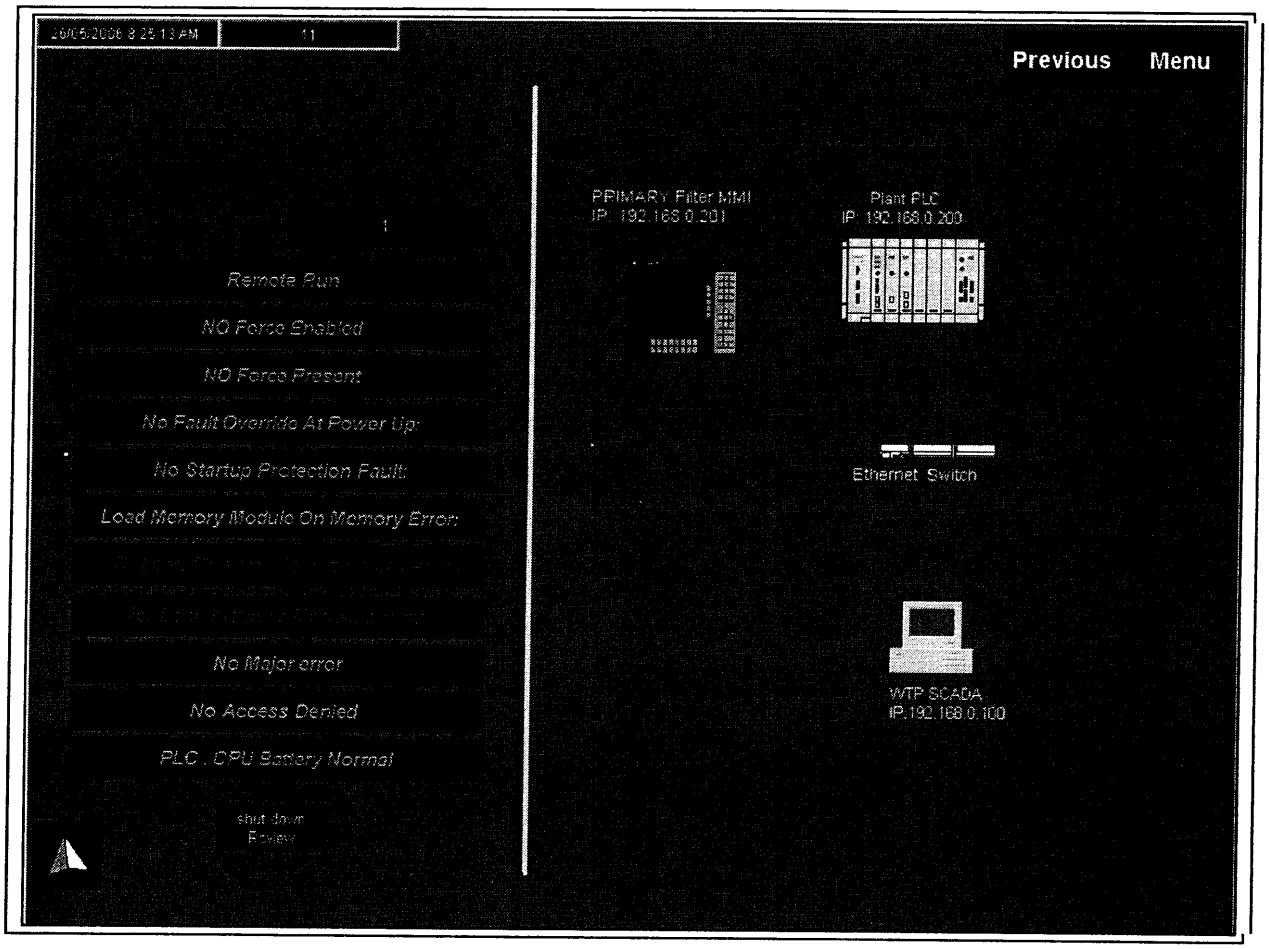
A Diagnostics page has been supplied and is available from the Navigation Menu. It contains contact information for the system programmer. This page logs activities on the system, and is mainly useful to the programmer for diagnosing system problems.



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.

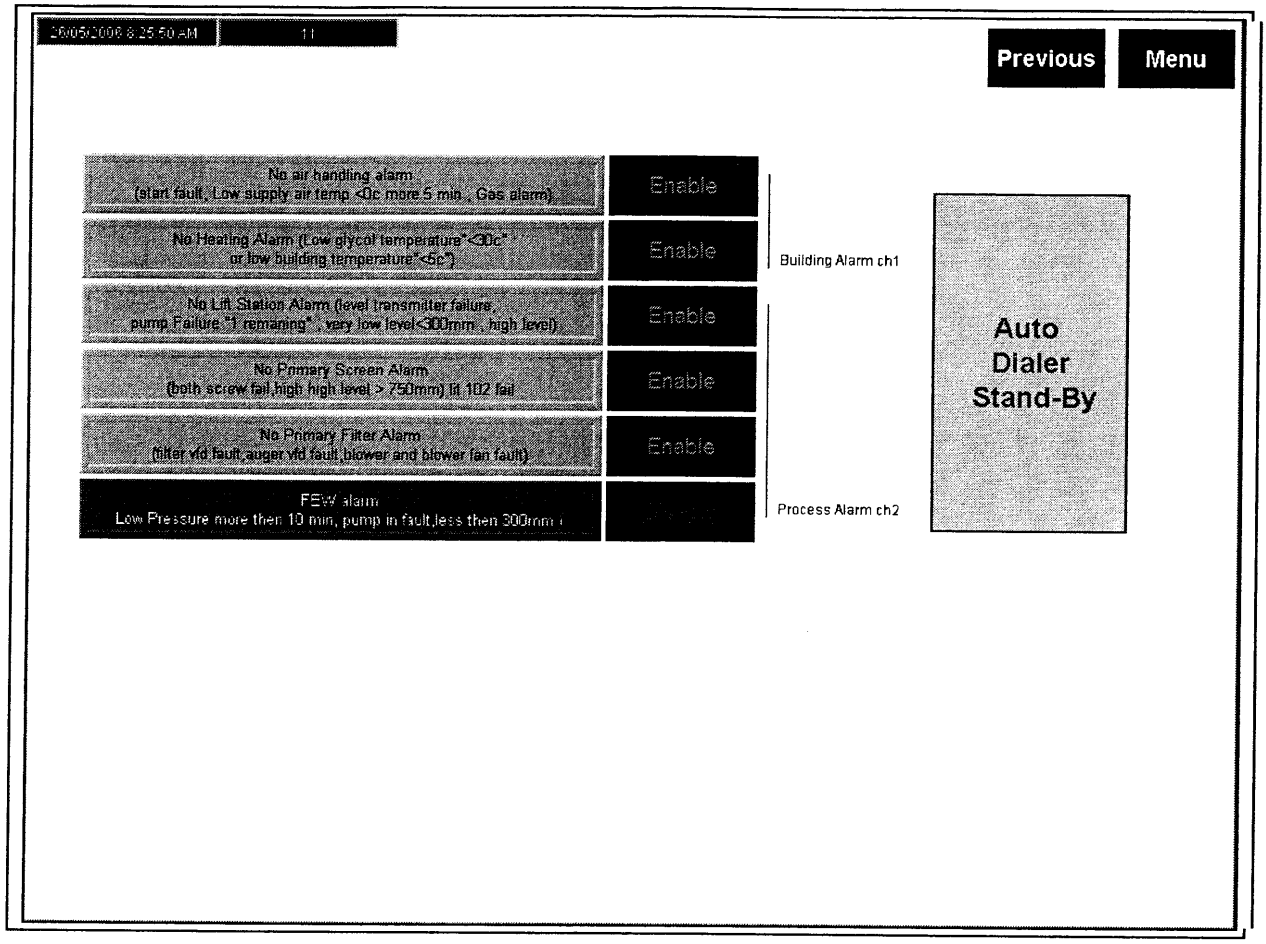
It calls out six distinct alarms, that monitor different areas of the plant. They are described in more detail in Section 6 of the Process and Mechanical O&M Manual.

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:			

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:			

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:			

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** 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
	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

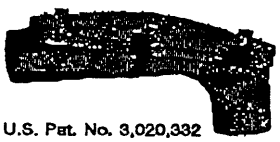
ELBY and ELBD 90° Pulling Elbows: Explosion-Proof, Dust-Ignition-Proof

UNILETS® for Use with Threaded Metal Conduit.





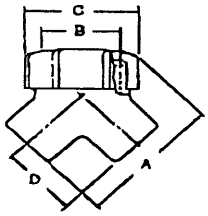
Type and Size (Inches)	Catalogue Number Aluminum	Ferrous Alloy
ELBY Capped Elbow		
1/2	ELBY-50A	ELBY-50
3/4	ELBY-75A	ELBY-75
1	ELBY-100-A	ELBY-100
1-1/4	ELBY-125-A	ELBY-125
ELBY Pulling Elbow		
1/2	ELBD-50-A	ELBD-50
3/4	ELBD-75-A	ELBD-75
1	ELBD-100-A	ELBD-100
1-1/4	ELBD-125-A	ELBD-125
1-1/2	ELBD-150-A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

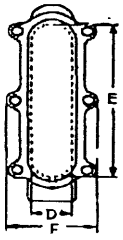
Patented Roller Feature–Listings in Bold Type

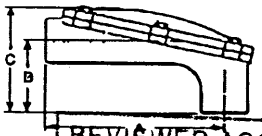
ELBY



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

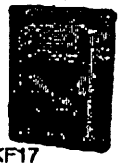
JOB; WASTE WATER TREATMENT PLANT AT IQUALUIT, NUNAVUT
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK per; C. FAUTEUX, T.P.
G, FAUTEUX, P.ENG.

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 30 Amp 600 Vac 2 H.P. 120 Vac 3 H.P. 240 Vac 7.5 H.P. 480 Vac 10 H.P. 600 Vac	ECSK2MS[2]
	3 Pole, Three Phase	30 Amp 250 Vac 30 Amp 600 Vac 3 H.P. 120 Vac 7.5 H.P. 240 Vac 10 H.P. 480 Vac 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

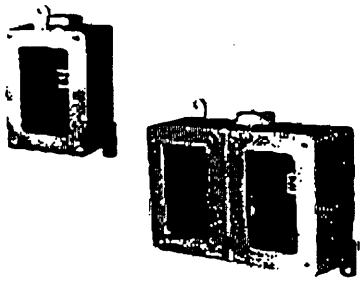
JOB; WASTE WATER TREATMENT PLANT AT IQUALUIT, NUNAVUT
CONTRACTOR PRE-APPROVAL;
SIFEC-KUDLIK per; C. FAUTEUX, T.P.
G, FAUTEUX, P.ENG.
P.A.PELLETIER, P.ENG.

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

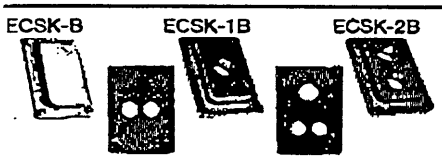
ECS Control Stations and Pilot Lights: Explosion-Proof, Dust-Ignition-Proof, Factory Sealed and Non Factory Sealed

ECS Covers and Back Boxes Only



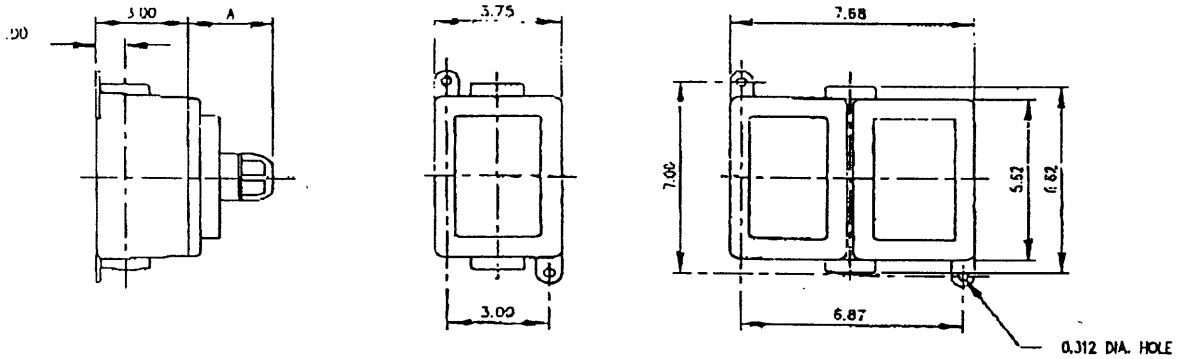
Hub Size (in inches)	Description	Catalogue Number
	ECS Series Mounting Boxes	
	C.S.A. certified when complete with ECSK cover assembly.	
	Boxes and covers sold separately.	
3/4	Single Gang	ECS-175
1	Single Gang	ECS-110
3/4	Two Gang	ECS-275
1	Two Gang	ECS-210

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

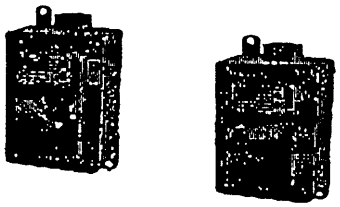
750 Lawrence Street
Cambridge, Ontario N3H 2N1

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.

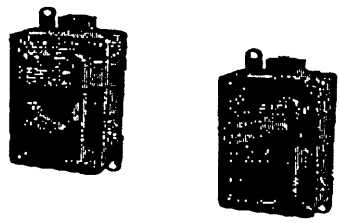
Class I, Div. 1 and 2,
Groups B, C, D;
Class I Zone 1 and 2, IIB + H_2 T6
Class II, Div. 1 and 2,
Groups E, F, G;
Class III, Encl. 3, weatherproof
NEMAC Type 3R, 7BCD, 9EFG
CSA Approved

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

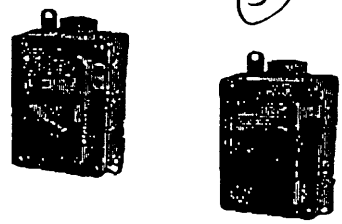
Toggle Switches



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

750 Lawrence Street
Cambridge, Ontario N3H 2N1

EGS Electrical Group | Appleton

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.

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**

750 Lawrence Street
Cambridge, Ontario N3H 2N1

EGS Electrical Group | Appleton

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.

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"

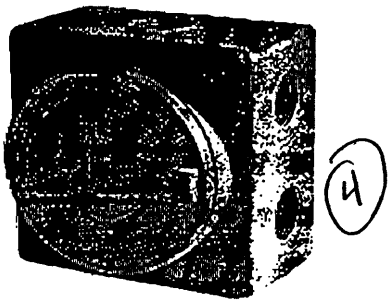
†Turning radius with cover or plug removed.

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.

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

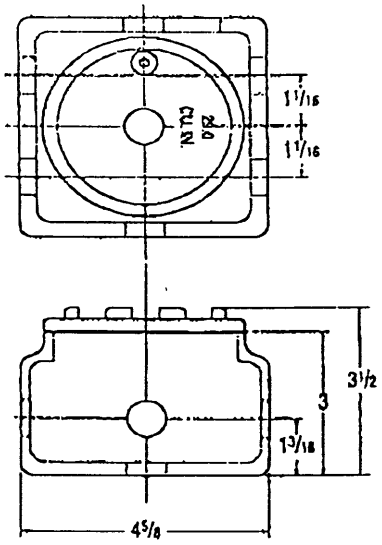
GRSS Conduit Outlet Boxes with Multiple Hubs, Explosion-Proof, Dust-Ignition-Proof

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

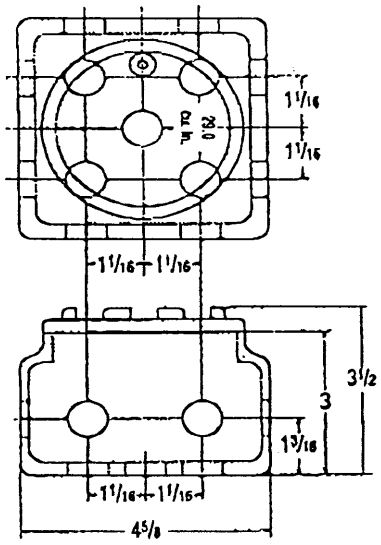


Box Type	Conduit Size (In.)	Cover Opening (Inches)	Hubs	Plugs	Catalogue Number Aluminum
GRSS Outlet Box with Cover					
Internally threaded aluminum bodies with externally threaded aluminum form 1 covers. Has 7 hubs; 2 on each of the sides, 1 on the top, 1 on the bottom and 1 on the centre in the back. 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

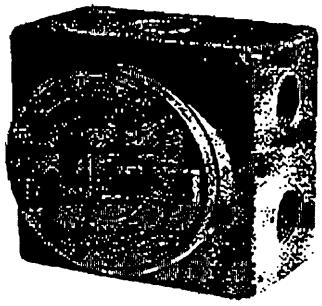
EGS Appleton

JOB; WASTE WATER TREATMENT PLANT AT IQUALUIT, NUNAVUT
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Class III, Enclosure 3

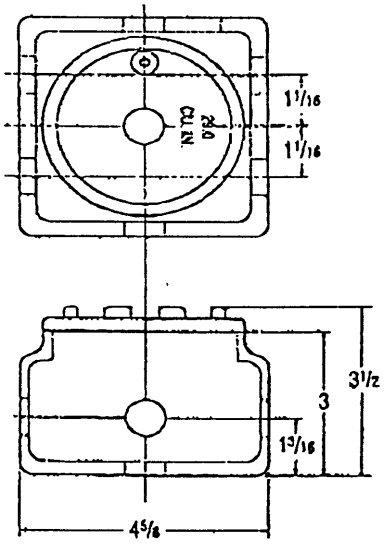
GRSS Conduit Outlet Boxes with Multiple Hubs, Explosion-Proof, Dust-Ignition-Proof

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

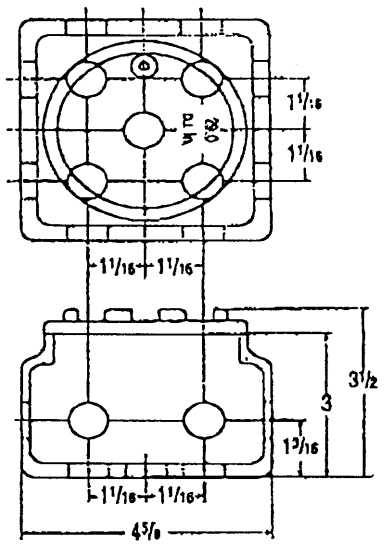


Box Type	Conduit Size (In.)	Cover Opening (Inches)	Hubs	Plugs	Catalogue Number Aluminum
GRSS Outlet Box with Cover					
Internally threaded aluminum bodies with externally threaded aluminum form 1 covers. Has 7 hubs; 2 on each of the sides, 1 on the top, 1 on the bottom and 1 on the centre in the back. 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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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

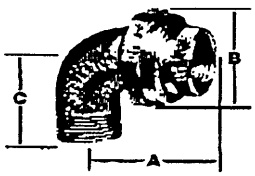
Unions: UNY, UNF and UNL; Explosion-Proof, Dust-Ignition-Proof

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.

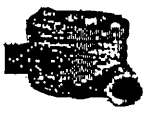
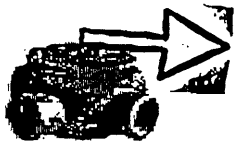
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JOB; WASTE WATER TREATMENT PLANT AT IQUALUIT, NUNAVUT
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J-3

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.

EGS Electrical Group | Appleton

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.

9-10

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
			16		

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.

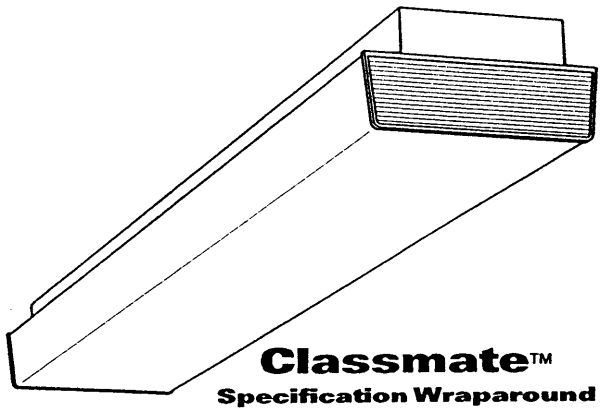
LISTING — UL listed and labeled. Listed and labeled to comply with Canadian Standards (see options). Listed and labeled to comply with Mexican Standards (see options).

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

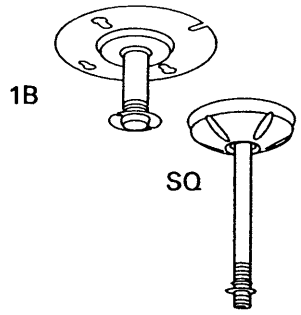
MOUNTING DATA

For unit or row installation, surface or stem mounting.

Unit installation —Two single-stem hangers required.

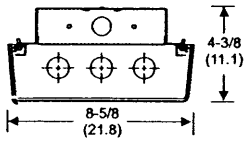
Row installation — One hanger per fixture plus one per row required.

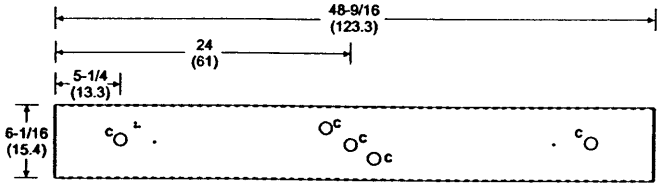
See ACCESSORIES below for hanging devices.



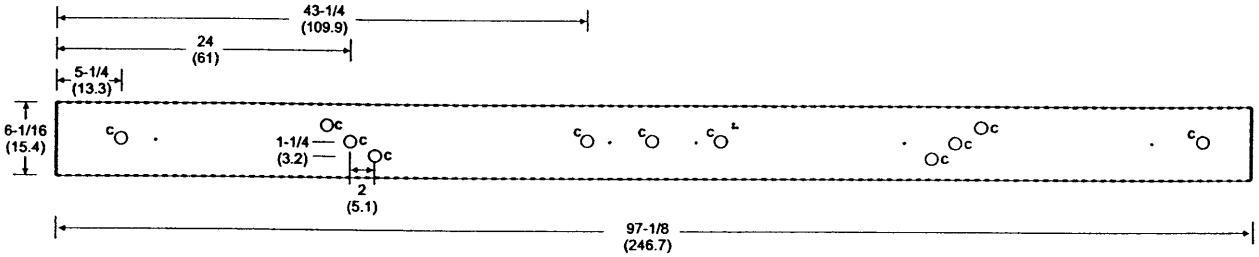
DIMENSIONS

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 1/3 One 3-lamp ballast 1/4 One 4-lamp ballast 2/3 Two 3-lamp ballasts EL Self-contained emergency inverter CSA Listed and labeled to comply with Canadian Standards 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

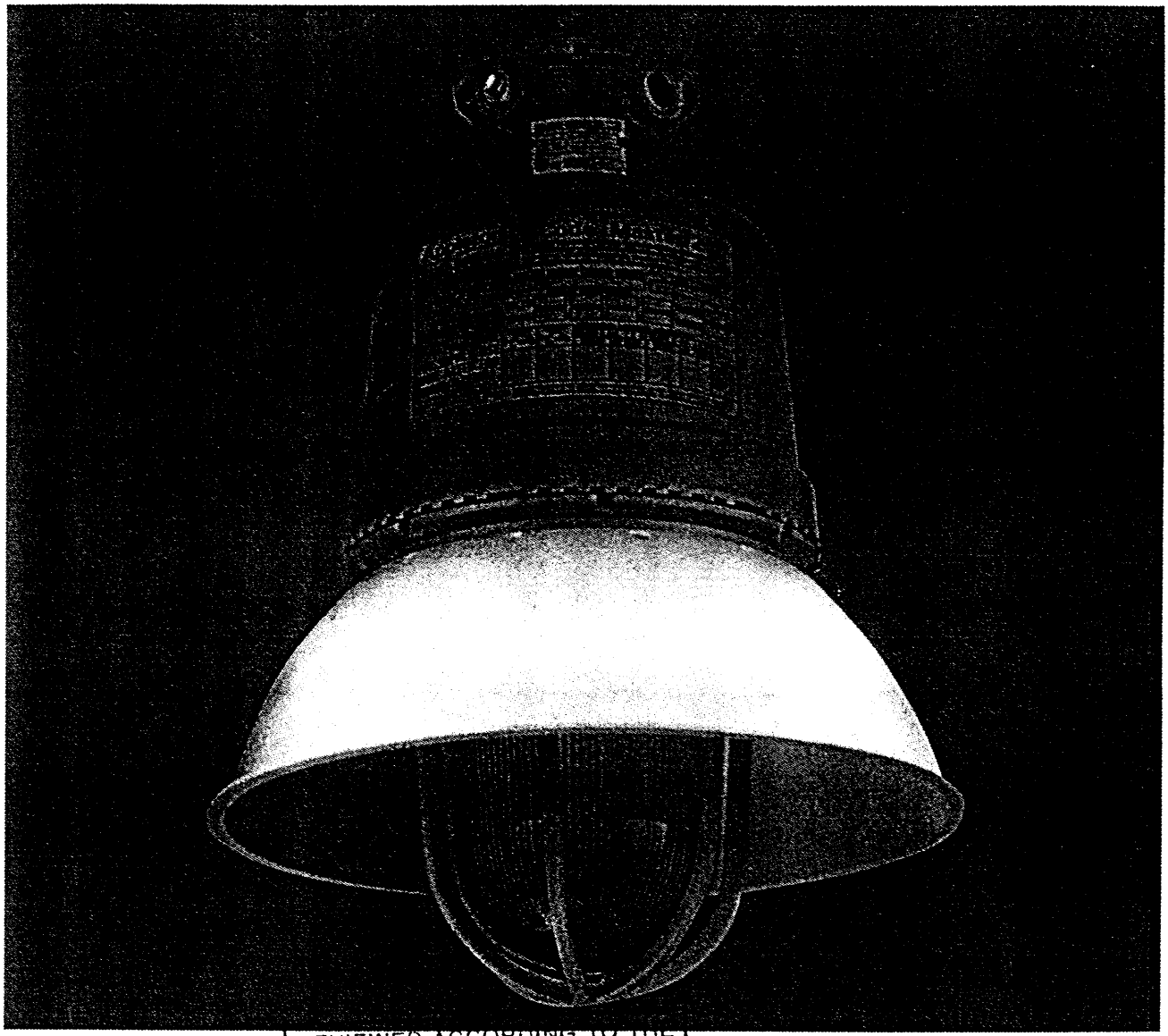
LITHONIA LIGHTING
GENERAL FLUORESCENT LIGHTING
ONE LITHONIA WAY, CONYERS, GEORGIA 30012, TELEPHONE 770-922-9000, FAX 770-929-8789
www.lithonia.com • IN CANADA: 1100 50TH AVE., LACHINE, QUEBEC H8T 2V3

#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;
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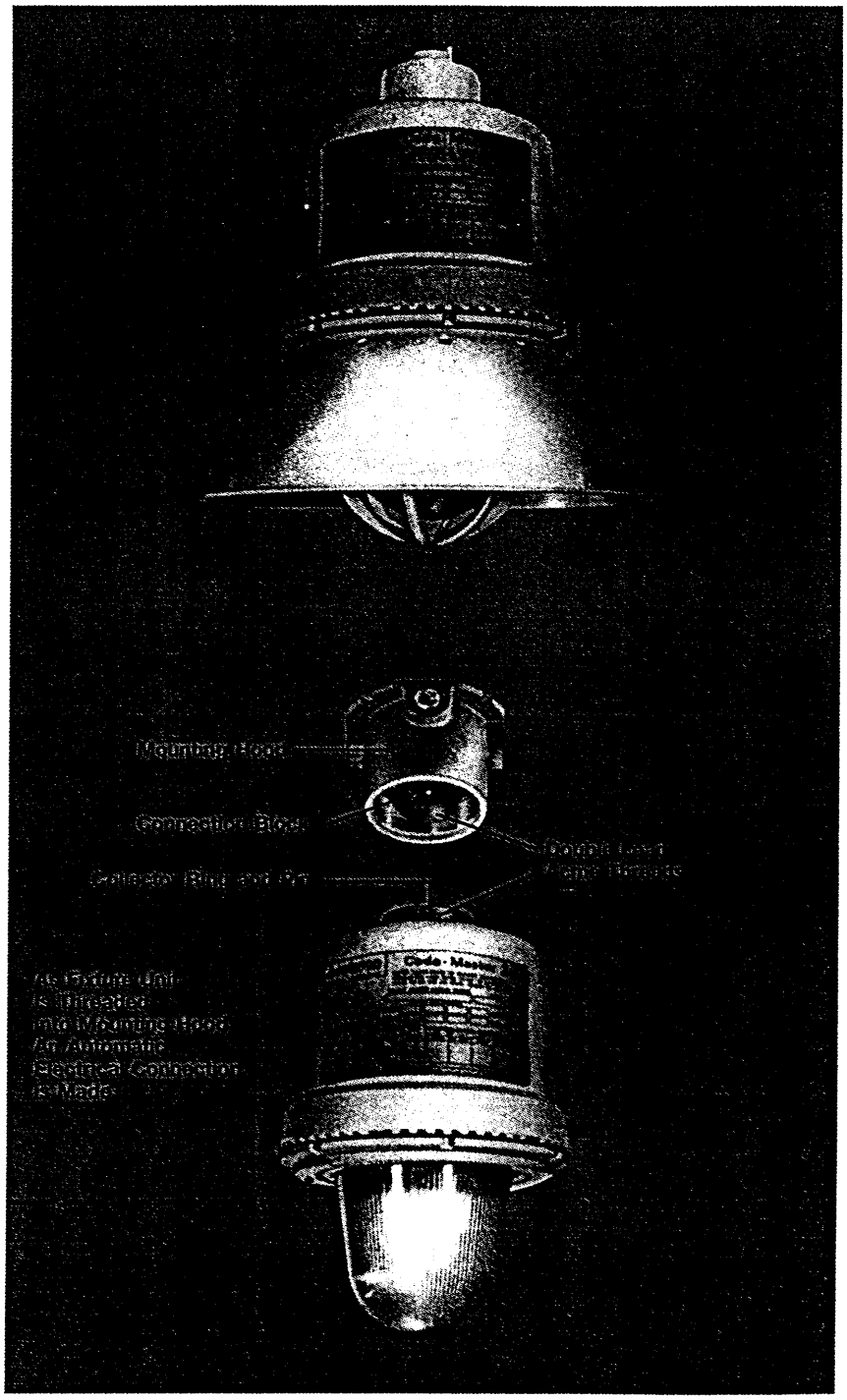
Applications

- 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

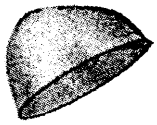
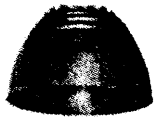
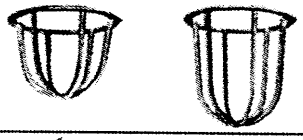
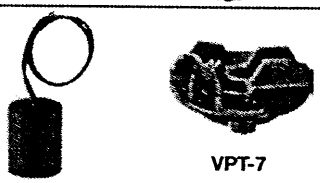
10.2

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®

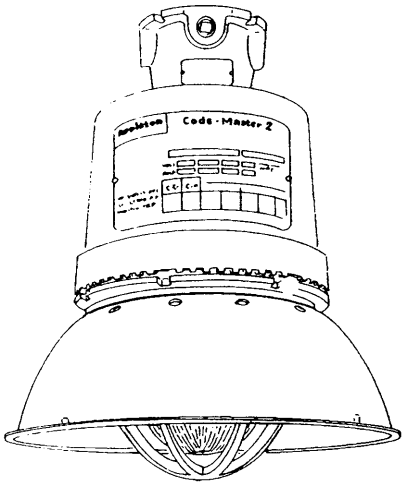
654028-001
INSTRUCTION SHEET

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

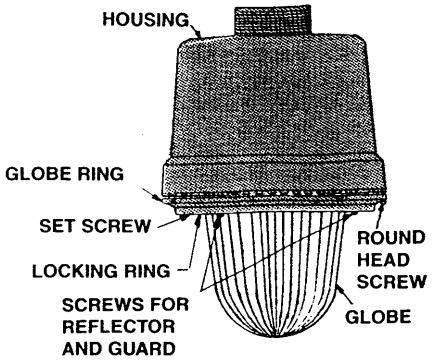
Single voltage fixtures are completely wired, needing no additional field wiring. Fixtures with multi-tap ballasts (more that one ballast voltage listed on nameplate) need to have one ballast primary lead connected to fixture lead.

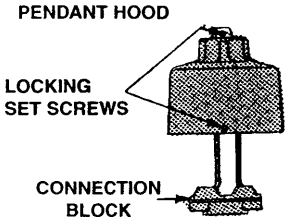
REMOVING GLOBE-RING ASSEMBLY

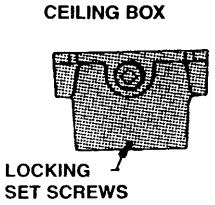
Loosen round head locking screw in globe ring until screw clears pry bars in ballast housing. Unthread globe-ring assembly (Do not hold glass globe to unthread globe-ring assembly as this might loosen globe locking ring. Should the globe locking ring be accidentally loosened it must be retightened. Loosen 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.

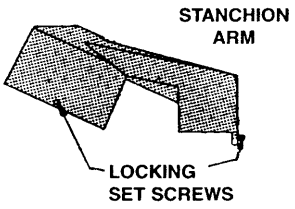
WIRING MULTI-TAP BALLAST

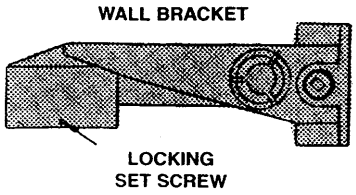
Loosen the three screws securing the socket support plate, remove plate and set aside (enough slack in the wires is provided). Locate fixture lead marked "Line" and connect to ballast voltage lead corresponding to supply voltage. All other ballast voltage leads must remain capped. Replace socket support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



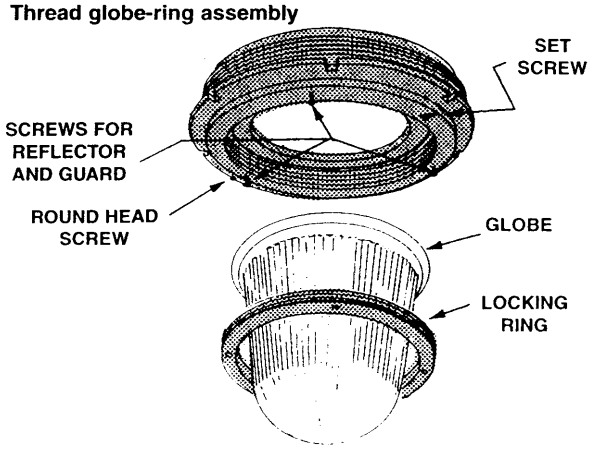








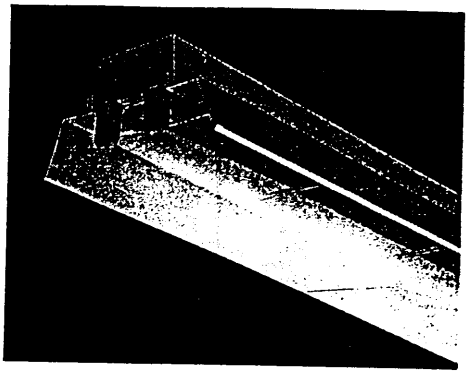
Thread globe-ring assembly



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

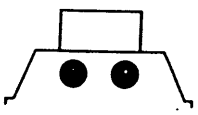
Series	Lamps per cross section	Lamps per fixture	Lamp type	Width[2] in. (cm)	Depth[2] in. (cm)	Length[2] in. (cm)
RI, RIU	1	1	17, 20[1]	9 (22.9)	4¼ (10.8)	24 (61.0)
	2	2				
RI, RIU	1	1	32, 40, 48	9 (22.9)	4¼ (10.8)	48 (121.8)
	2	2				
TRI, TRIU	1	2	32, 40, 48	9 (22.9)	4¼ (10.8)	96 (243.6)
	2	4				
RI,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

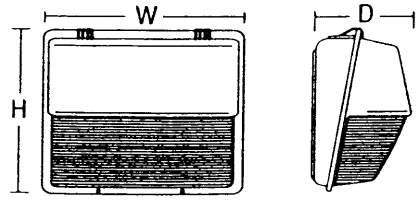
Lamp/Fixture/Ballast Data[9]

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.

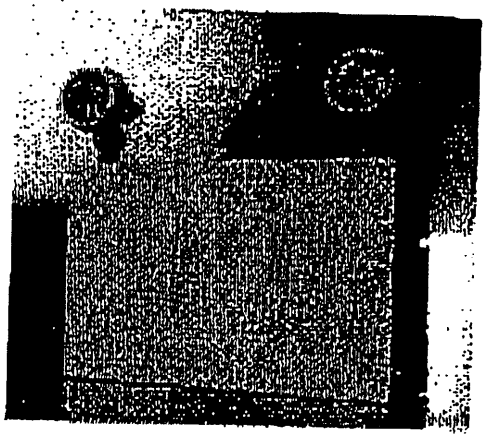
10.4

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.

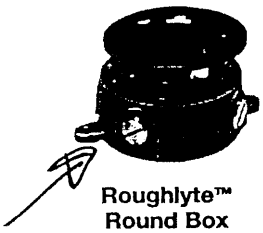
– ONE FOR ELECTRICAL ROOM

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

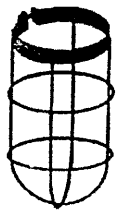
Full molded threads. Fit all Stonco housings.
Globes for vertical mounting only.

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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BY
SMITH TECH (CANADA) INC.



V127 Plated Wire Guard



V131 Cast Aluminum Guard

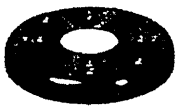
GUARDS

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

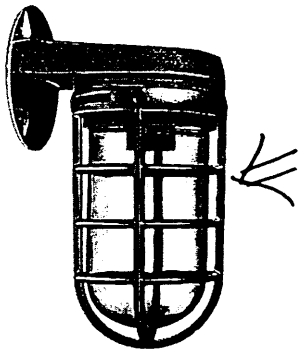
2/2

TYPE NO. _____

CATALOG NO. _____

Stonco

ROUGHLYTE™ Series
Wall Mount



ORDERING INFORMATION

Catalog Number: Example: VW1GC

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

ACCESSORIES

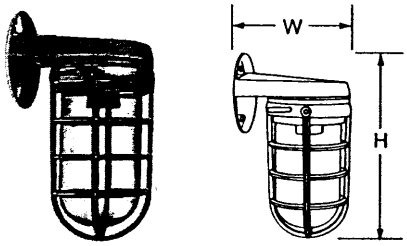
Accessories - See page 5-A

TECHNICAL INFORMATION

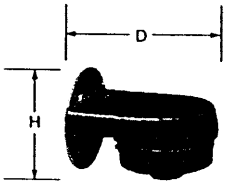
All incandescent Roughlyte ceiling and wall fixtures are not supplied with a lamp. This fixture requires a medium base incandescent A lamp. The lamp can be clear or coated.

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.

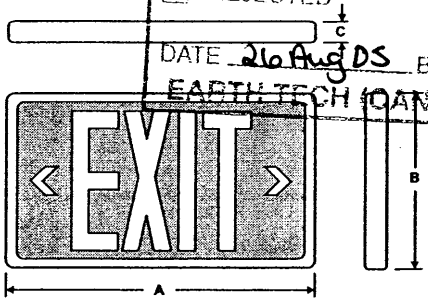


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DATE 26 Aug 05 BY DC
EARTH TECH (CANADA) INC.

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.

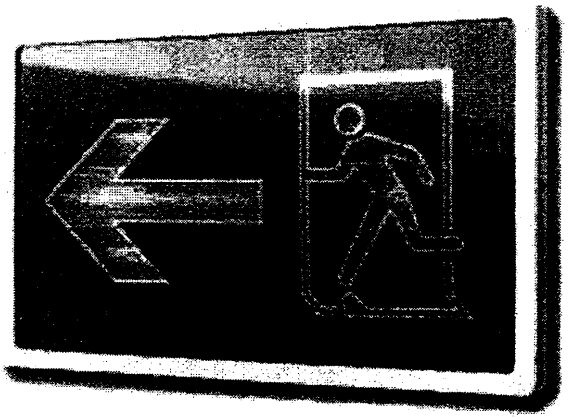
Beghelli

Technical Data

Canadian Nuclear Safety Commission Approved

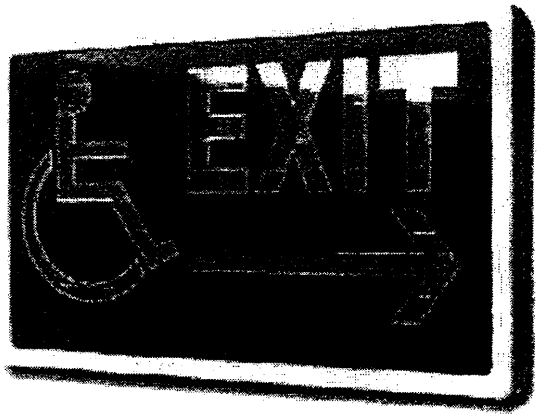
PRACTICAL DESIGN

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
			13		

11/0

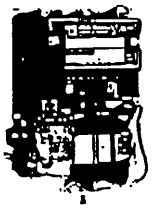
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☒ NO EXCEPTIONS TAKEN
☐ MAKE NOTED CORRECTIONS
☐ REVISE & RESUBMIT
☐ REJECTED
DATE: May 12/05 DC

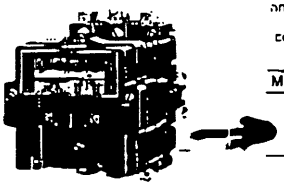
SQUARE D
Schneider Electric

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 • Numéro de type • Code de tension de la bobine • 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

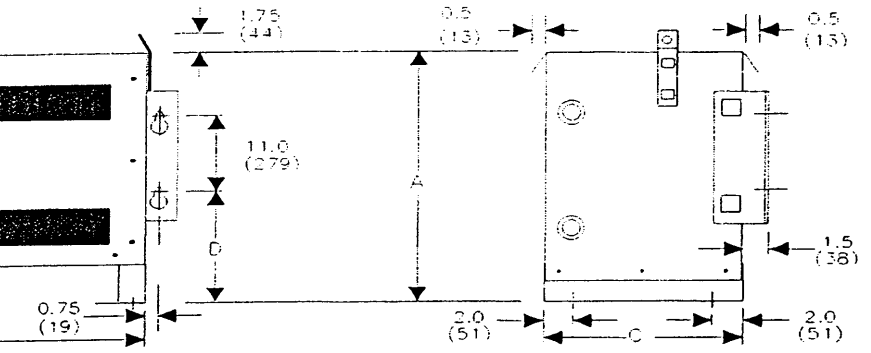
OPTION
SPMGCT

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.

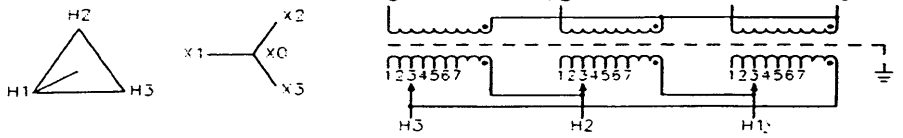


DRIPPROOF COVER / TOIT À L'ÉPREUVE DES ÉGOUTTEMENTS

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

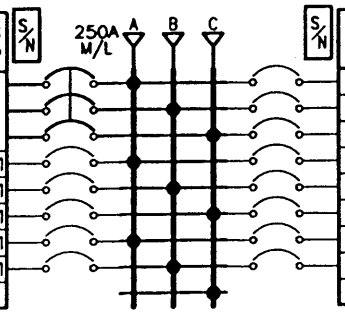
1/1

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

Blank

Blank

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

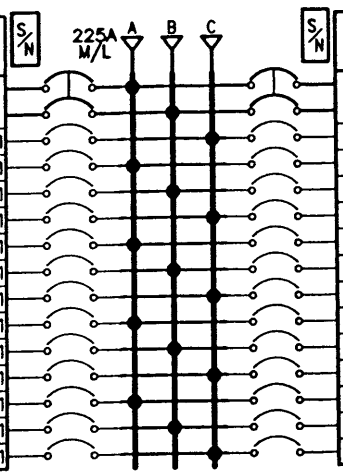
13-15A/1P EDB

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

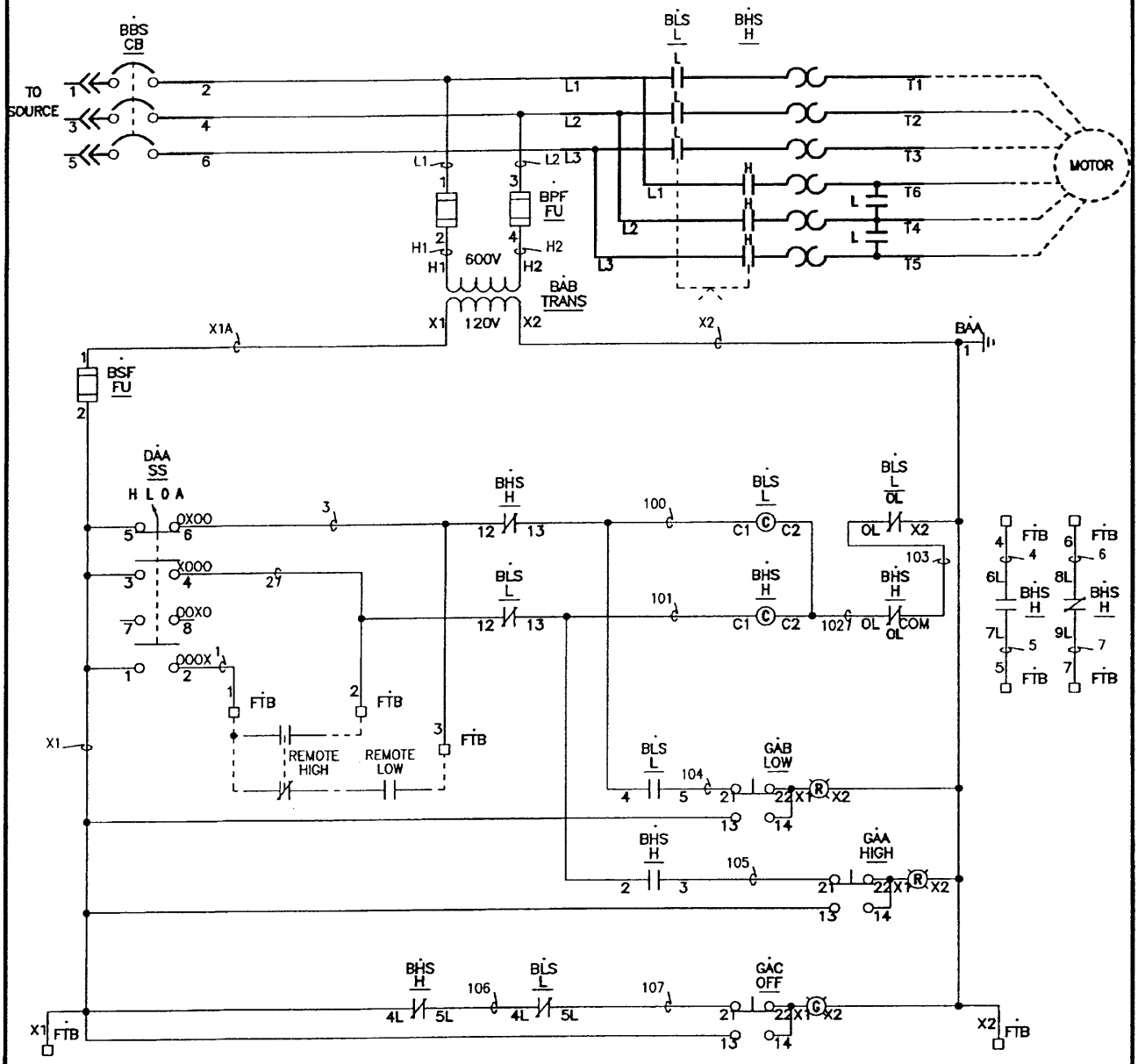
SQUARE D FACTORY ORDER NUMBER: 20507290-001

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	-	----	--	--/--/--

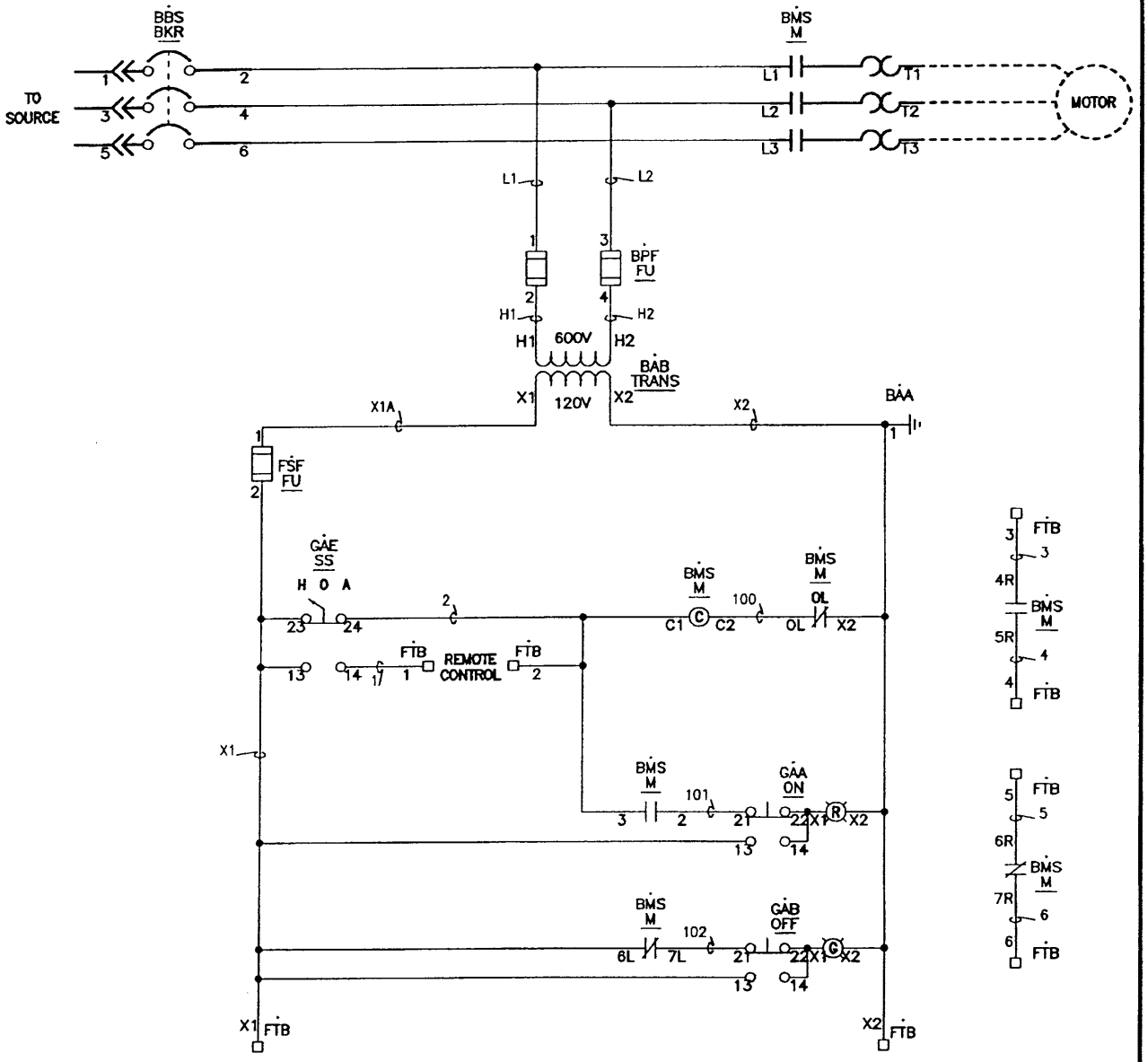


THERMAL UNITS INCLUDED
HEATSHRINK WIRE MARKERS

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	-	----	--	--/--/--

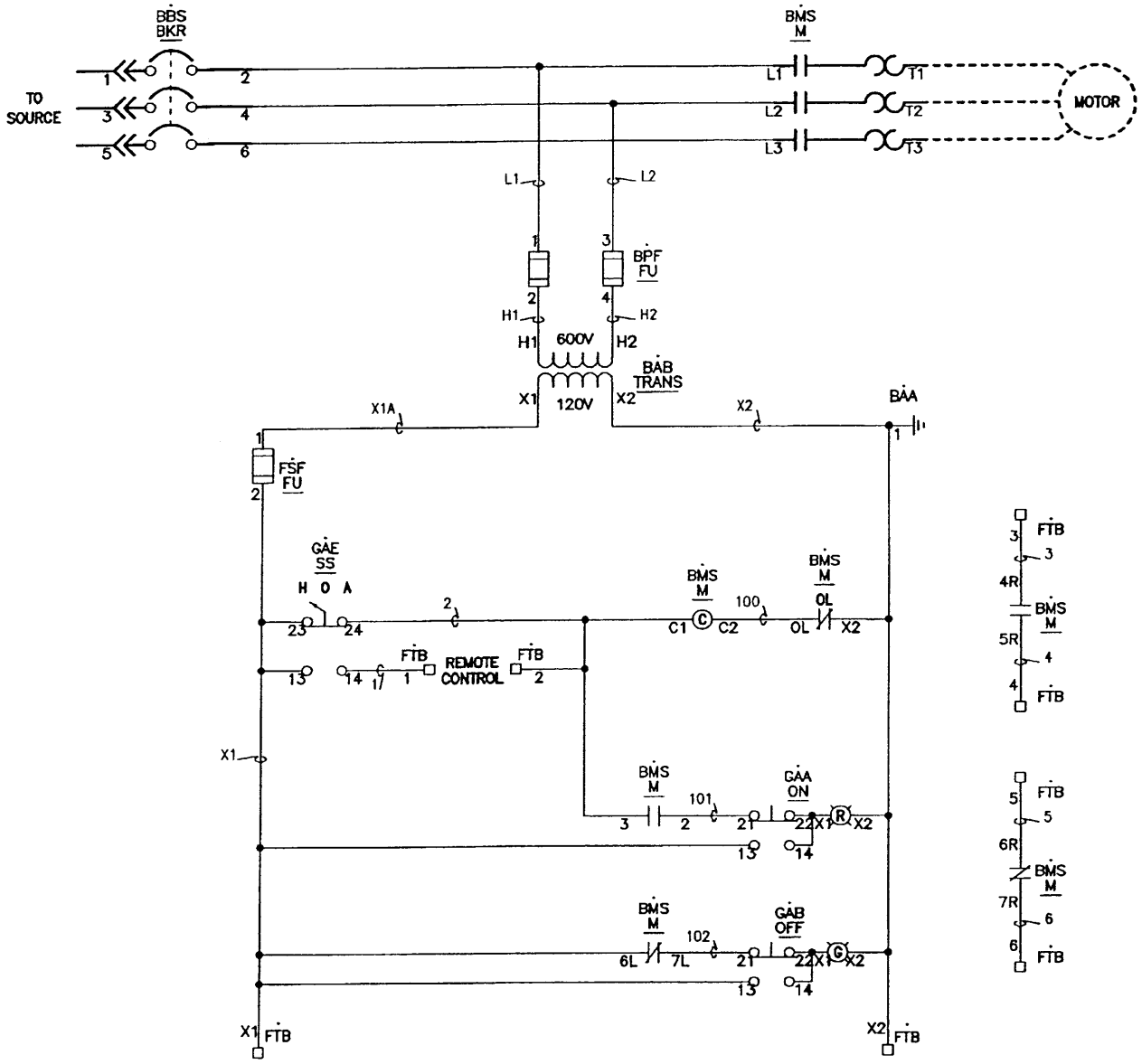


THERMAL UNITS INCLUDED
HEATSHRINK WIRE MARKERS

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	-	----	--	--/--/--

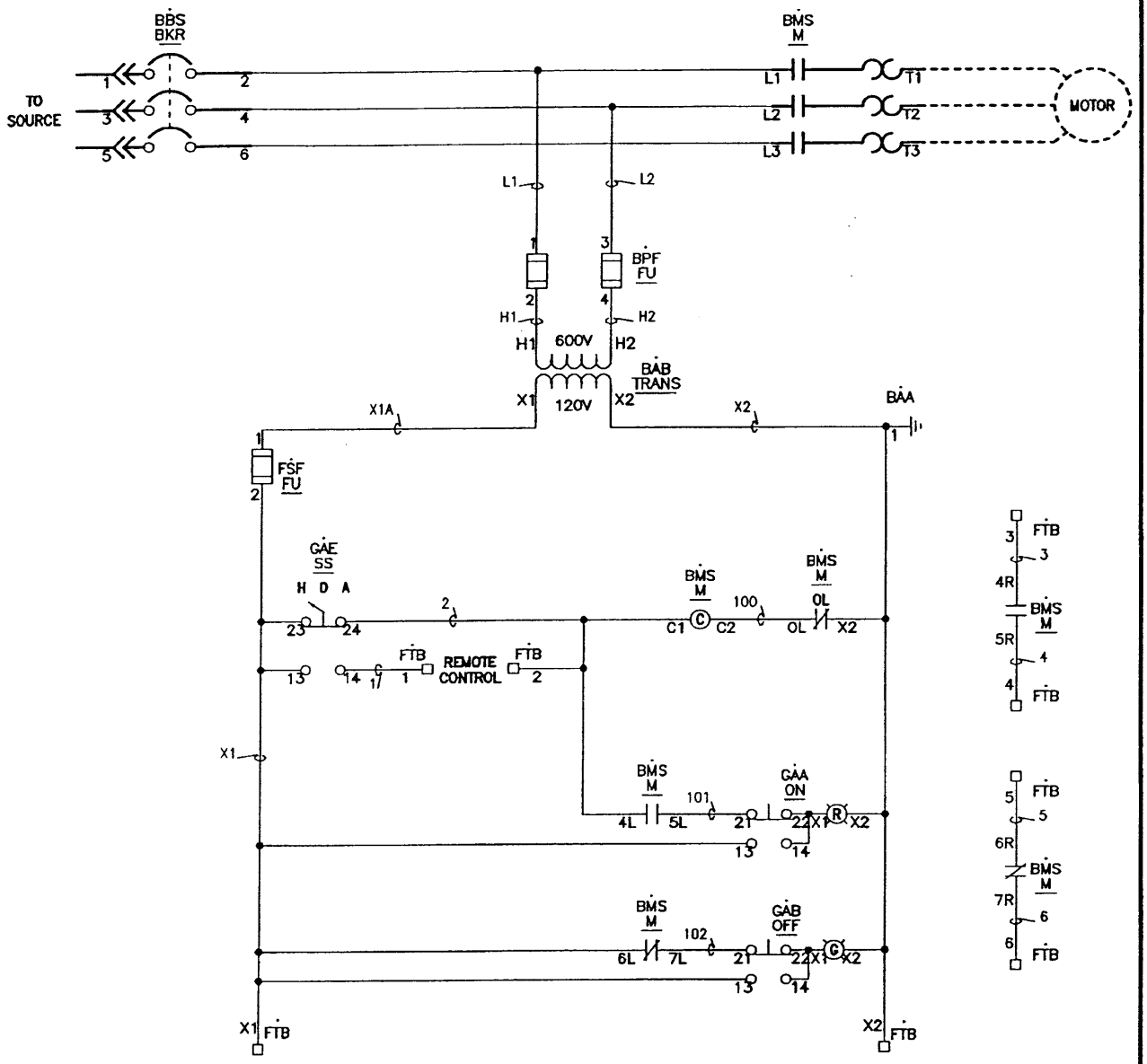


THERMAL UNITS INCLUDED
HEATSHRINK WIRE MARKERS

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

11.6.4

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

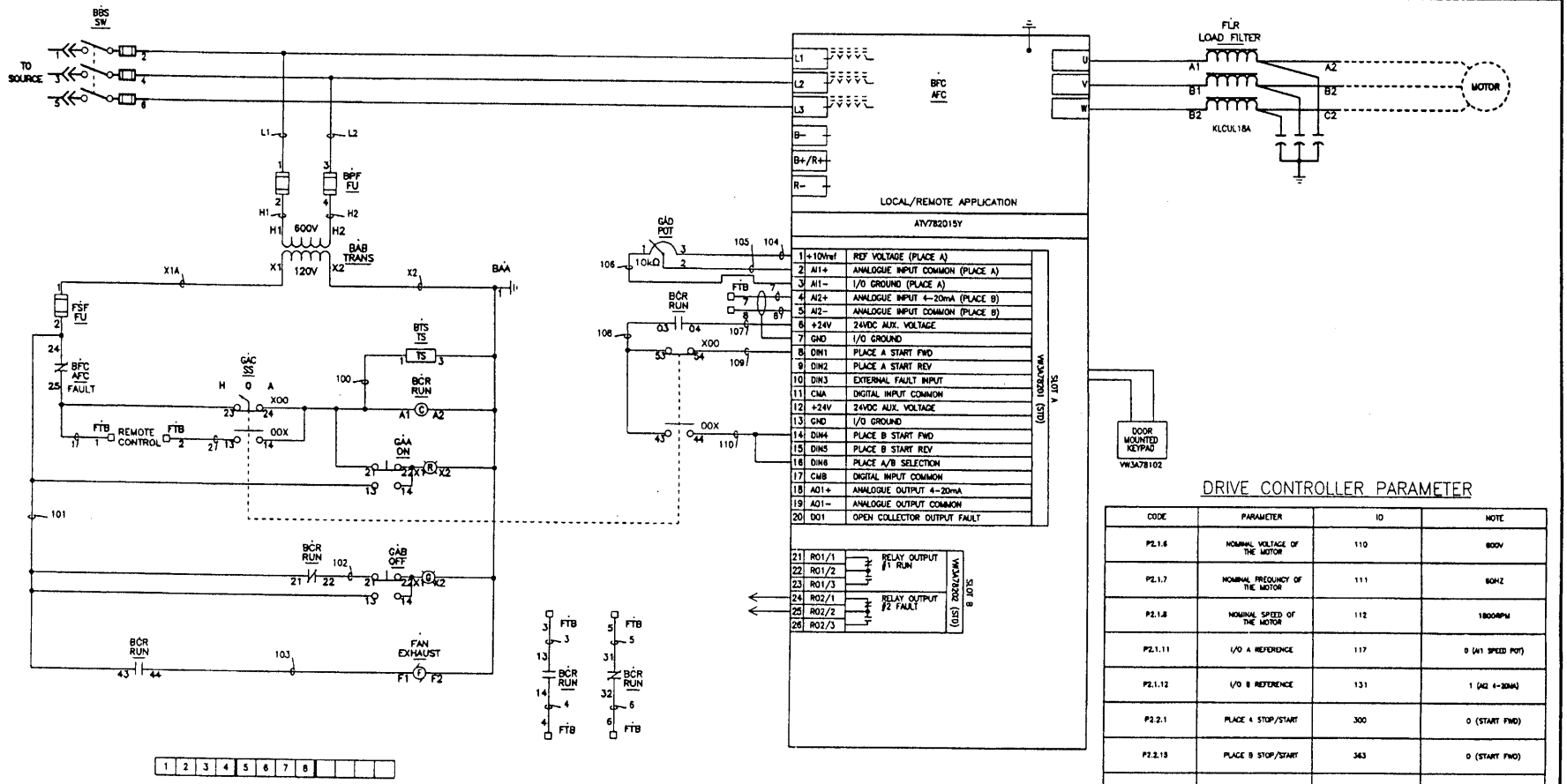


THERMAL UNITS INCLUDED
HEATSHRINK WIRE MARKERS

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# E20507290-001-04	PG 1 OF 1 REV A

11.6.5

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

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

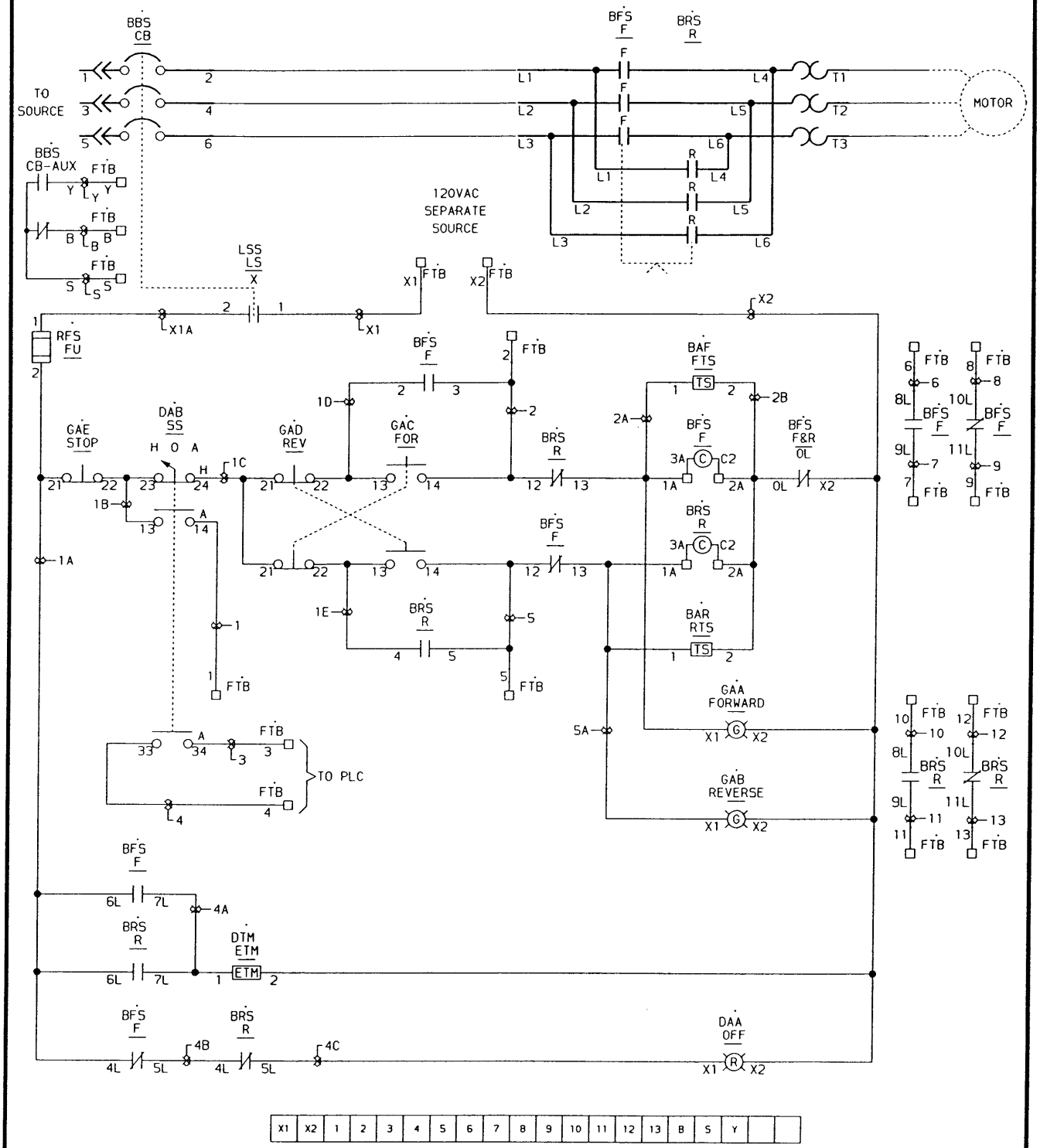
JOB NAME:	IQUALUIT SEWAGE WATER STATION
JOB LOCATION:	MIRABEL QC
DRAWN BY:	CAD
ENGR:	STEPH USES
DATE:	June 15 2005
DRAWING STATUS:	RECORD

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



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

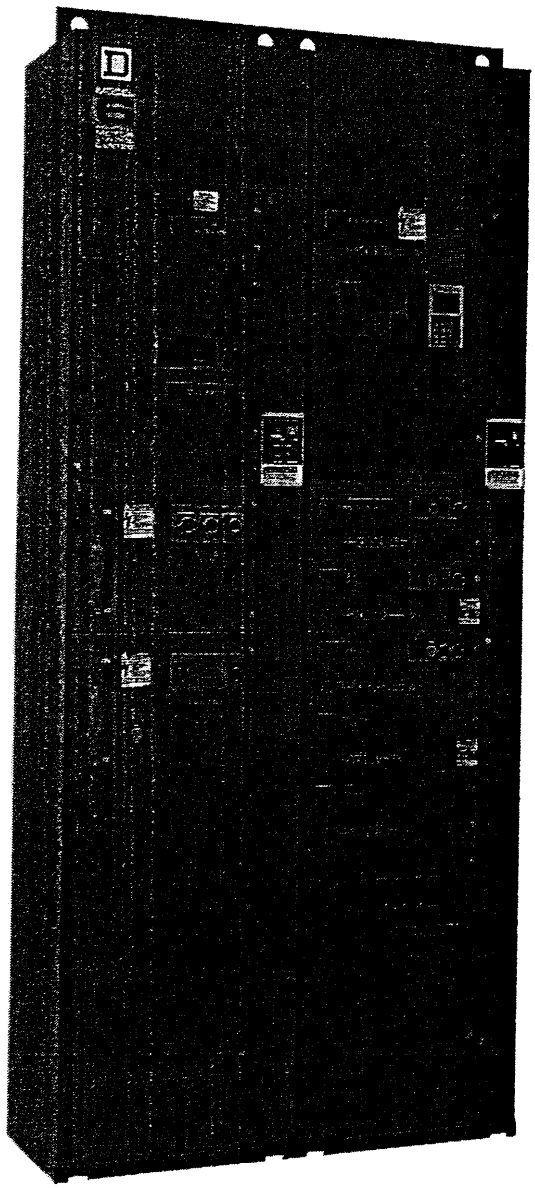
JOB NAME:	HILL MURRAY & ASSOCIATES	EQUIPMENT DESIGNATION:	**MCC ADDER**
JOB LOCATION:	SIDNEY BC	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	CAD	DRAWING TYPE:	ELEMENTARY DIAGRAM
ENGR:	S.U.	GROUPE SCHNEIDER	SQUARE D
DATE:	MAY 28, 1999	DWG# E12461865-001-02	PG 1 OF 1 REV -
DRAWING STATUS:	RECORD		

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Model 6 Motor Control Centers
Class 8998

Instruction Bulletin

Retain for future use.



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SQUARE D

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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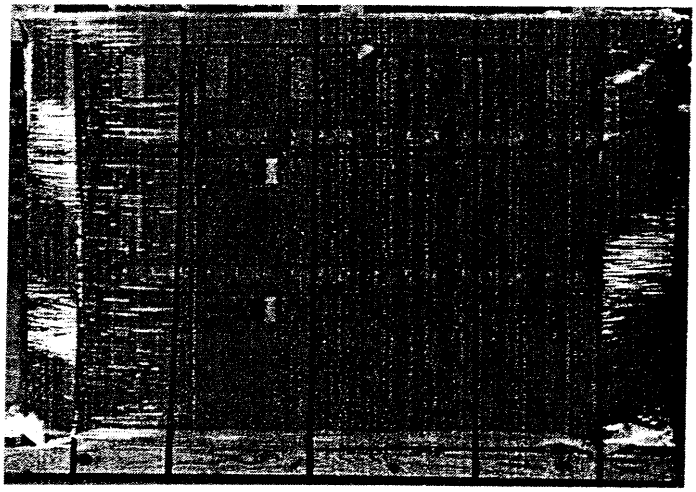
SECTION 3—RECEIVING, HANDLING, AND STORING THE MCC

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

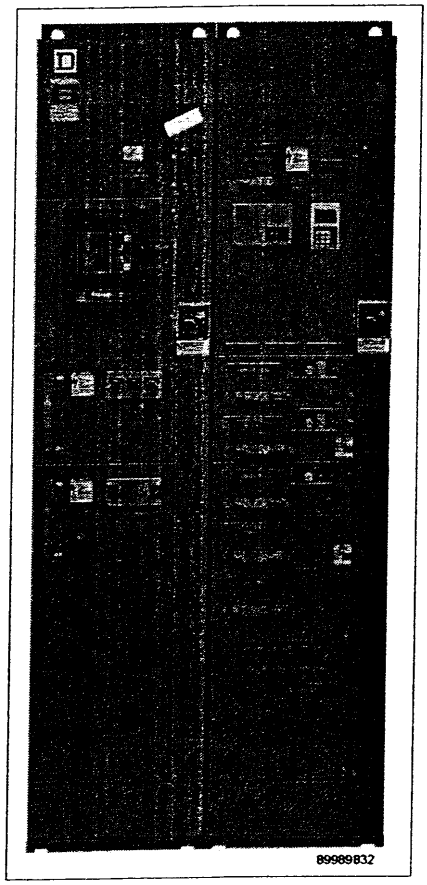


Figure 4a:All Covers in Place

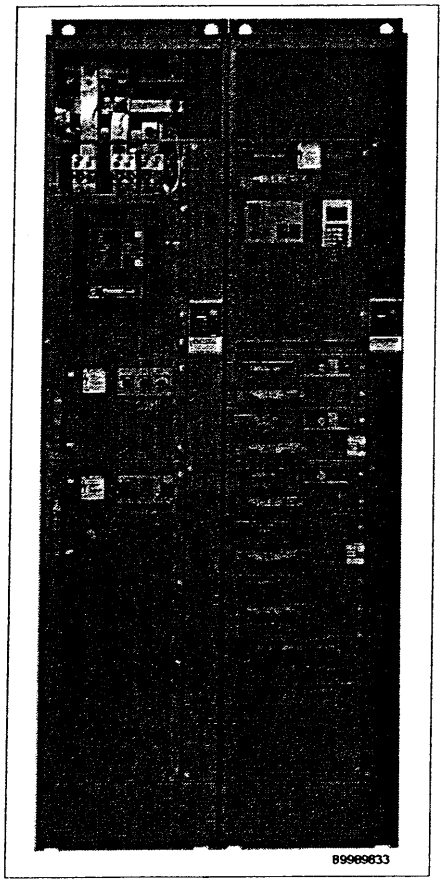


Figure 4b:Upper Horizontal Wire Trough Covers Removed

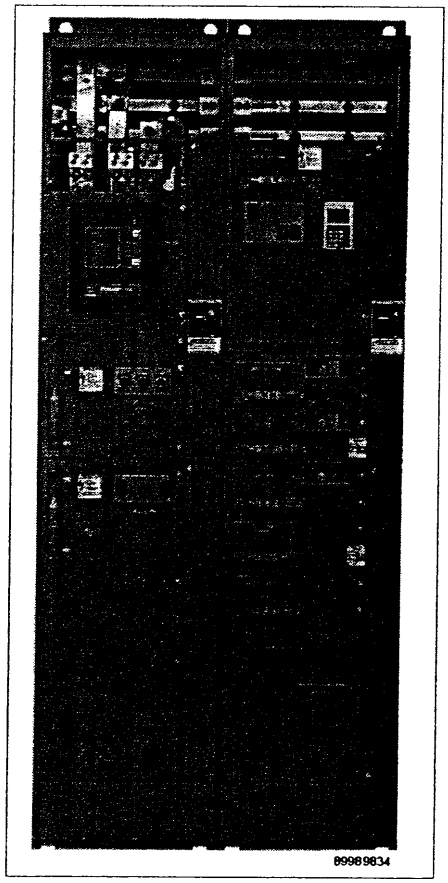
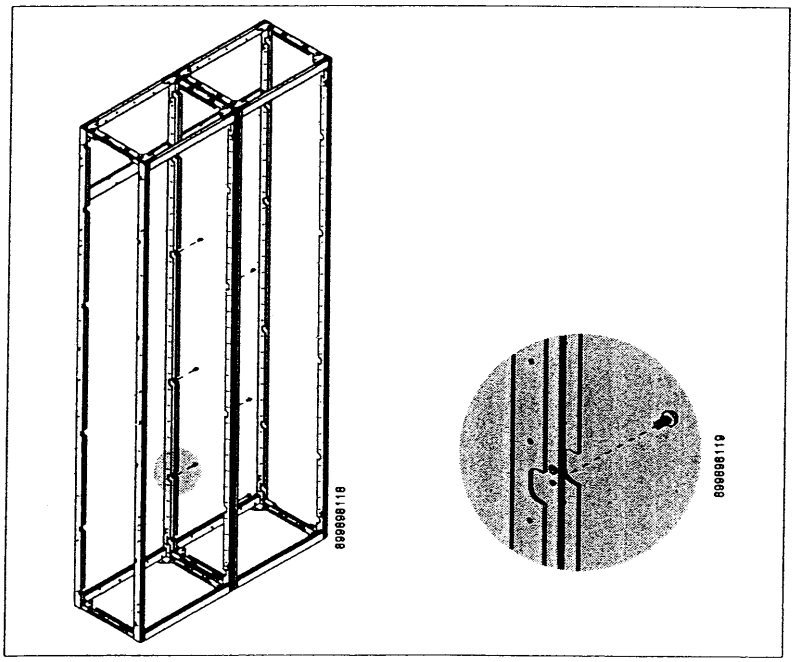


Figure 4c:Two-piece Bus Barriers Removed (splice connection made)

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

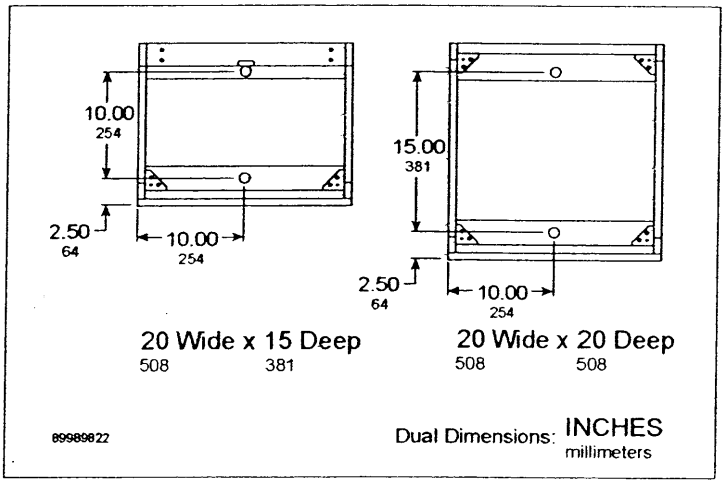


Securing Structures to the Floor

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

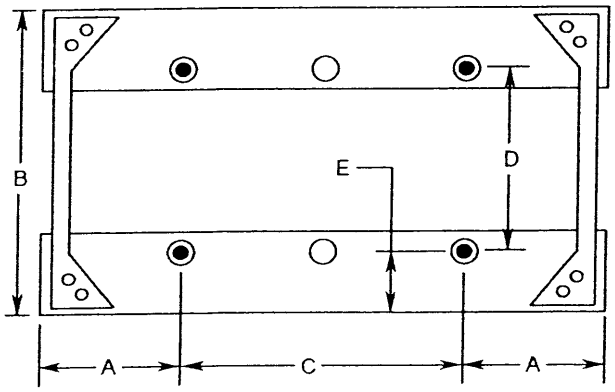


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Securing Structures to Floor—Seismic Hazard[1] Designated Locations

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



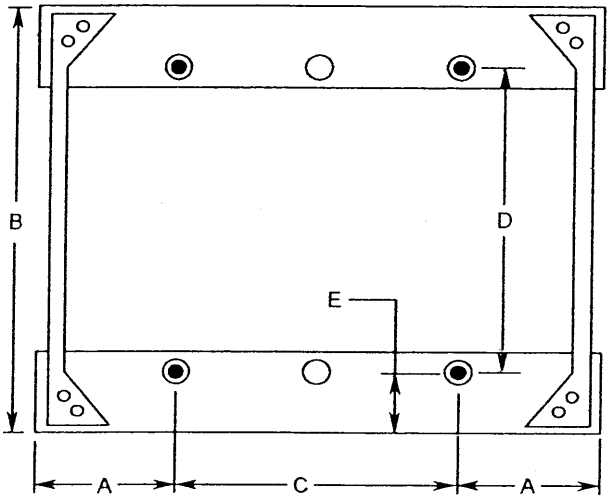
● Seismic Tie-Down Locations

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

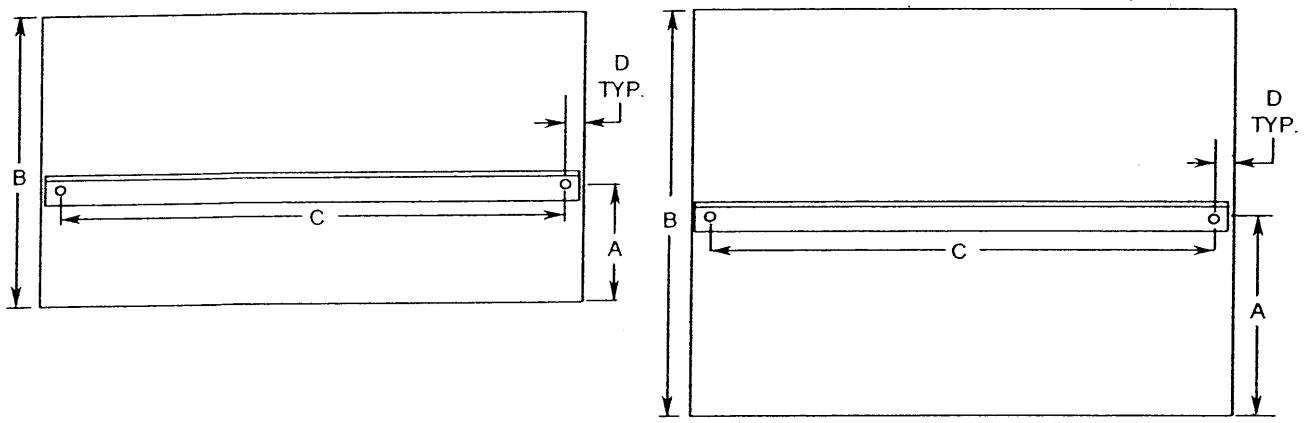
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- 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.

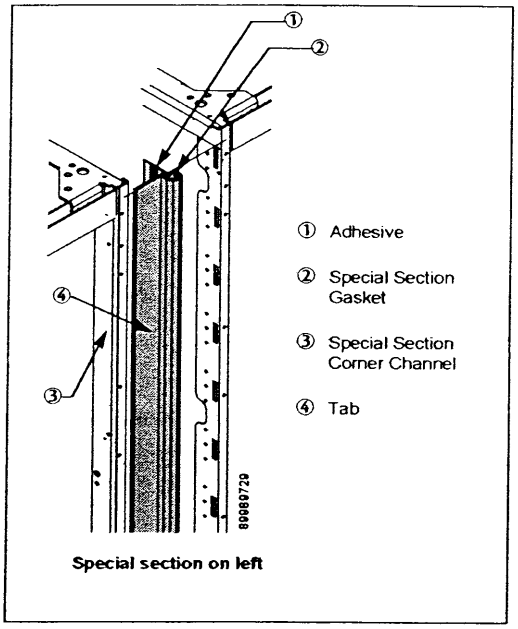
Special Section Splicing Instructions

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.

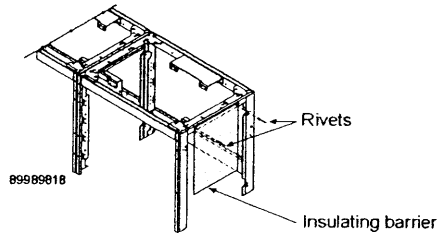
Figure 12: Special Section Splicing



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.

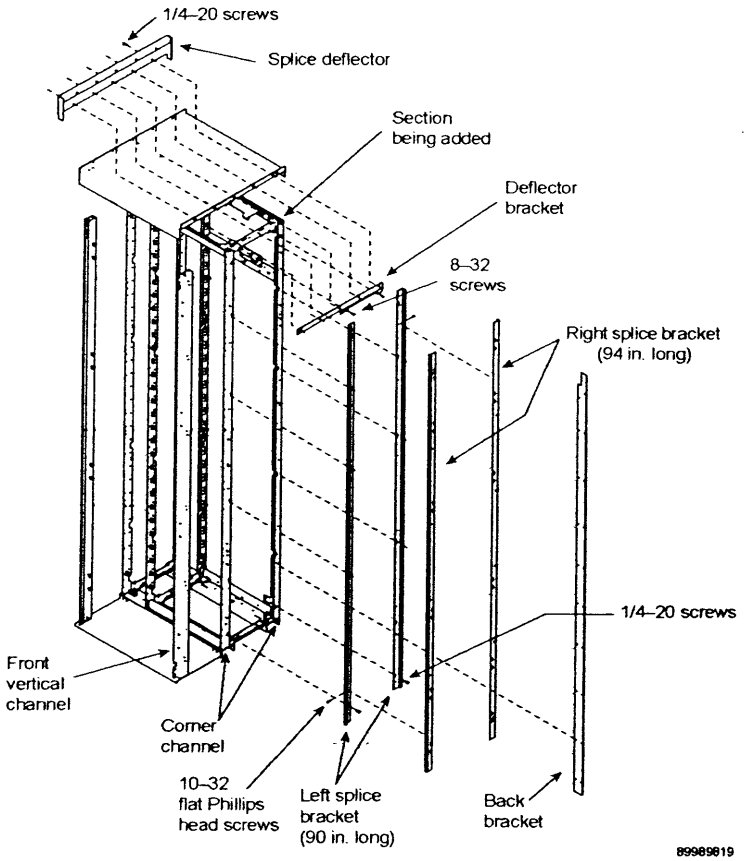
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Figure 14: Removing the Insulating Barrier



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

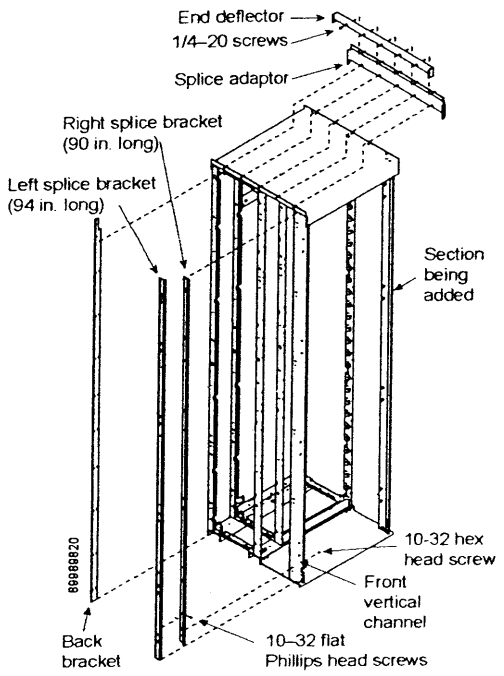


6. Attach a left splice bracket (see Figure 15), 90 inches long, to the front corner channel of the rightmost section of the MCC being added using six 1/4–20 screws contained in the kit. Ensure that the short flange is flush with the front of the corner channel and that the holes in the bracket line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

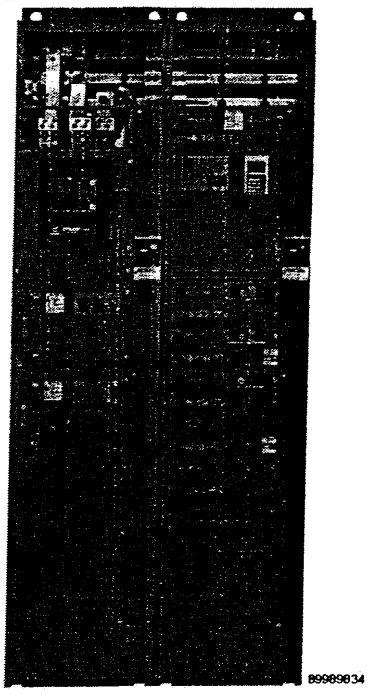
⚠ DANGER

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:

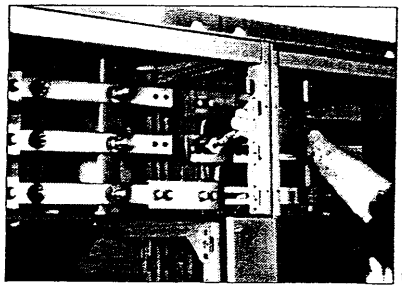
1. Remove the horizontal bus covers and slide horizontal bus barriers from the left and right sections (see Figure 22).

   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

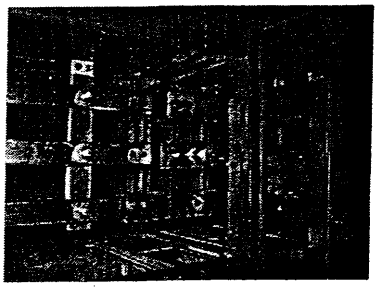


Figure 29: Optional 85,000 A Bus Bracing

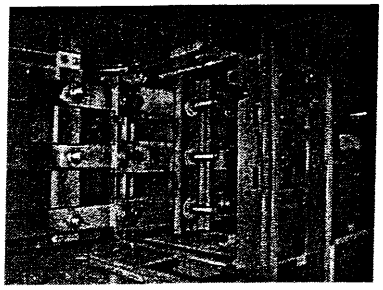
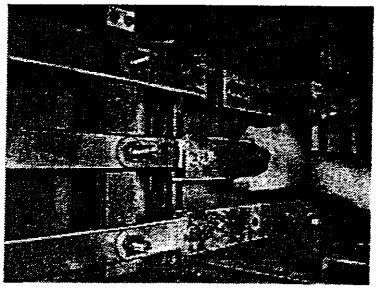


Figure 30: Slide the Splice Assembly to the Left



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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.

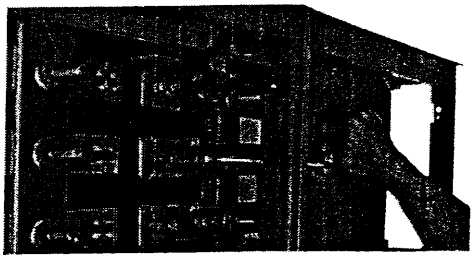
To splice the power bus, follow these steps:

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.

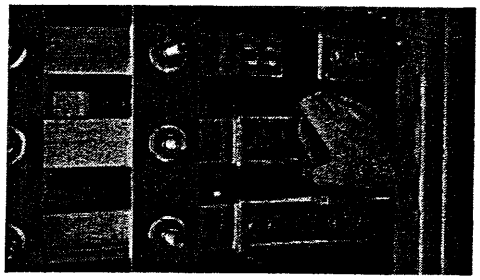
2. Remove all four bolts from each splice assembly (see Figure 35).
3. Slide the splice assembly to the left until the two left holes are in line with the corresponding holes in the horizontal bus on the left section (see Figure 36).

Figure 35: Removing the Bolts from the Splice Assembly



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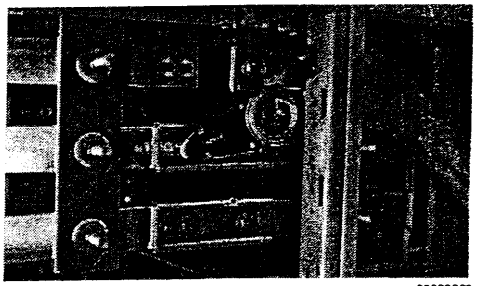
Figure 36: Aligning the Splice and Bus Holes



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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.

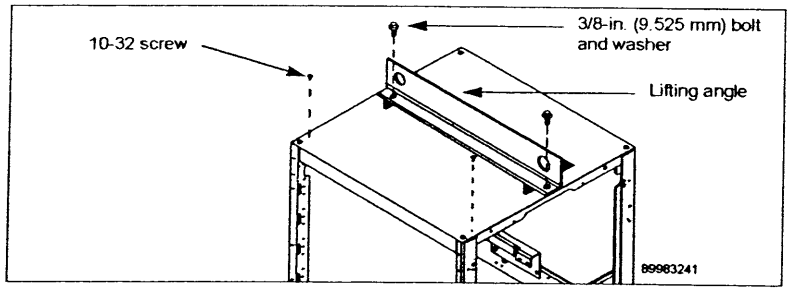
Failure to follow these instructions will result in death or serious injury.

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

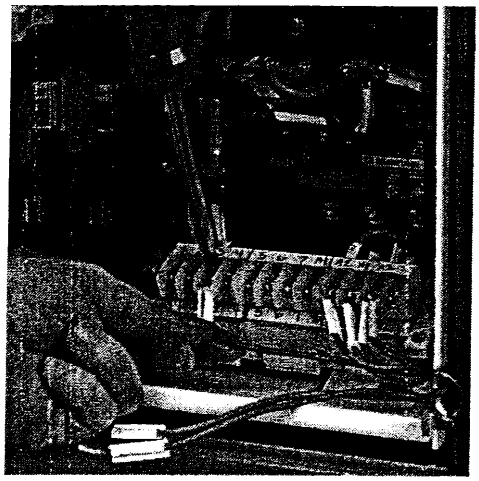


2. Remove the two 10-32 screws that secure the closing plate to the top of the cabinet (see Figure 39).
3. Remove the top plate from the structure.

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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 35–100 A	35 lb-in. (3.94 N•m) 80 lb-in. (9.00 N•m)
FC	20–30 A 40–100 A	35 lb-in. (3.94 N•m) 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 450–1000 A	300 lb-in. (33.76 N•m) 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.

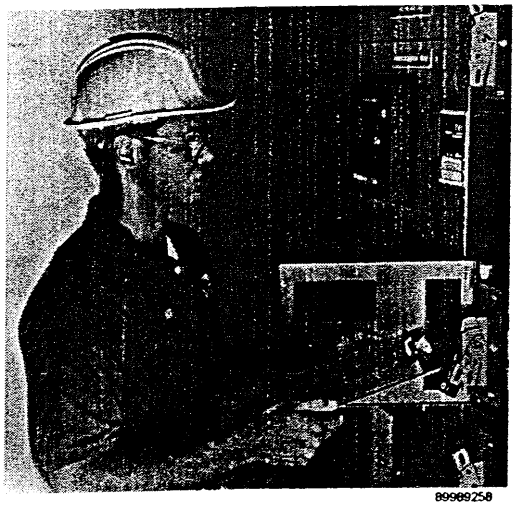
Pre-operation Checklist

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.

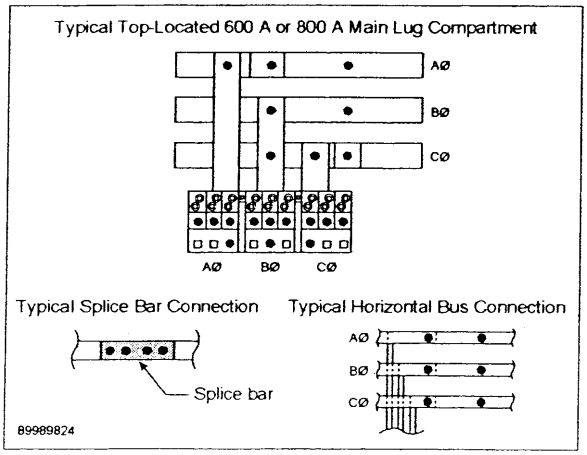
Perform maintenance of bus and incoming line lug connections at least annually, or more frequently if indicated by service conditions and your established maintenance policy. Follow the steps below at the time of installation to locate and tighten any connections that may have loosened during shipment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

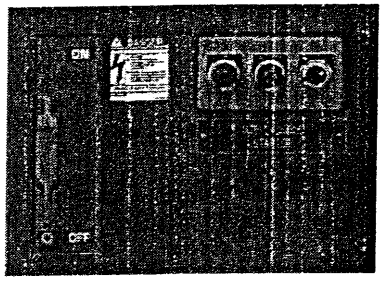
Figure 50: Typical Bus Connection Points



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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)



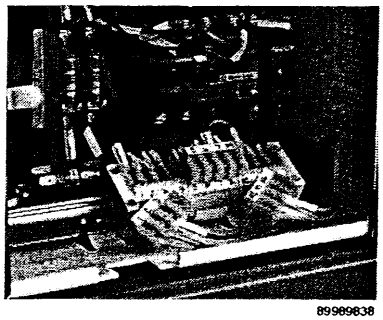
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The Model 6 MCC is designed for convenient and quick control unit removal and replacement. Follow these steps to remove control units:

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.

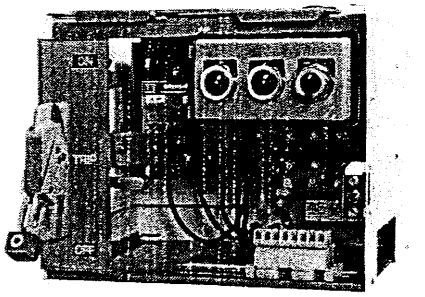
Figure 56: Disconnected Terminal Blocks



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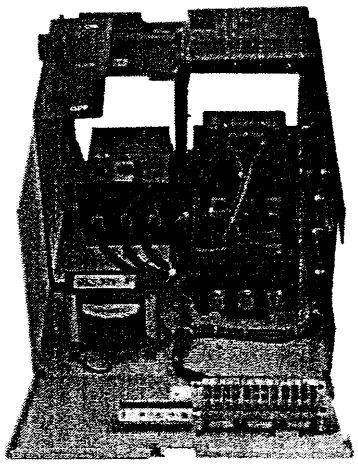
Figure 61: Control Unit Removed



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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).

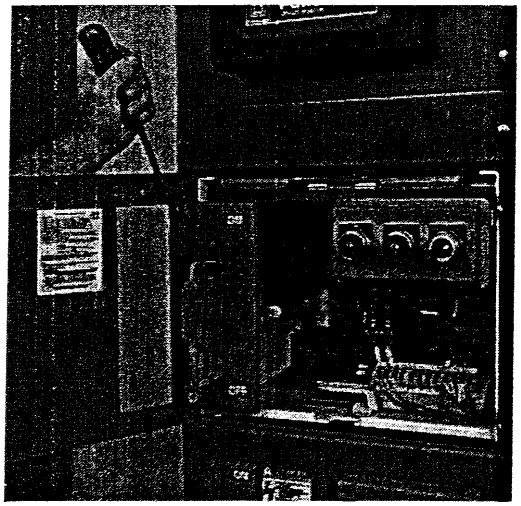
Figure 62: Control Unit Bottom Plate Folded Down



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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



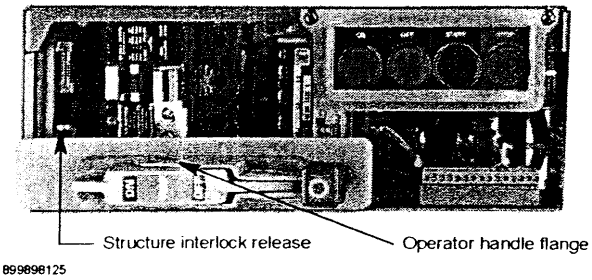
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11. When reinstalling the hinge pin, make certain that the hooked end is fully engaged into the hinge collar.

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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.

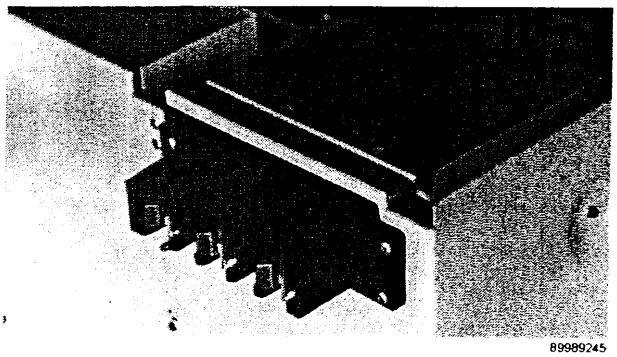
Failure to follow this instruction can result in equipment damage.

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.

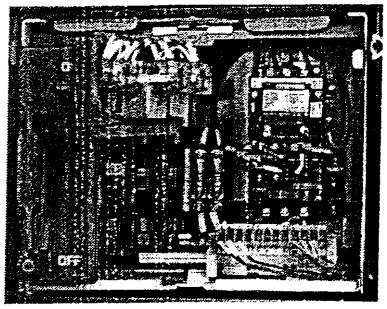
NOTE: If the stab assembly is badly pitted, the vertical bus may also need to be replaced.

Figure 68: Stab Assembly



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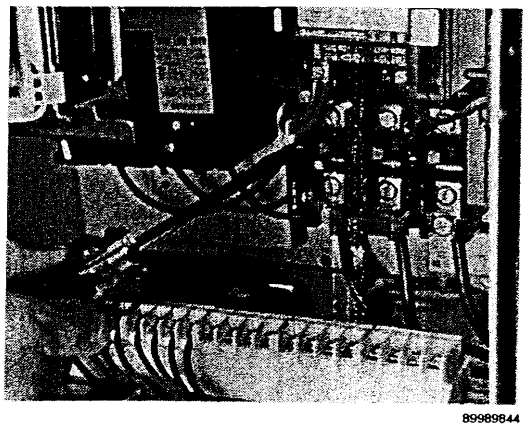
Figure 72: Control Devices



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

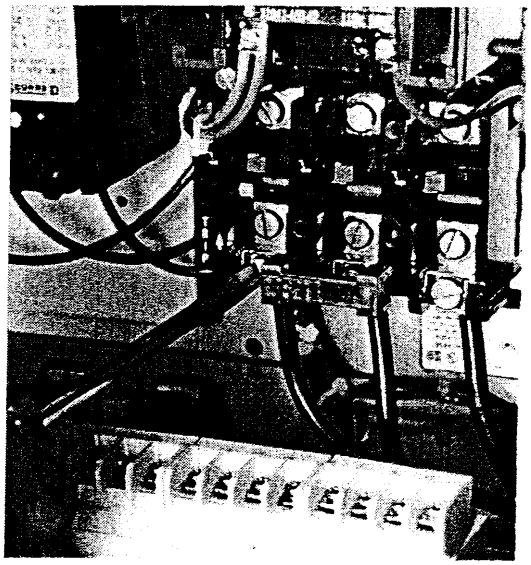
Overload Relay—Manually trip the overload relay to ensure proper operation (see Figure 73). Verify that the thermal unit is the proper size for the application. Refer to the thermal unit selection tables on the inside of the vertical wire trough doors.

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.

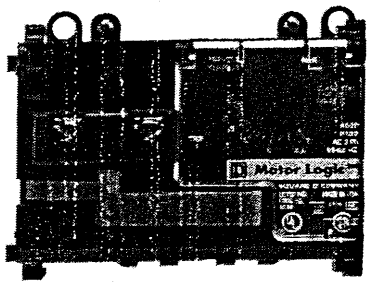
Excessive currents occurring during a fault may result in structure, component, bus or conductor damage. This damage is caused by mechanical distortion, thermal damage, metal deposits, or smoke from fault currents. After a fault, locate and correct the cause of the fault. Inspect all equipment and make 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

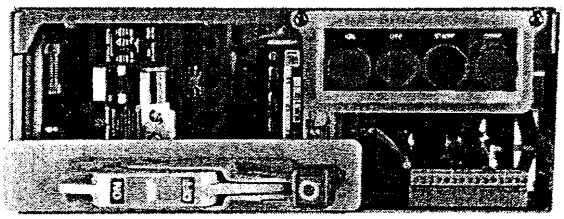
The following describes 600 V rated MCC starter units equipped with the Motor Logic solid-state overload relay (SSOLR). Read and understand the safety precautions at the beginning of this section before you install, adjust, or perform maintenance on these units. For full details about MCC installation,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

Figure 77: Motor Logic SSOLR



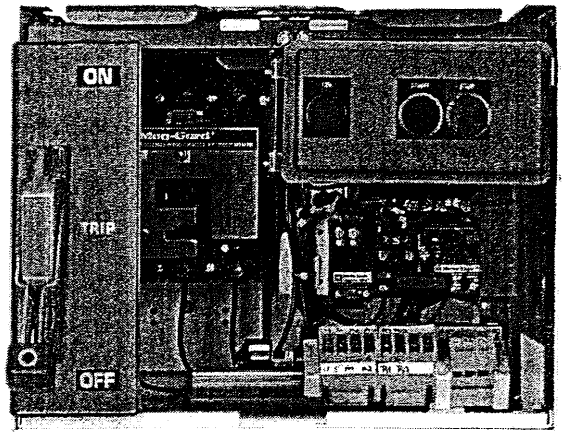
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Figure 78: NEMA Rated Compac™ 6 Unit



899898125

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

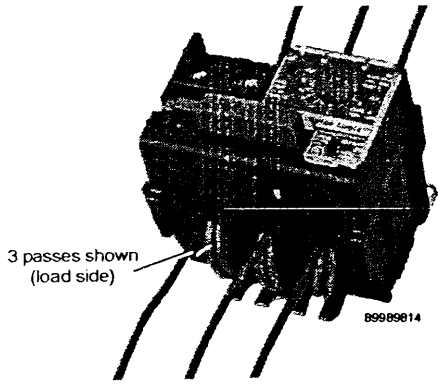
① Refer to the overload relay label next to the adjustment dial.

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

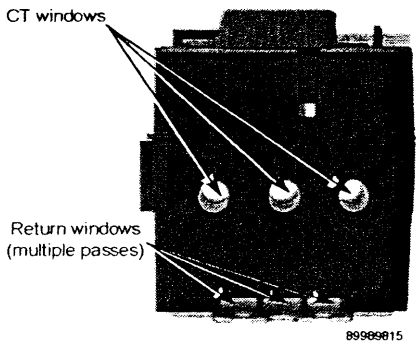


Size 00B, 00C, 0, and 1 relays have conductor (CT) windows through which the motor leads must pass before being connected to the load terminals on the contactor (T1, T2, and T3). By allowing multiple passes (turns) of the load leads through these CT windows, overload protection can be provided for motors 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.

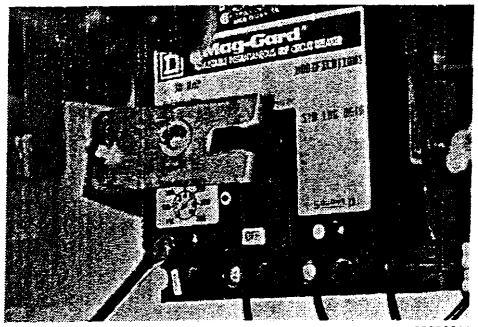
⚠ DANGER

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



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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 Repeater: 4850PDR3399	4850PDR3399 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.

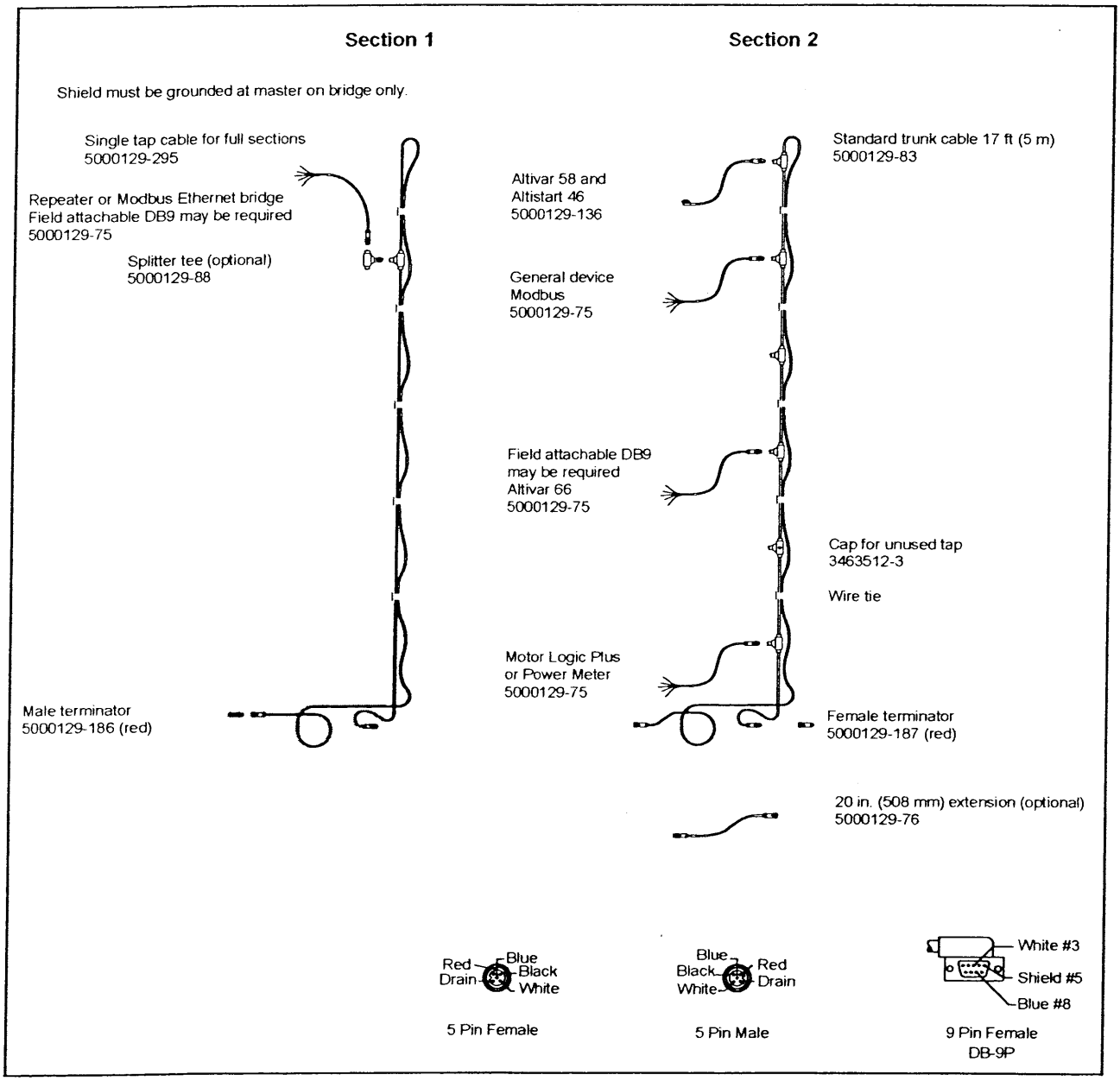
For typical grounding requirements, refer to Modicon® —Modbus Protocol Reference Guide, document number PI-MBUS-300 (see "OMNI Center-Related Literature List" on page 54).

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.

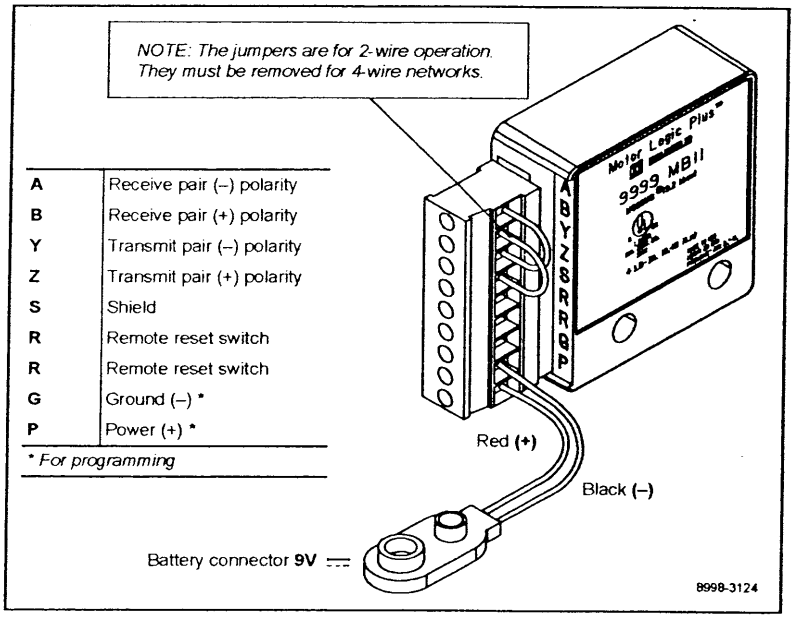
Failure to follow these instructions will result in death, serious injury or equipment damage.

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

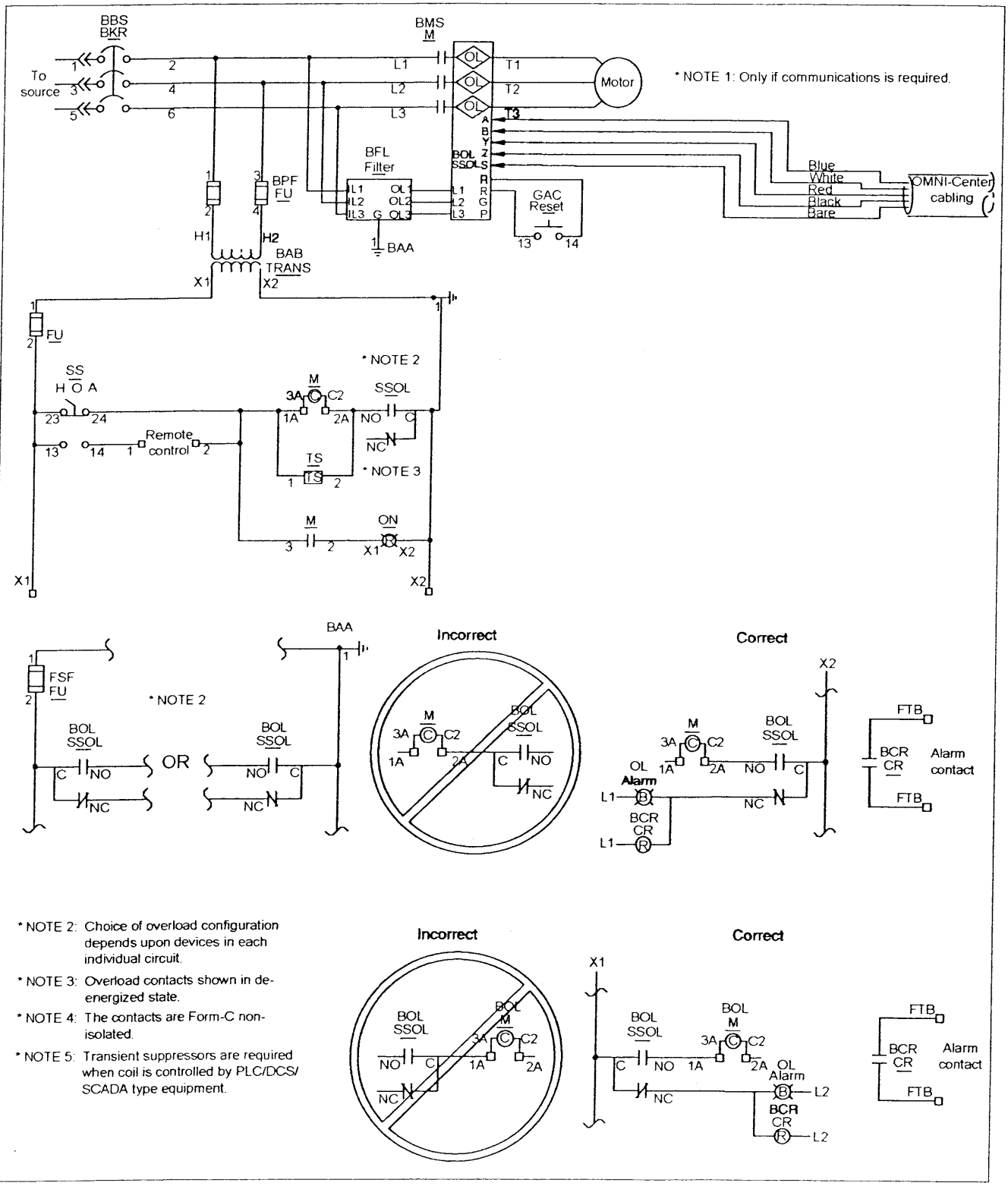
Part #	Description	Use
3463512-1	Female threaded cap	Unused male taps all networks (approximately 2 per MCC)
3463512-3	Male threaded cap	Unused female taps all networks (approximately 4 per section)
5000129-75	5P MM DC male in-line plug 36 inches (stripped and tinned)	Modbus® unit taps (1 per unit)
5000129-76	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

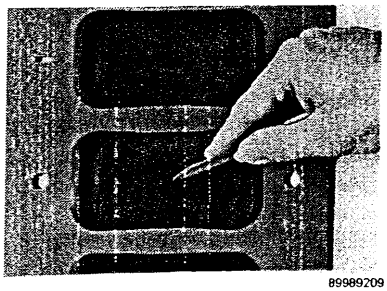
1. De-energize equipment as outlined in "Section 2—Safety Precautions".
2. Remove the MCC unit from the structure. See the procedure for "Maintaining the Control Unit" on page 38 of this manual.
3. Perform the required modifications. Use thread-forming screws to mount devices. Do not use bolts and nuts, 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

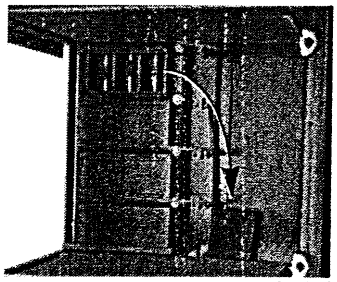
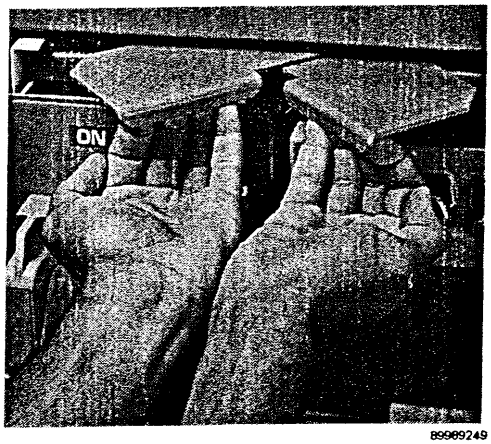


Figure 91: Pulling the Twin Handles of the Cam Mechanism Forward



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

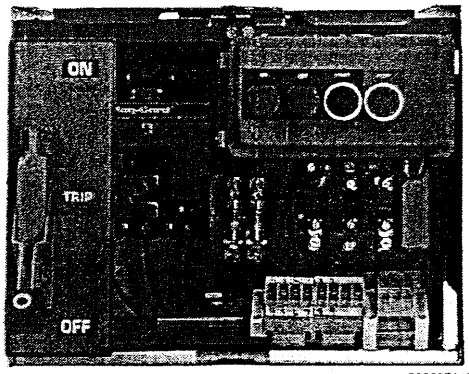
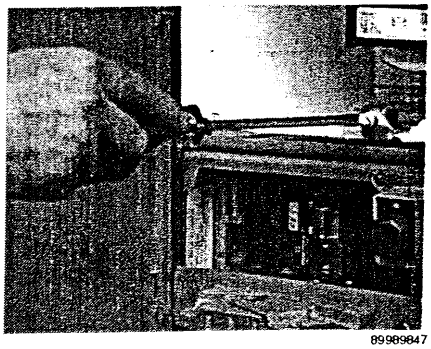


Figure 95: Tightening the Control Unit Lock-in Panel (when supplied)



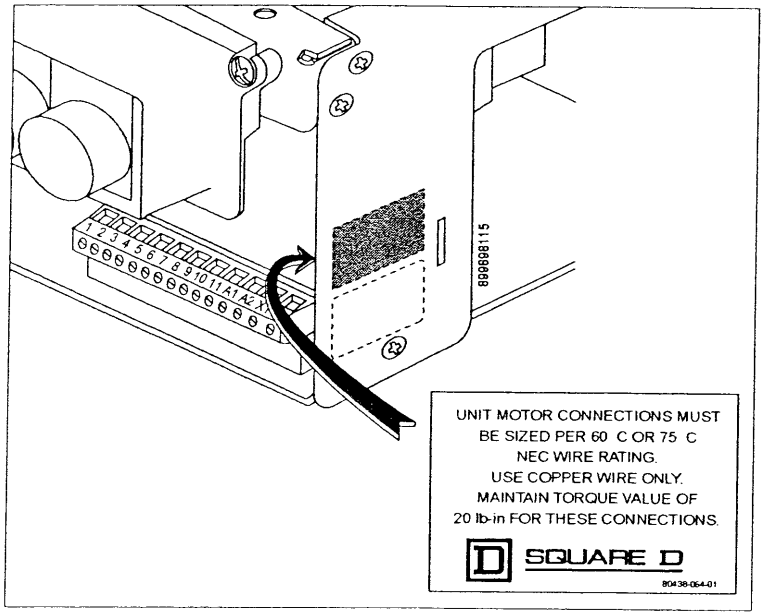
9. Turn the screw on the control unit lock-in panel (when supplied) located at the bottom front of the control unit (see Figure 95), until the lock-in pawl is latched to the support shelf below the control unit.

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Cable Connection Torque Values

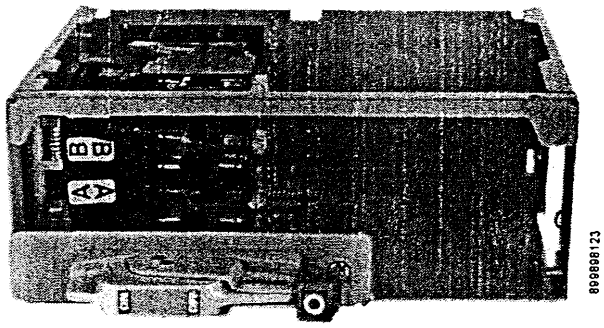
Refer to the torque label on the right inside wall of the unit for load terminal wire and torque requirements (see Figure 98).

Figure 98: Unit Torque Label

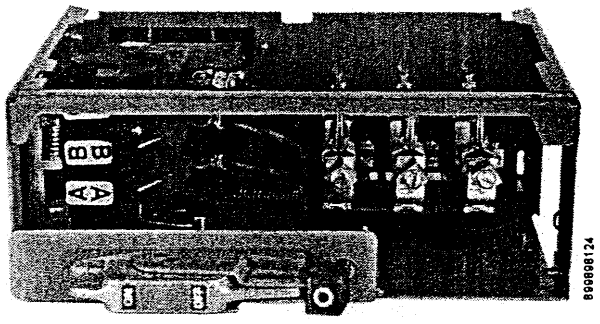


Fuse clips in six-inch units accommodate 600 V, Class J fuses only. The switch mounted fuse base (see Figure 99) is configured either for 30 A or 60 A fuses. The bottom plate mounted fuse base accepts 100 A fuses.

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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Date	Job Description	Name/Initials

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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)

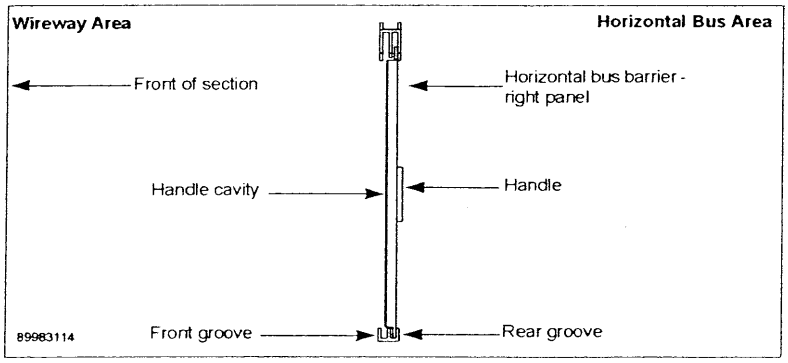
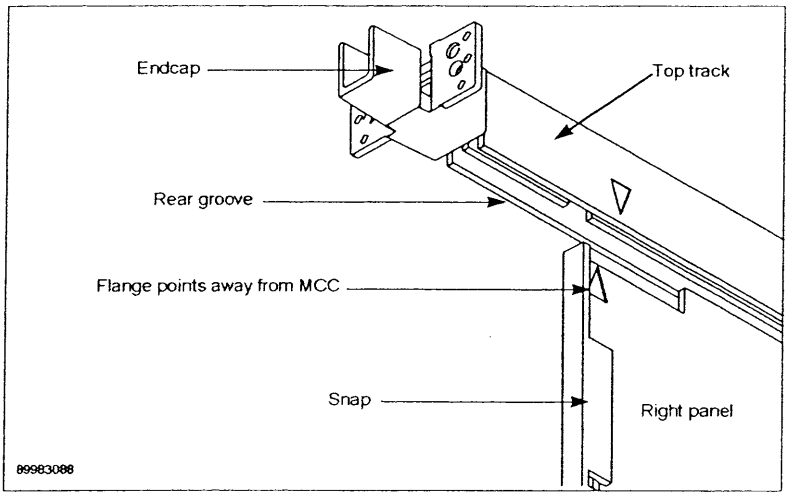


Figure 103: Installing the Right Panel into the Rear Groove



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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.

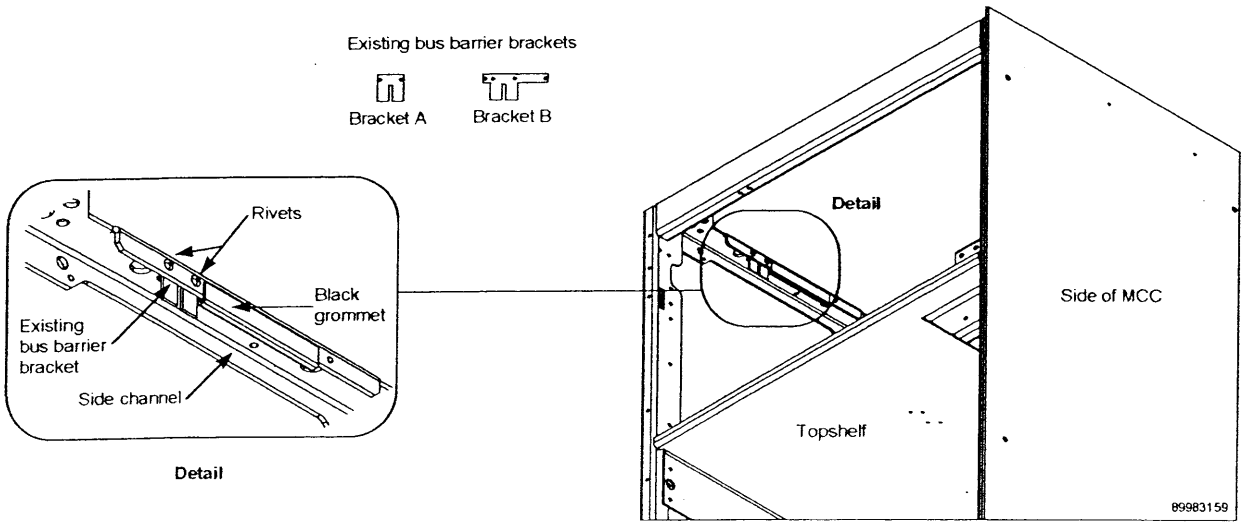
⚠ DANGER

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

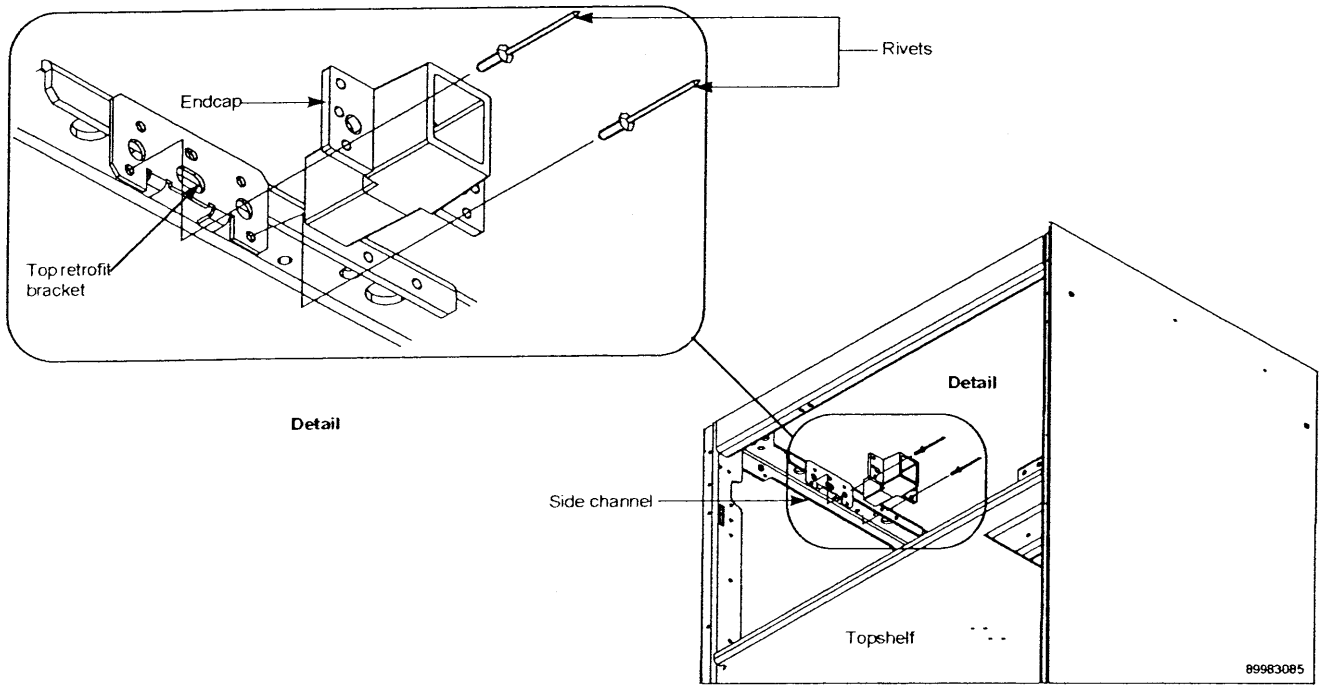


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Follow the steps below to install the endcaps (see Figure 108).

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)

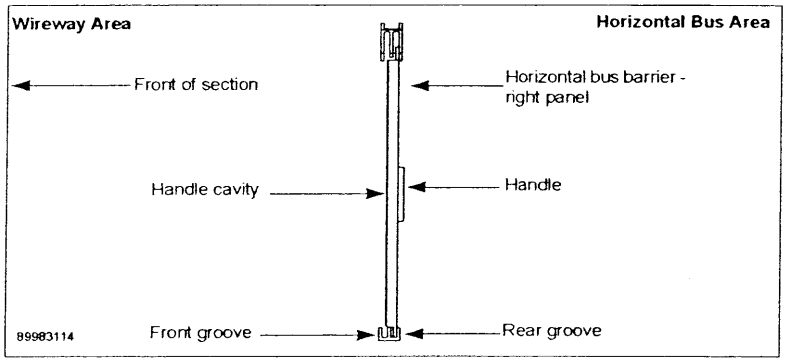
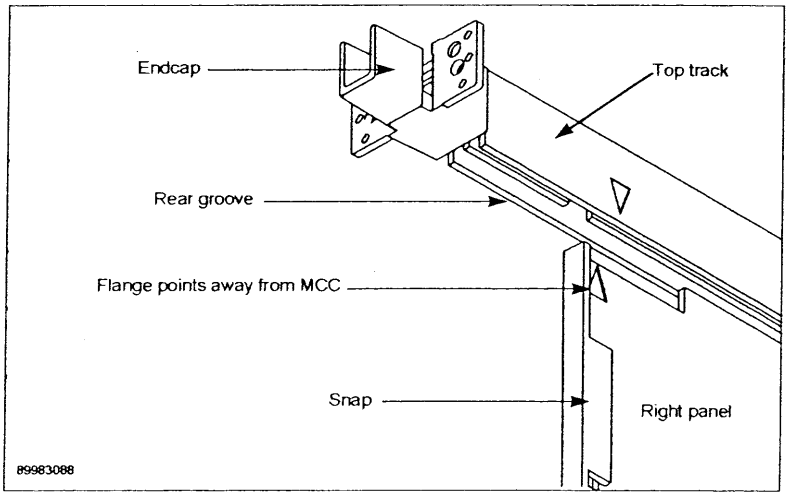


Figure 112: Installing the Right Panel into the Rear Groove



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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.

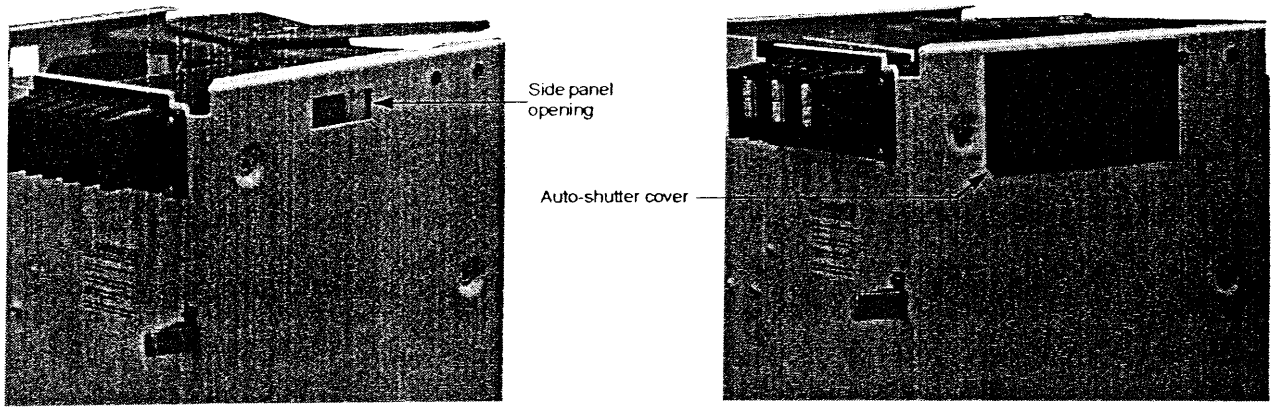
The automatic shutter assembly requires an updated midshelf to allow clearance for the shutter above the plug-in unit.

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.

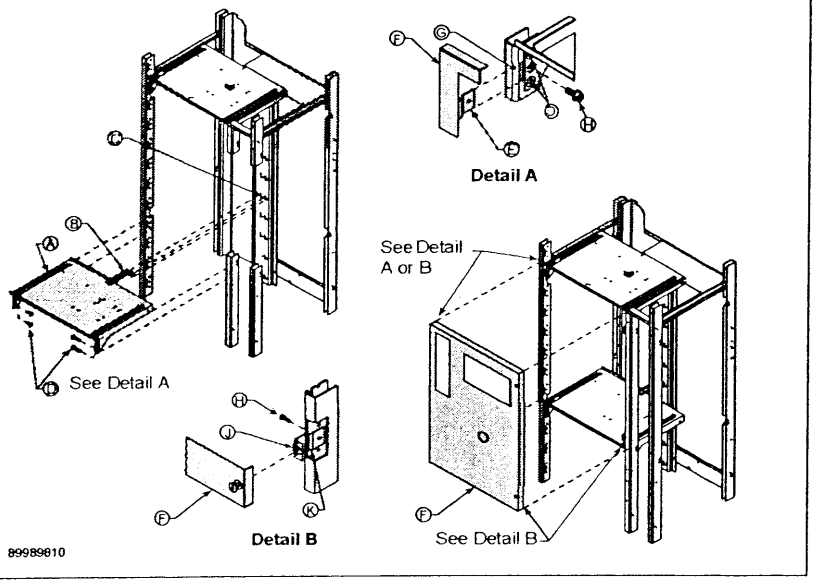
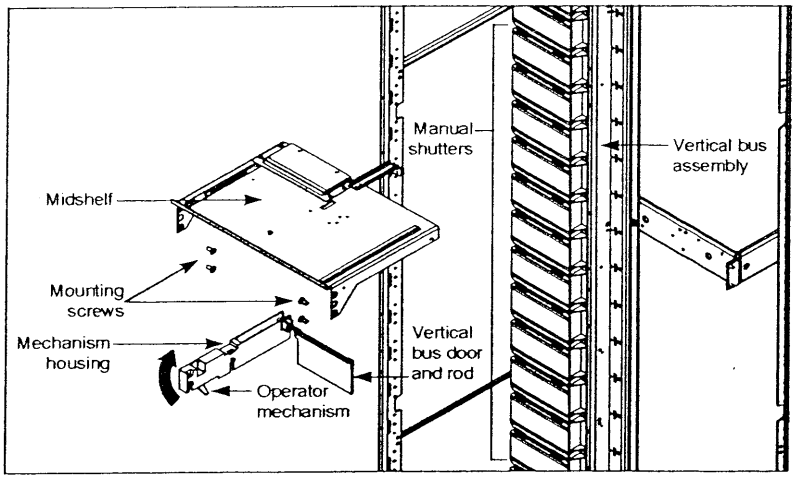


Figure 117: Automatic Vertical Bus Shutter Installation



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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1990 Sandifer Blvd.
Seneca, SC 29678 USA
1-888-SquareD
(1-888-778-2733)
www.SquareD.com

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.

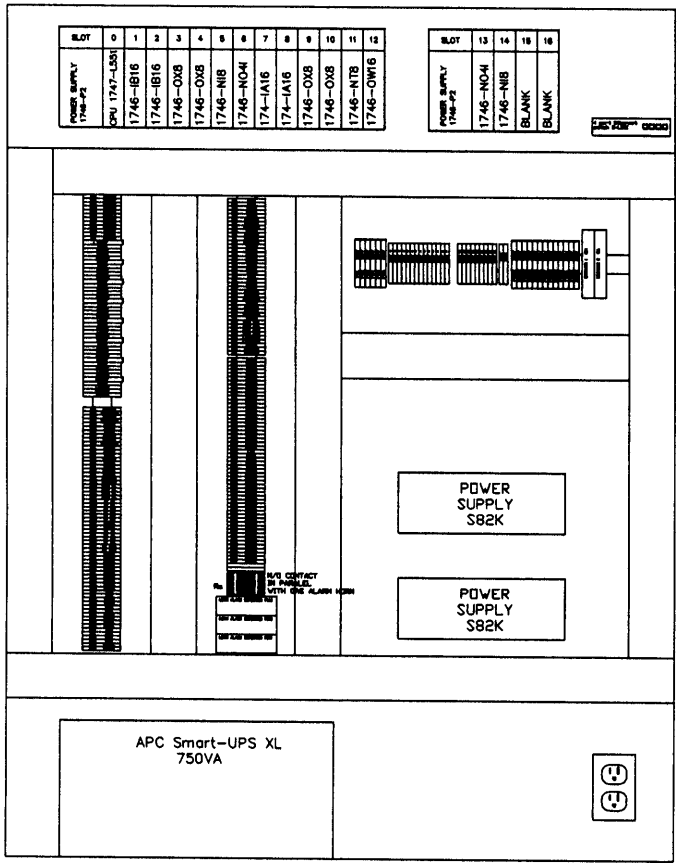
12.5.2 SSCR-105 MCC DRAWINGS.

12.5.3 SSCR-106 INTERCONNECTION.

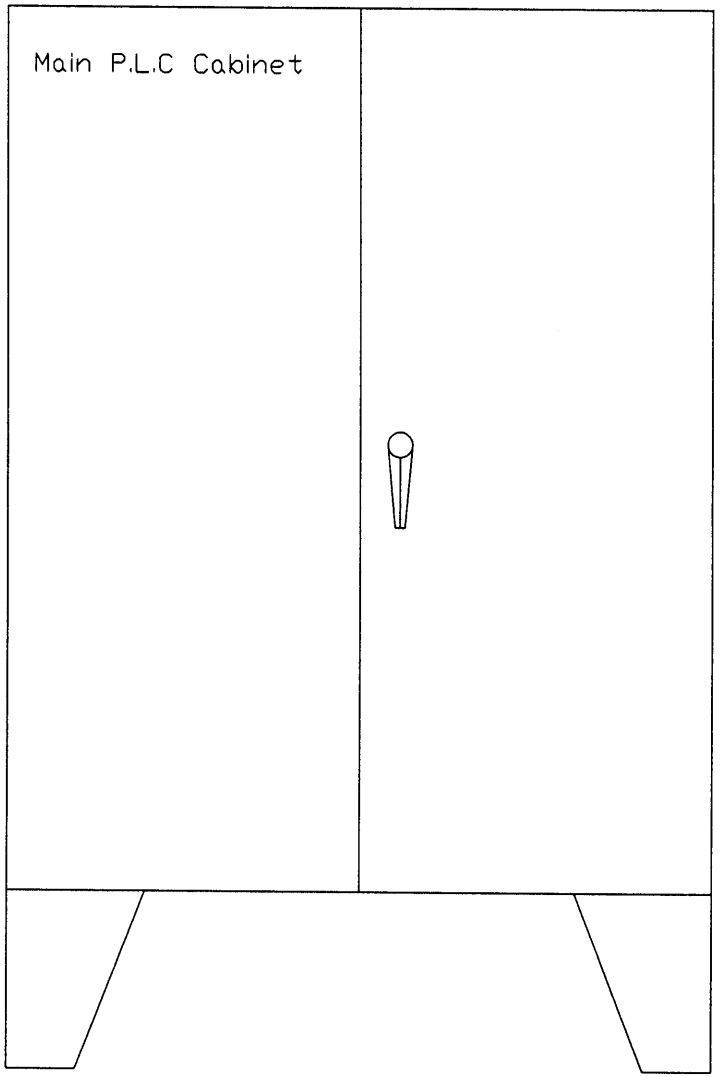
12.5.4 SSCR-106 MCC DRAWINGS.

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

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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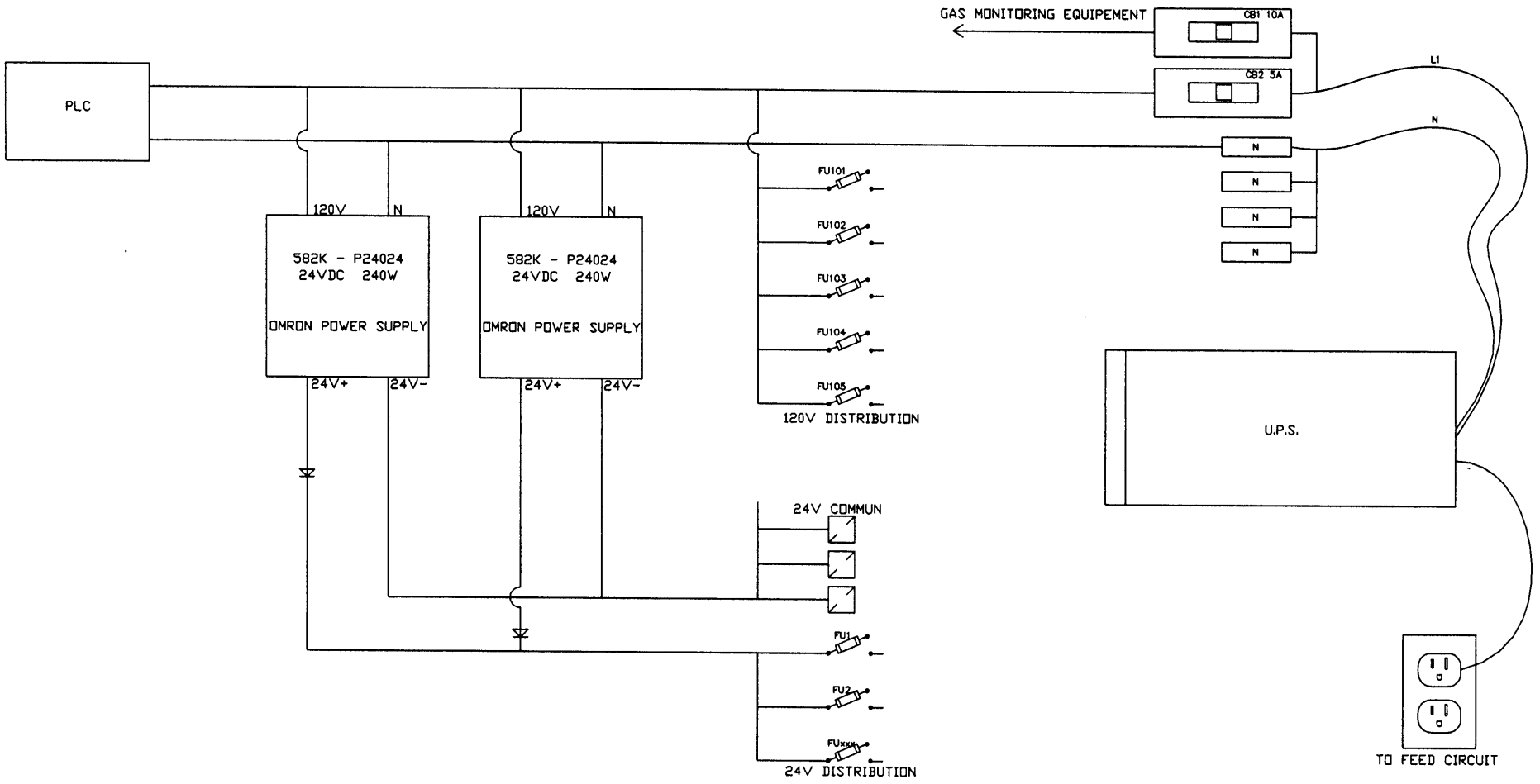
CITY OF IQALUIT

WASTEWATER TREATMENT PLANT
PHASE 1

Main P.L.C Cabinet

DRAWN BY:	SCALE: NTS	DATE JUNE 15TH, 2006	SHEET NO ---
CHECKED BY:			
CADD SYSTEM AutoCAD	DWG NO. CADD SYSTEM	REV. 0	CONTRACT 0

POWER DISTRIBUTION



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

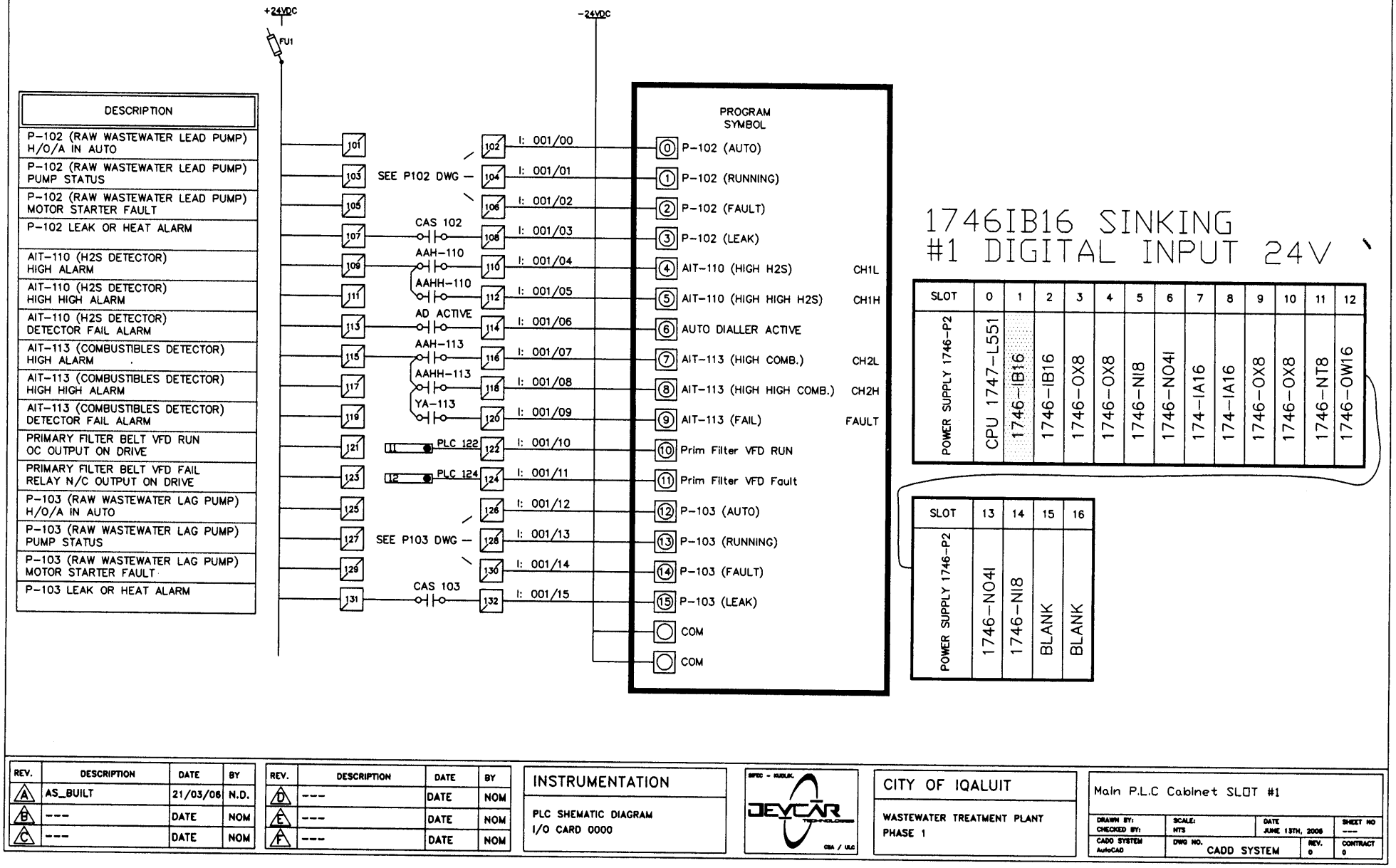
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SPEC - MODUL
CSA / ULC

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WASTEWATER TREATMENT PLANT
PHASE 1

Main P.L.C Cabinet POWER DIST.

DRAWN BY: CHECKED BY:	SCALE: NTS	DATE JUNE 13TH, 2006	SHEET NO ---
CADD SYSTEM AutoCAD	DWG NO. CADD SYSTEM	REV. 0	CONTRACT 0



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

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

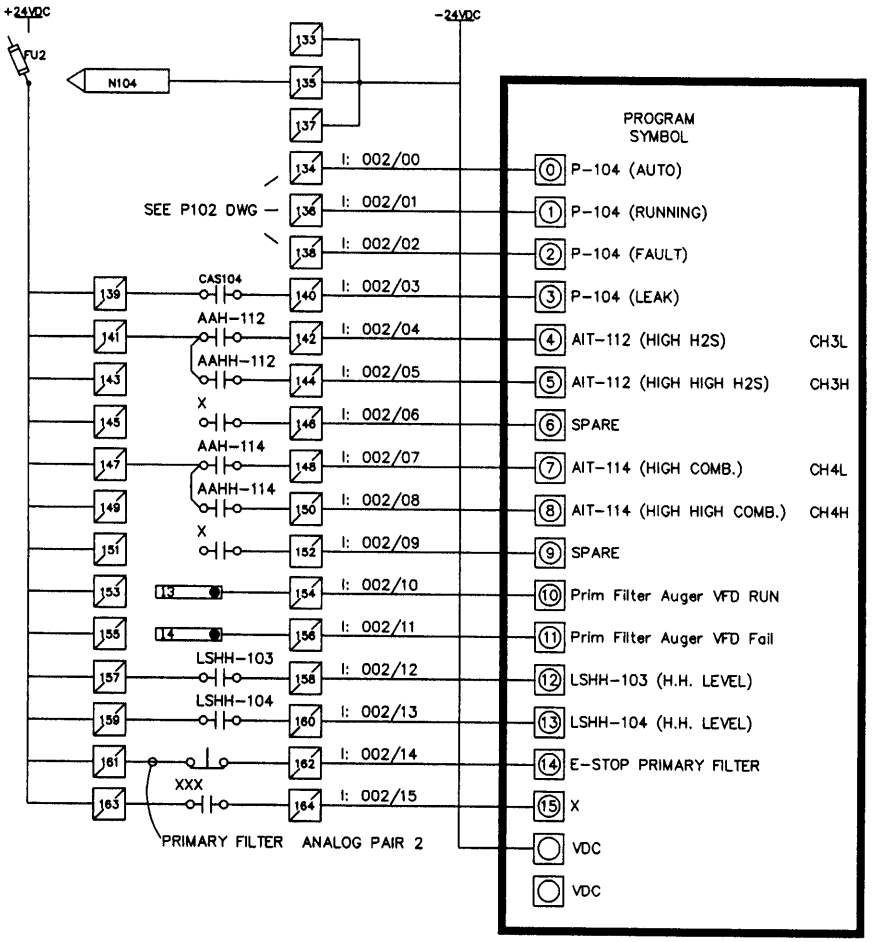
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WASTEWATER TREATMENT PLANT
PHASE 1

Main P.L.C Cabinet SLOT #1

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-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 X
AIT-114 (COMBUSTIBLES DETECTOR) HIGH ALARM
AIT-114 (COMBUSTIBLES DETECTOR) HIGH HIGH ALARM
X 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 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

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

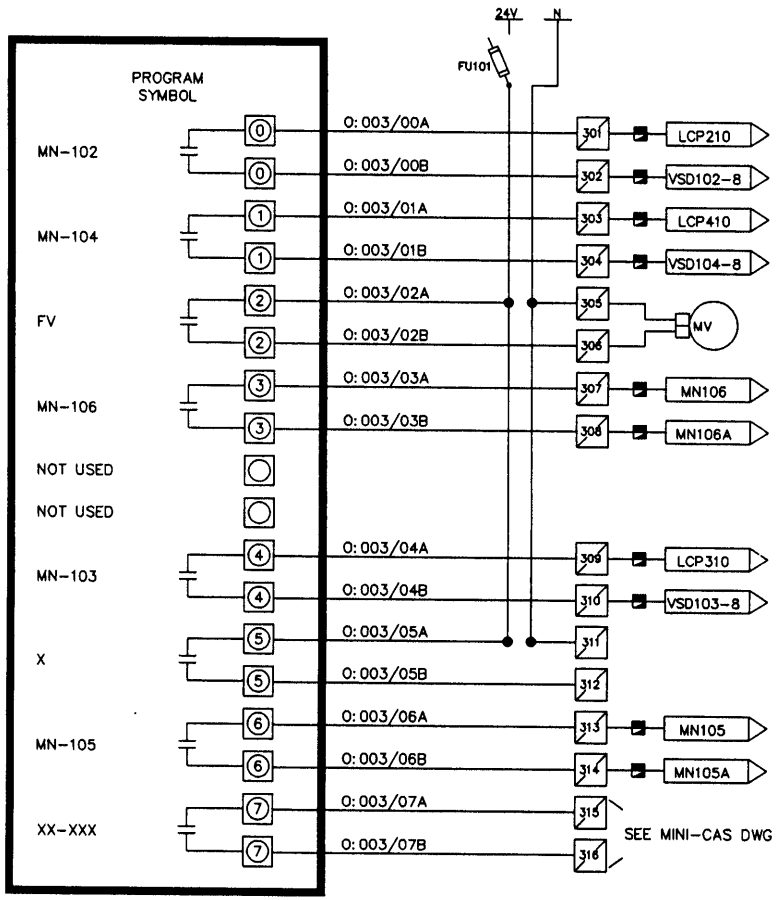
PLC SHEMATIC DIAGRAM
I/O CARD 0000

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WASTEWATER TREATMENT PLANT
PHASE 1

Main P.L.C Cabinet SLOT #2

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 RAW WASTEWATER LEAD PUMP PUMP START / STOP SIGNAL
P-104 RAW WASTEWATRER STAND-BY PUMP PUMP START / STOP SIGNAL
FEW FILTER FLUSH VALVE LOCATED ON MEZANINE BESIDE FEW TANK (BELLIMO VALVE)
SSCR-106 SCREW SCREEN MOTOR START / STOP SIGNAL
P-103 RAW WASTEWATER LAG PUMP PUMP START / STOP SIGNAL
SPARE X X
SSCR-105 SCREW SCREEN MOTOR START / STOP SIGNAL
Mni CAS Alarm Reset (on leek detection) 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

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

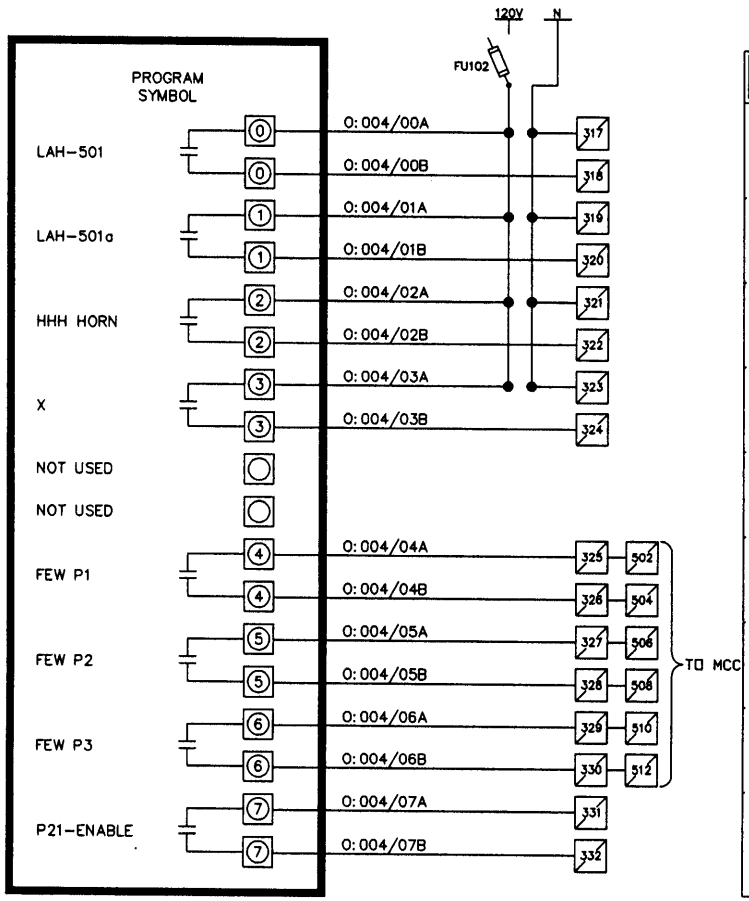
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WASTEWATER TREATMENT PLANT
PHASE 1

Main P.L.C Cabinet SLOT #3

DRAWN BY: / CHECKED BY:	SCALE: NTS	DATE: JUNE 13TH, 2008	SHEET NO: ---
CADD SYSTEM: AutoCAD	DWG NO.: CADD SYSTEM	REV.: 0	CONTRACT: 0



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

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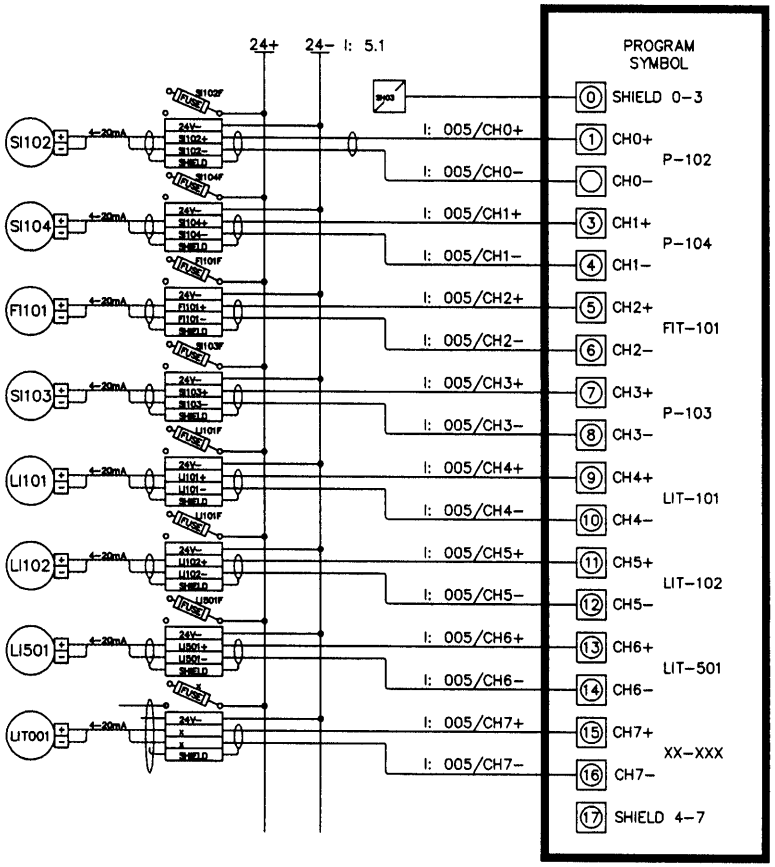
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WASTEWATER TREATMENT PLANT
PHASE 1

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 RAW WASTEWATER LEAD PUMP SPEED INDICATION	0
P-104 RAW WASTEWATER STAND-BY PUMP SPEED INDICATION	1
FIT-101 RAW WASTEWATER FLOW INDICATION	2
P-103 RAW WASTEWATER LAG PUMP SPEED INDICATION	3
LIT-101 WASTEWATER LIFT STATION LEVEL INDICATION	4
LIT-102 SCREENINGS CHAMBER LEVEL INDICATION	5
LIT-501 FINAL EFFLUENT WATER TANK LEVEL INDICATION	6
LIT-201 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

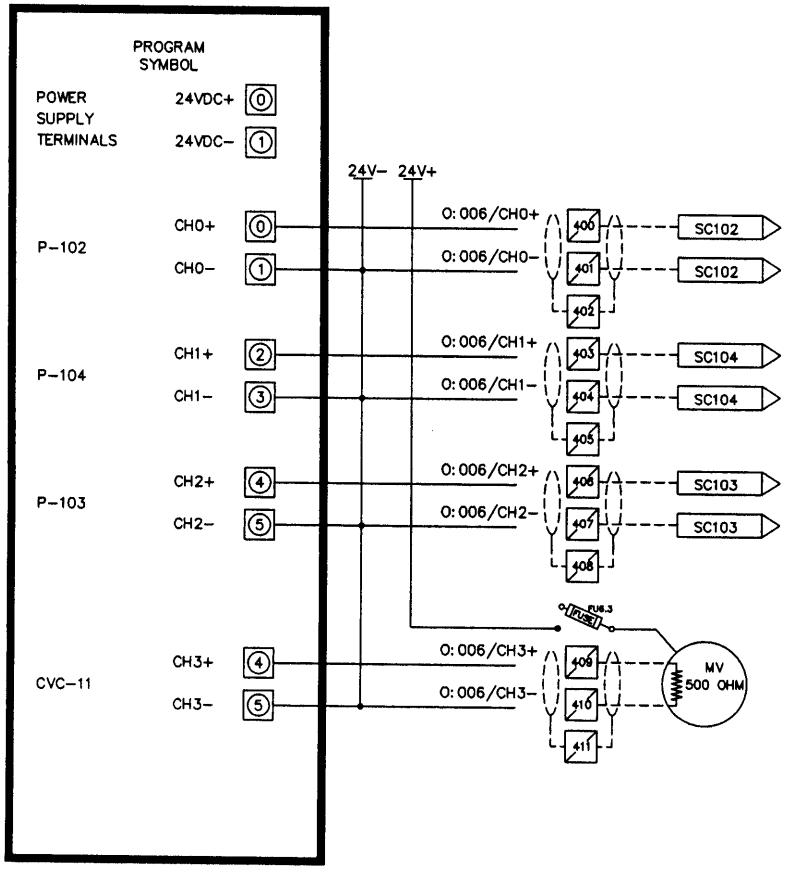
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WASTEWATER TREATMENT PLANT
PHASE 1

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 RAW WASTEWATER LEAD PUMP SPEED SETPOINT
P-104 RAW WASTEWATER STAND-BY PUMP SPEED SETPOINT
P-103 RAW WASTEWATER LAG PUMP 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

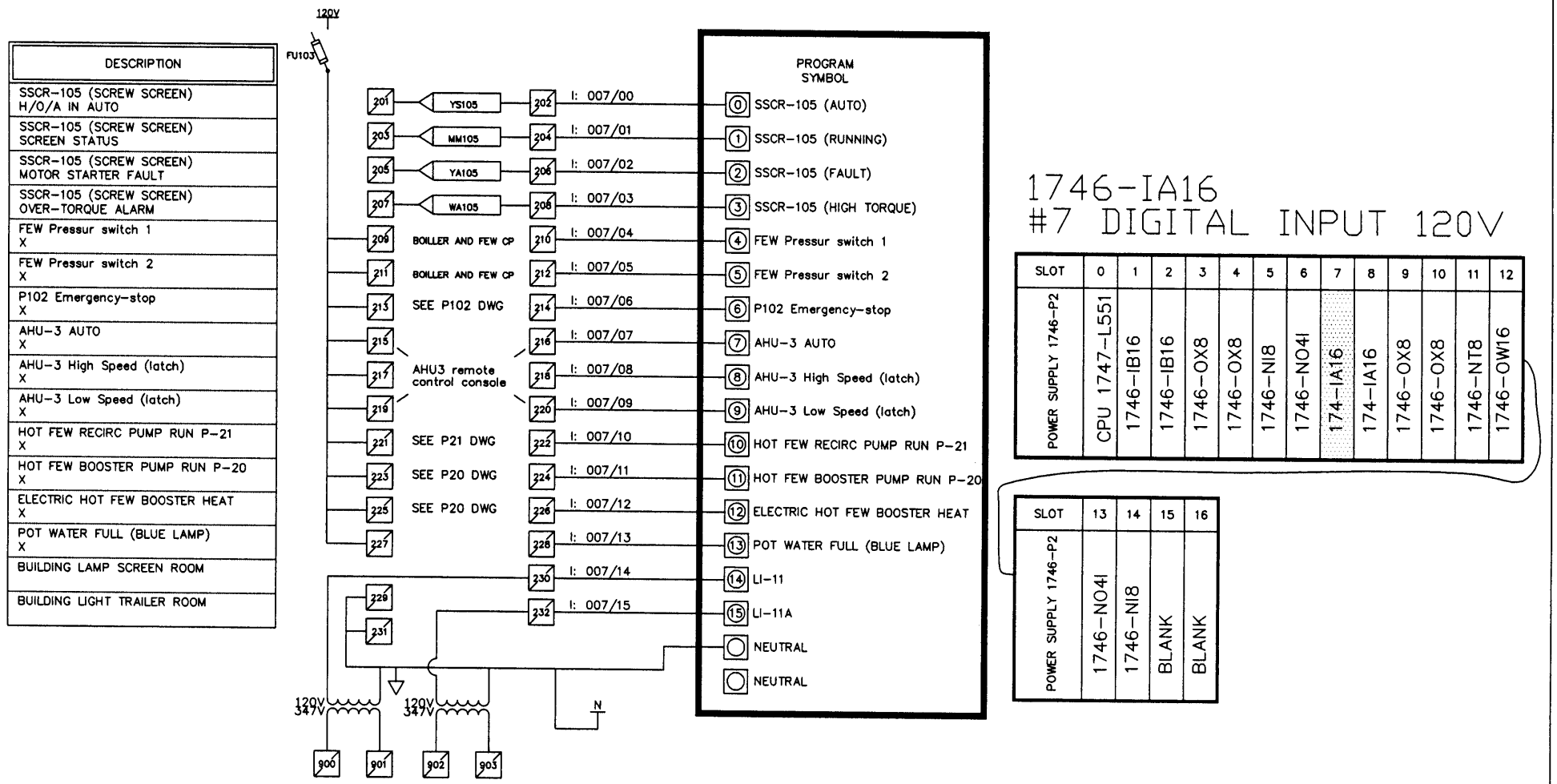
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WASTEWATER TREATMENT PLANT
PHASE 1

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

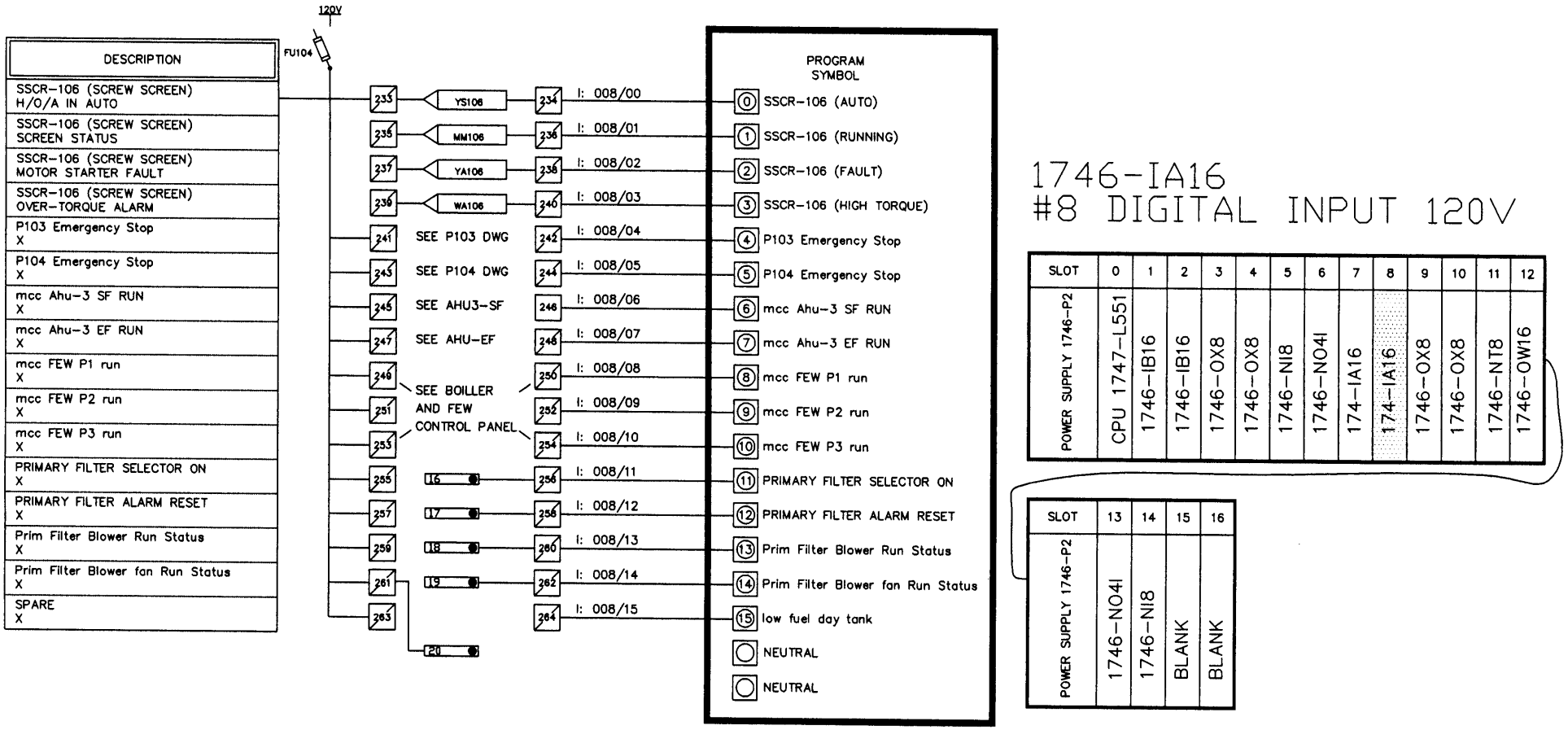
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WASTEWATER TREATMENT PLANT
PHASE 1

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

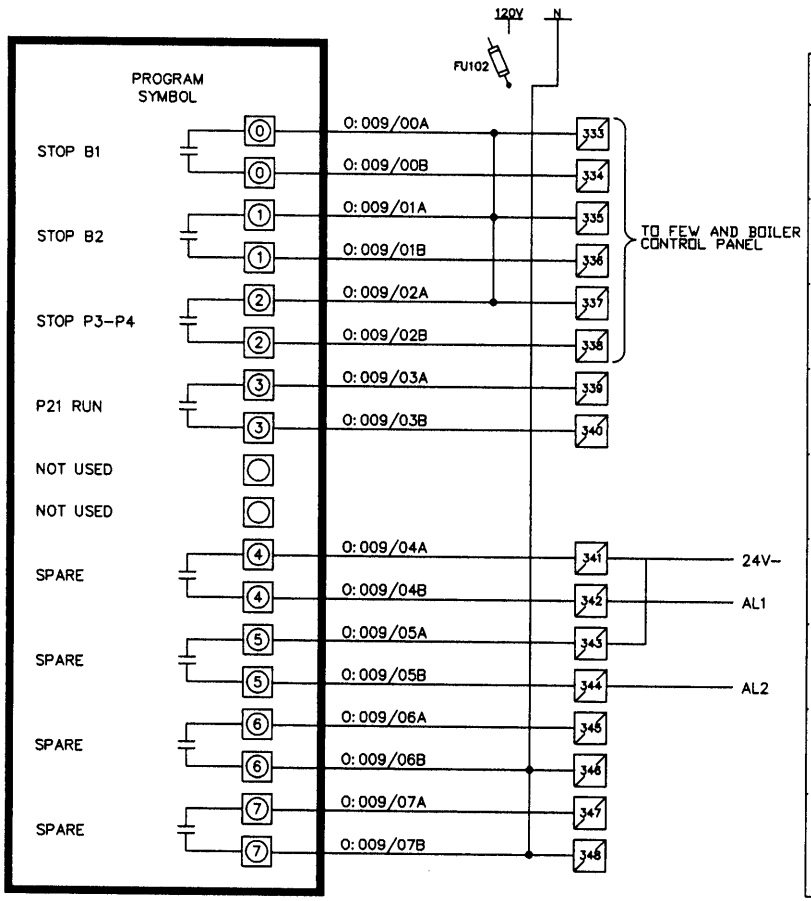
JEYCAR TECHNOLOGIES

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 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

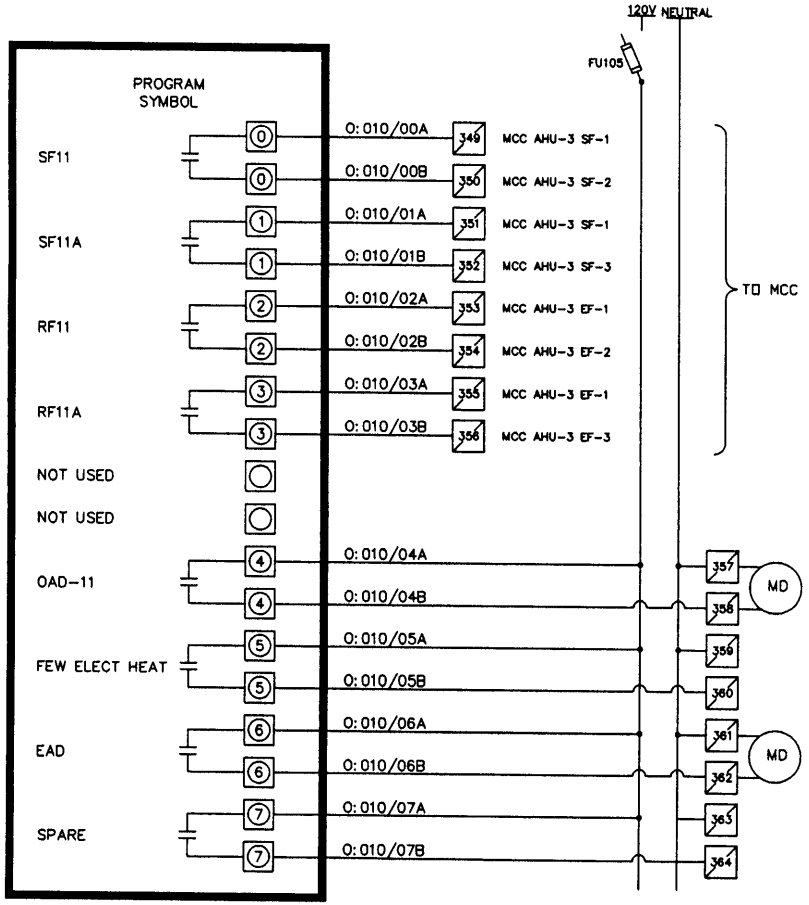
Main P.L.C Cabinet SLOT #9

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

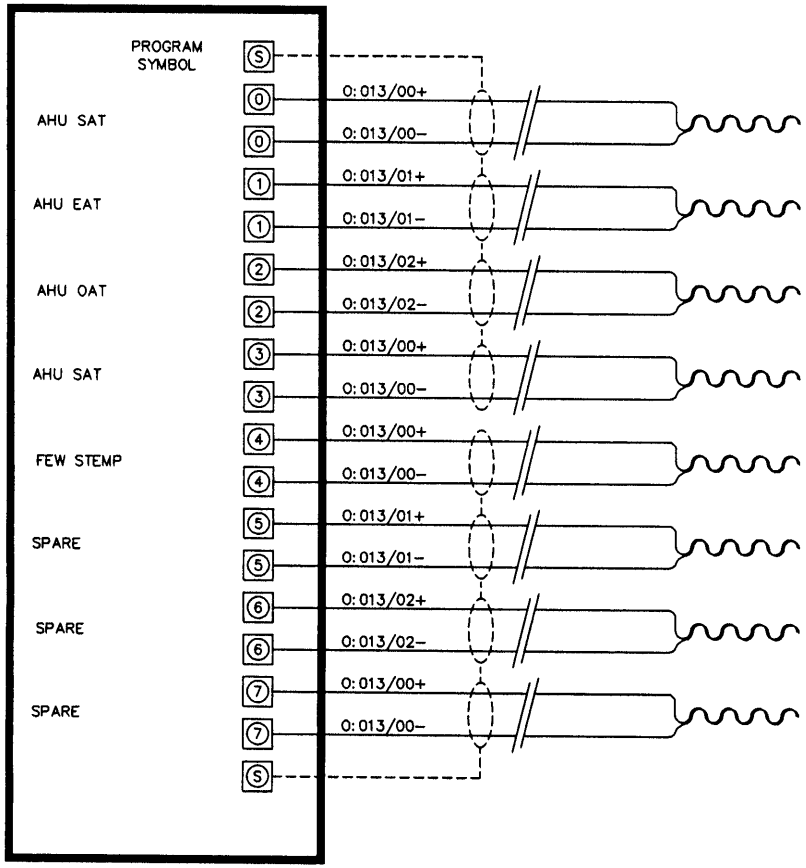
JEYCAR TECHNOLOGIES

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

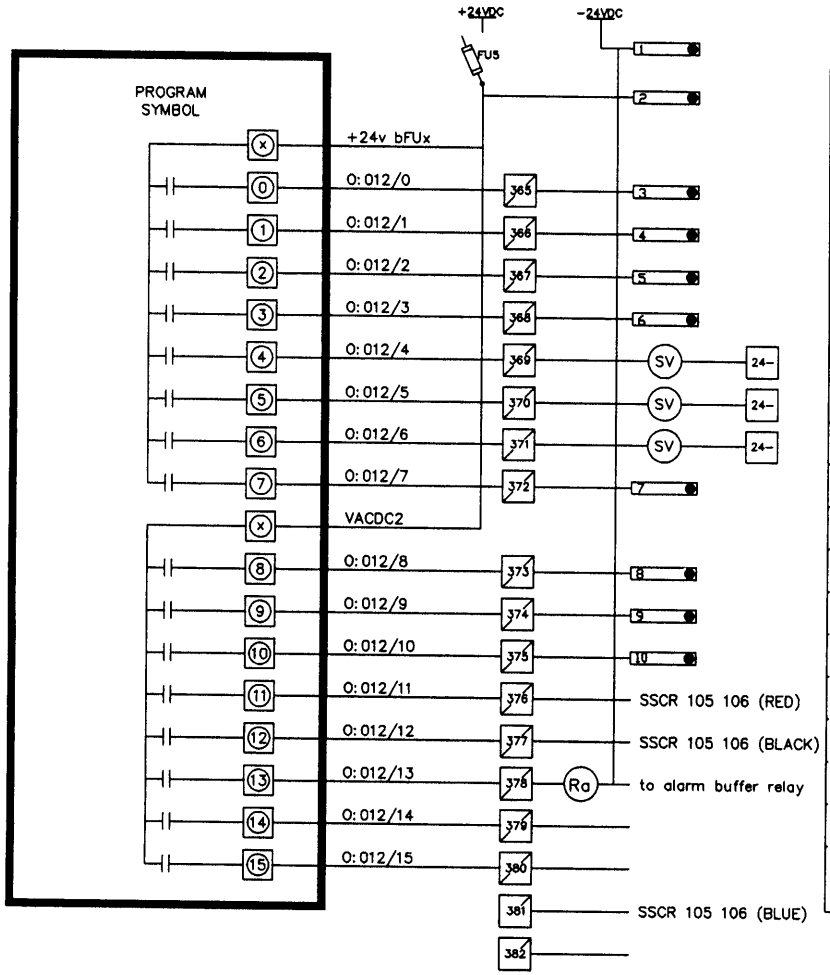
JEVCAR TECHNOLOGIES

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

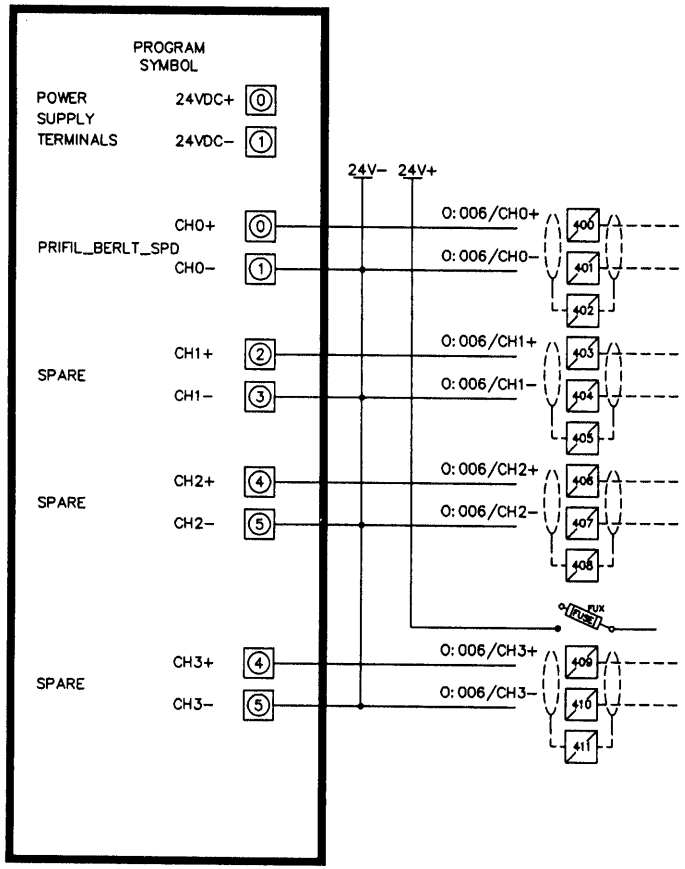
JEYCAR

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 PRIMARY FILTER BELT SPEED SETPOINT
SPARE X X
SPARE X 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

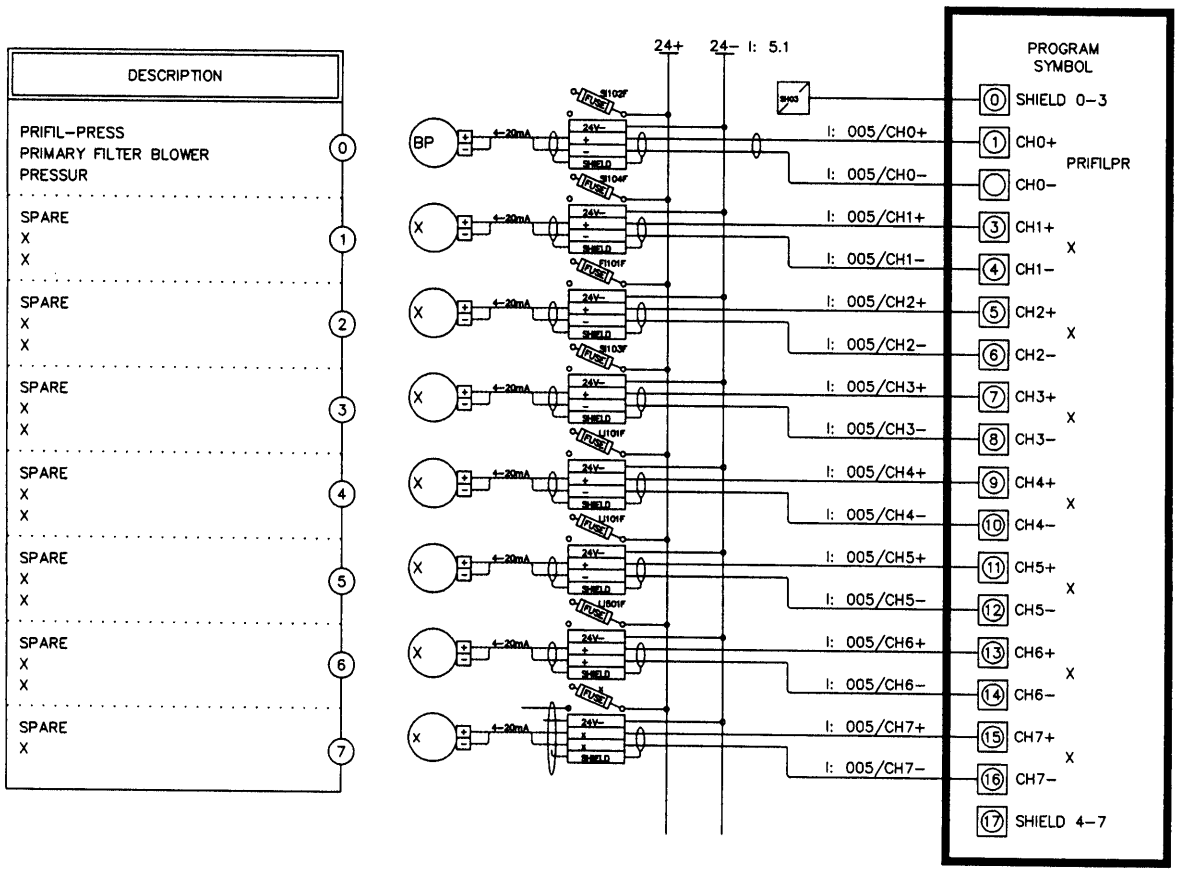
DEVCAR TECHNOLOGIES

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

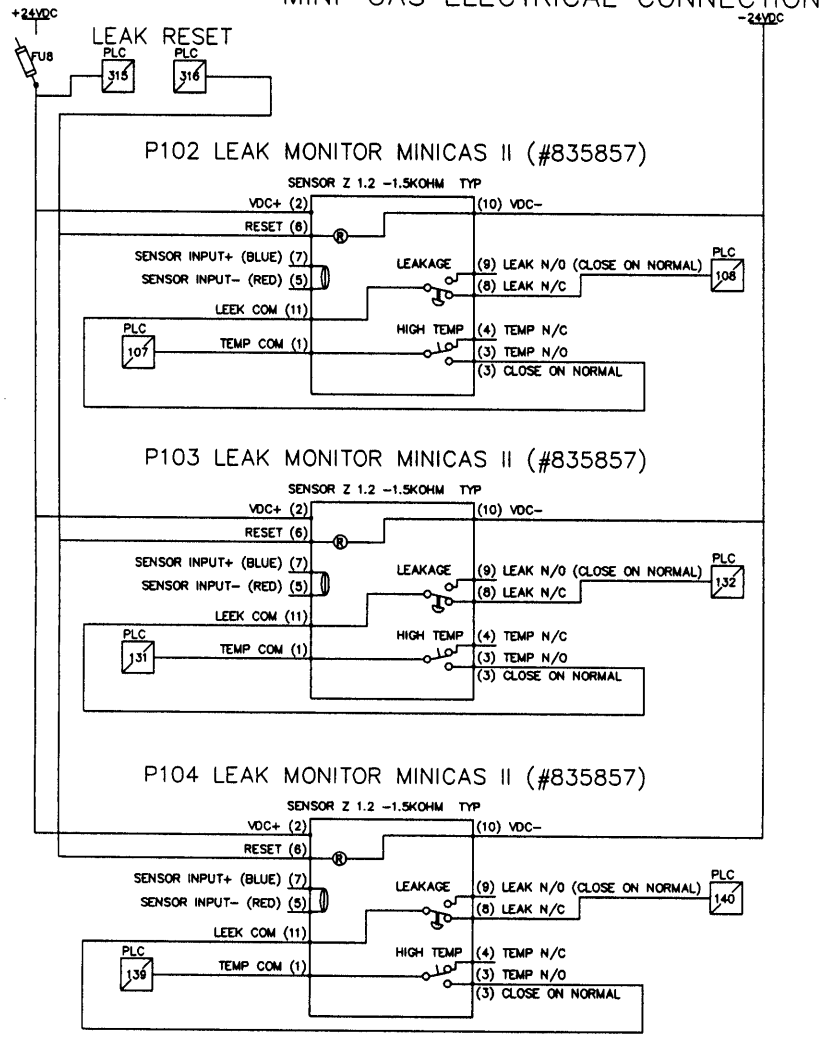
CITY OF IQALUIT

WASTEWATER TREATMENT PLANT
PHASE 1

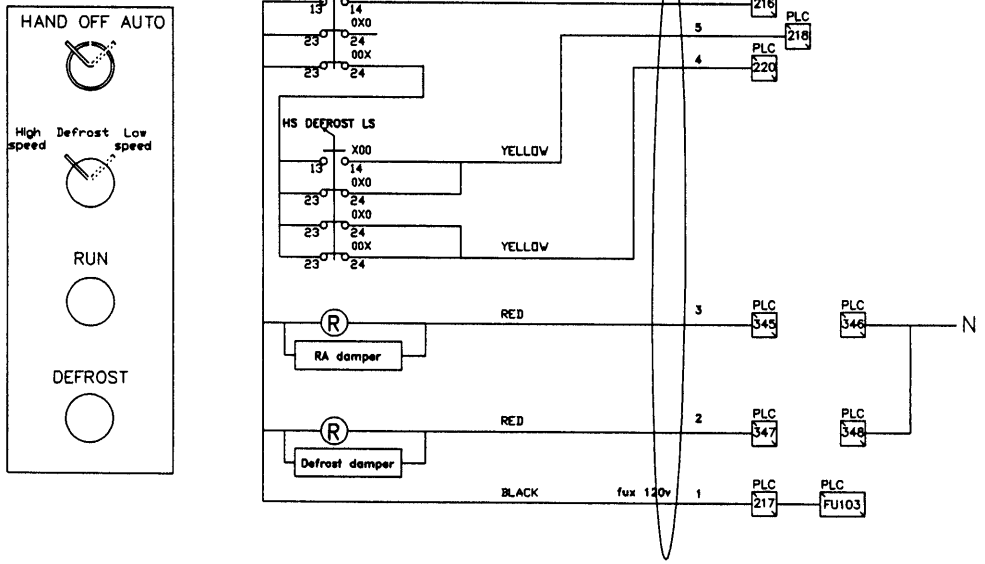
Main P.L.C Cabinet SLOT #14

DRAWN BY: / CHECKED BY:	SCALE: NTS	DATE JUNE 15TH, 2006	SHEET NO ----
CADD SYSTEM AutoCAD	DWG NO. CADD SYSTEM	REV. 0	CONTRACT 0

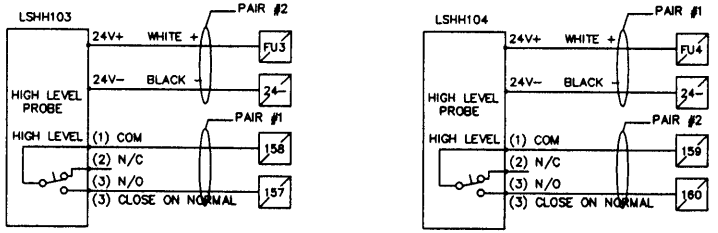
MINI-CAS ELECTRICAL CONNECTION



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

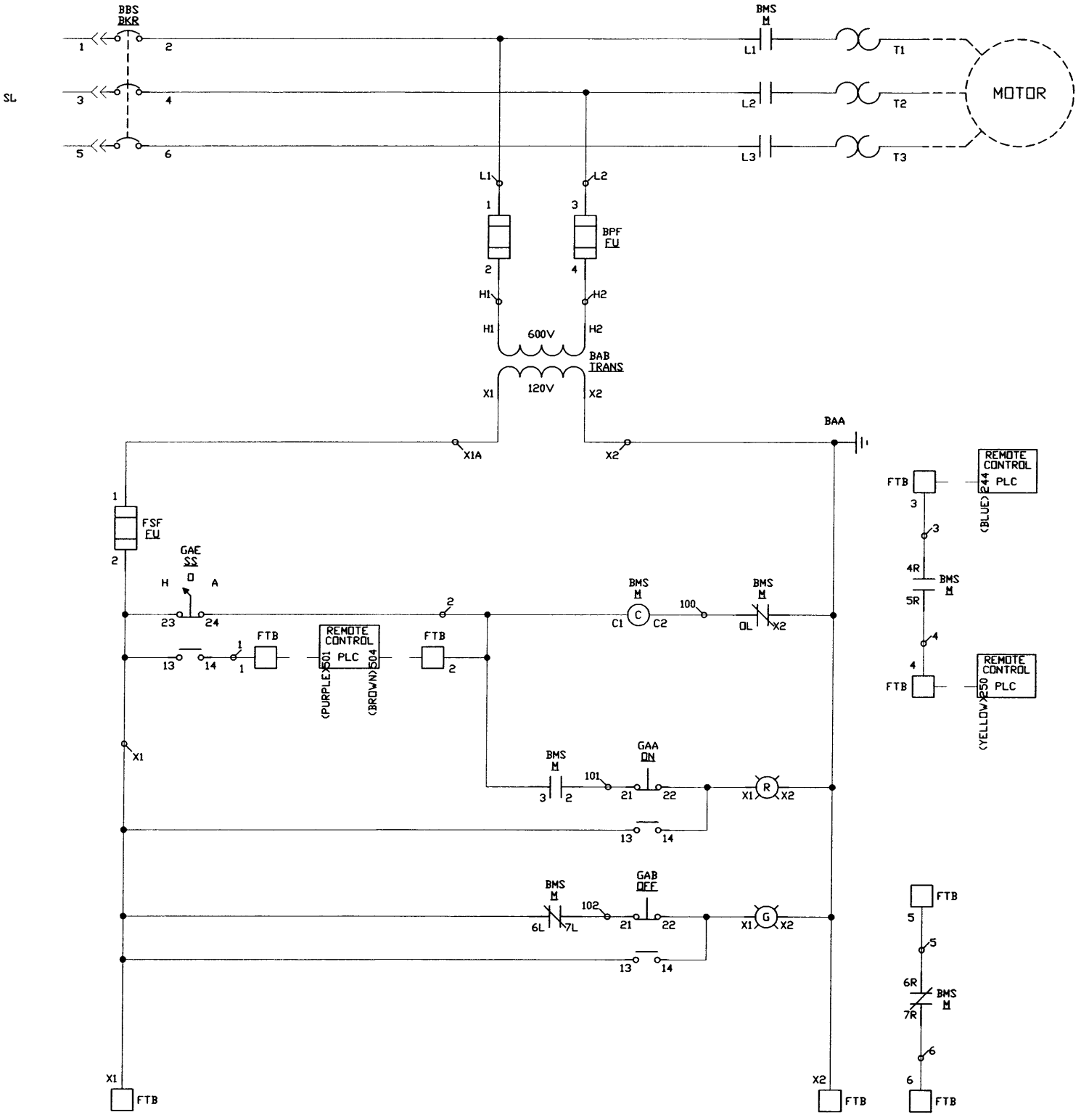
CITY OF IQALUIT

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

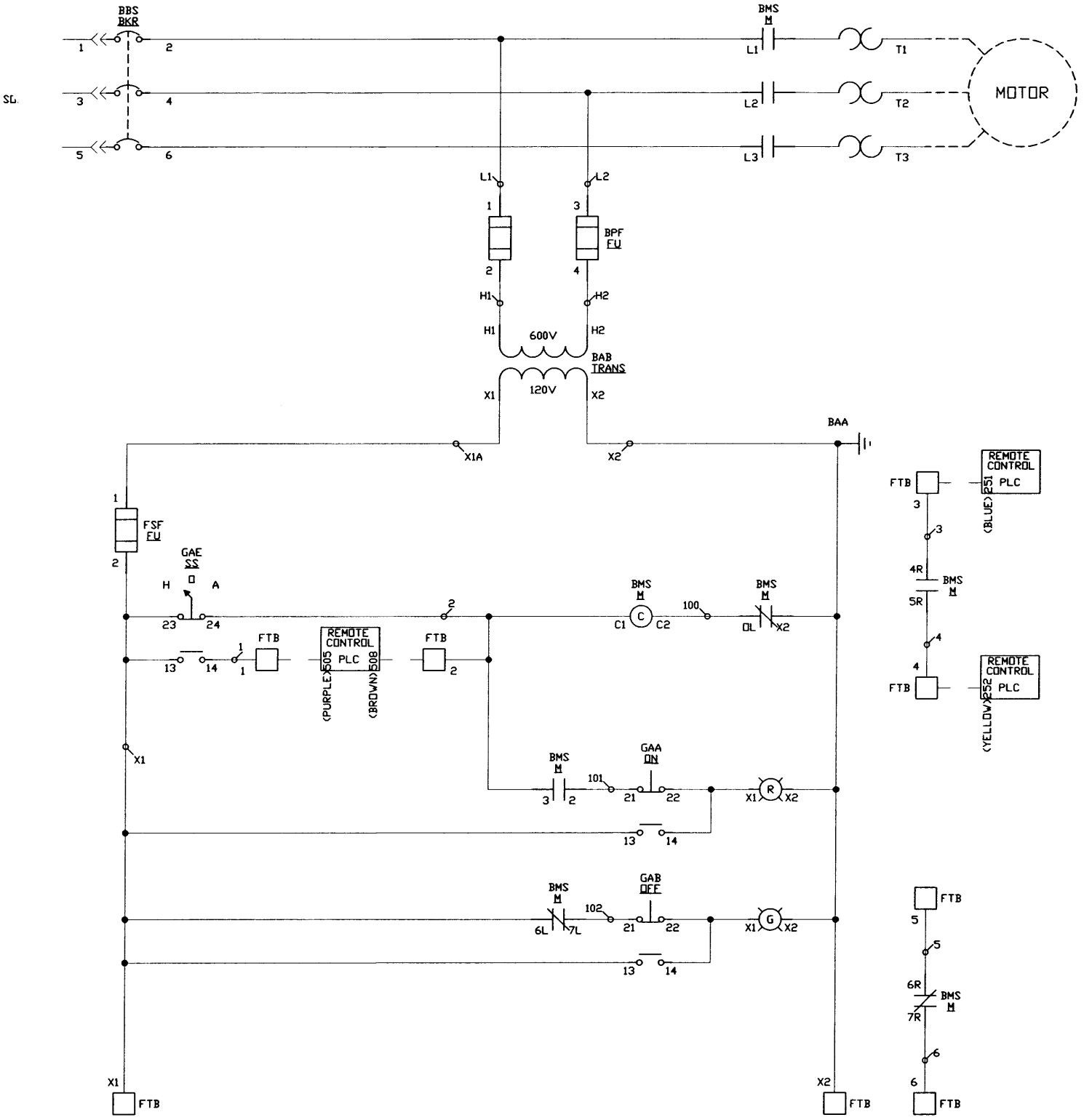


T' L UNITS INCLUDED

H. NK WIRE MARKERS

JOB [illegible]	IQUALUIT SEWAGE WATER STATION	MOTOR CONTROL CENTER 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 : - - -

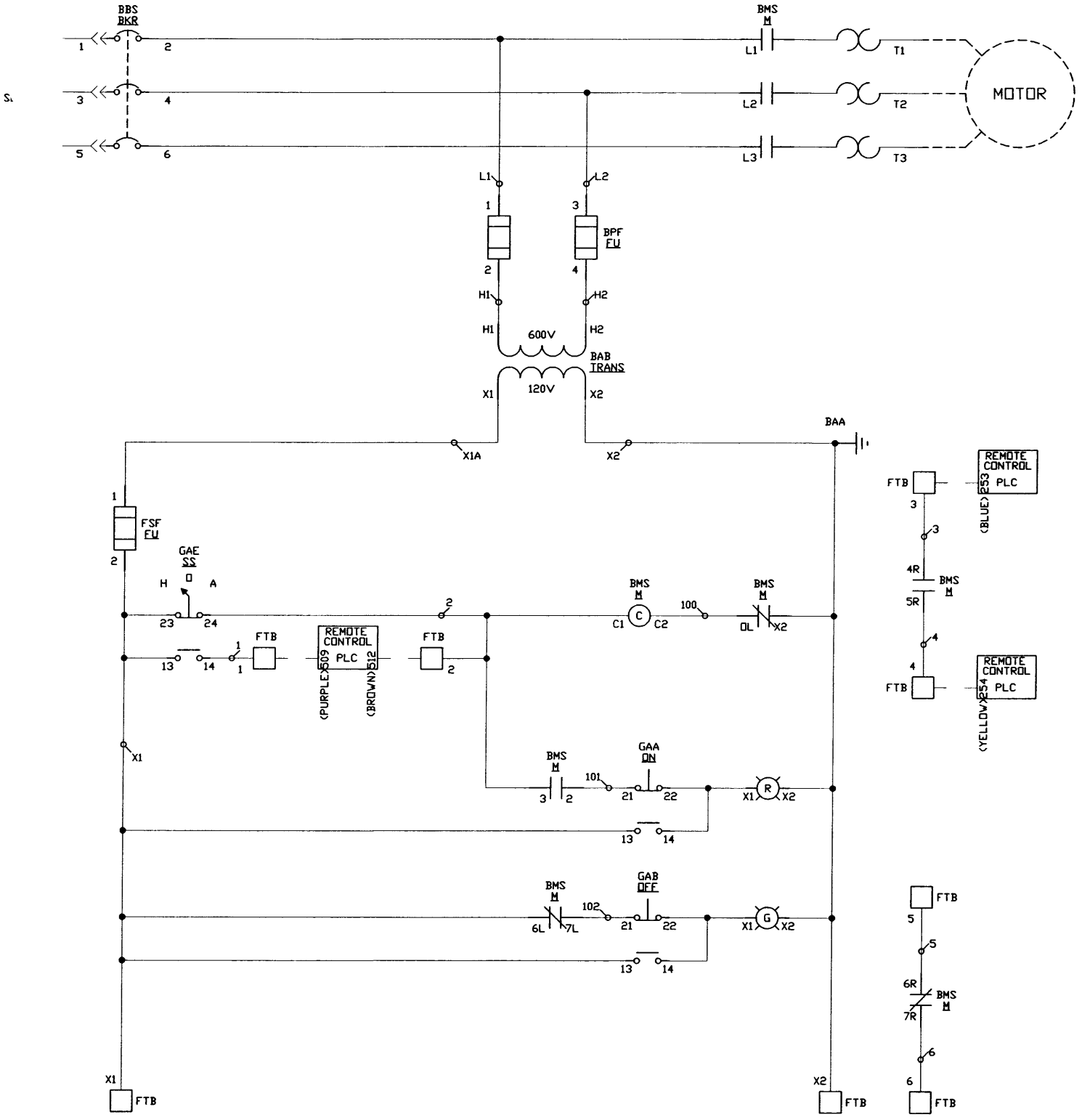
FEW P2



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

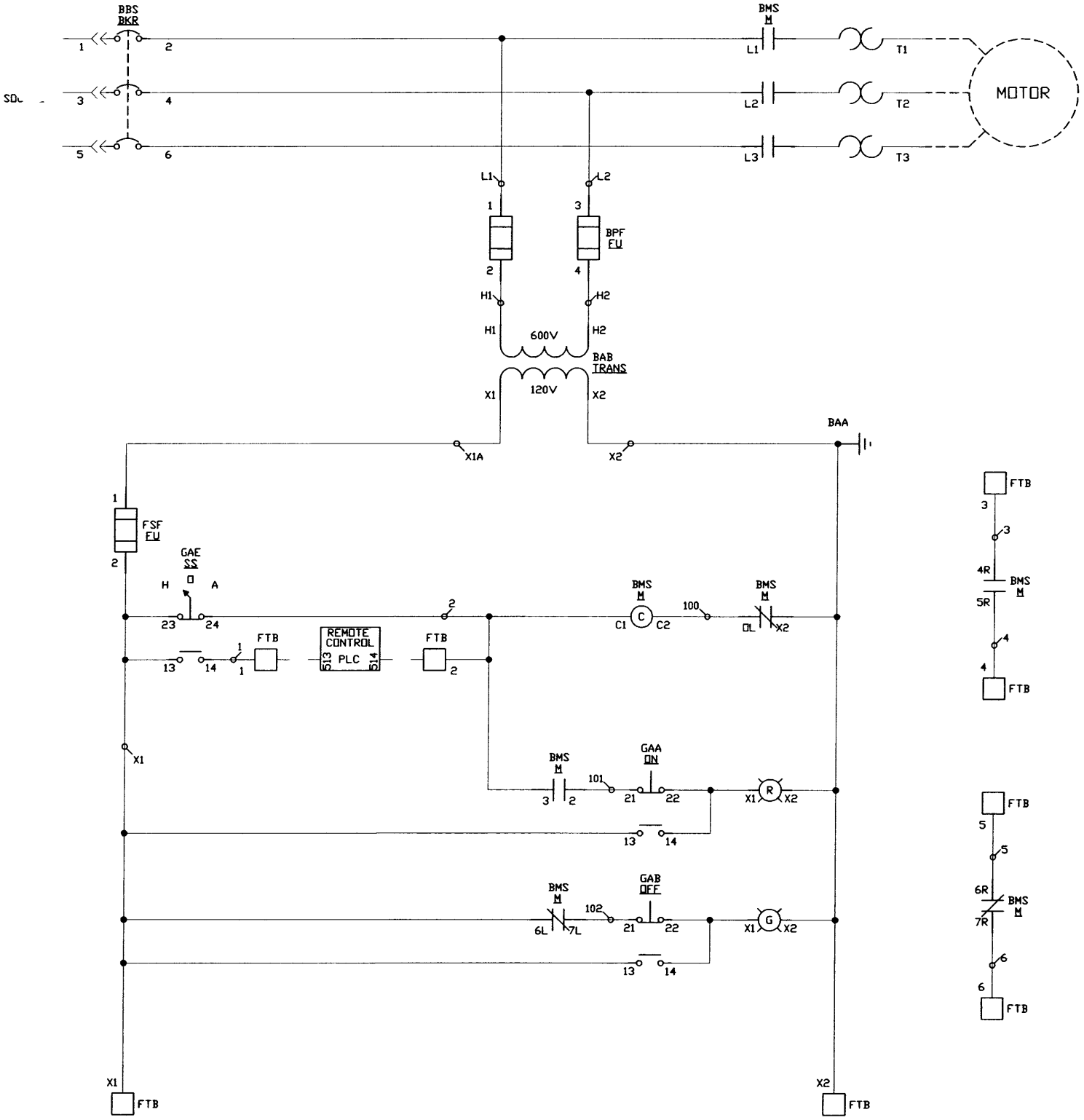


T' L UNITS INCLUDED

H. 'K WIRE MARKERS

JOB :	IQUALUIT SEWAGE WATER STATION	MOTOR CONTROL CENTER 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 : - - -

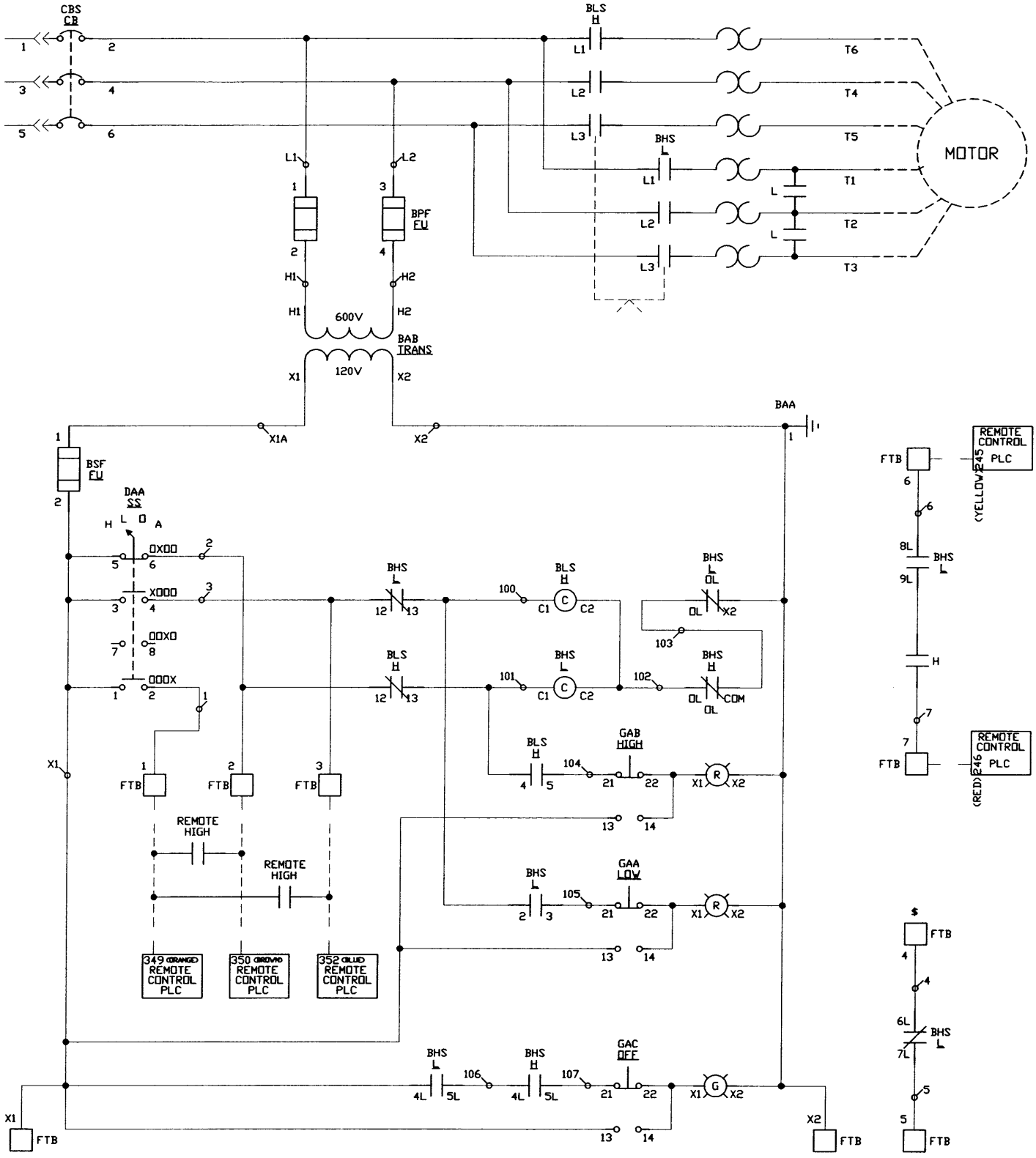
WASTE WATER GLYCOL P-04



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



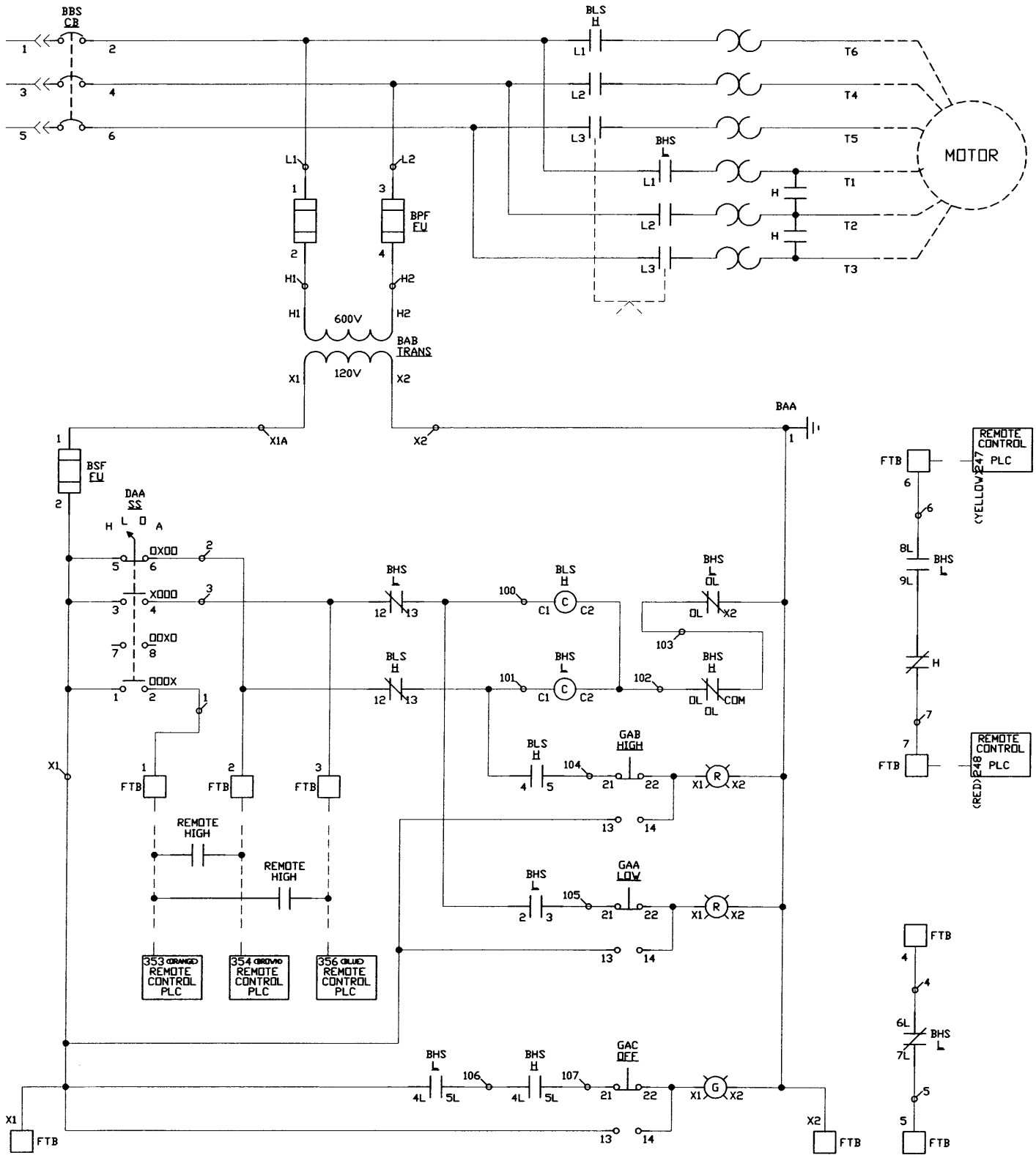
T' L UNITS INCLUDED

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

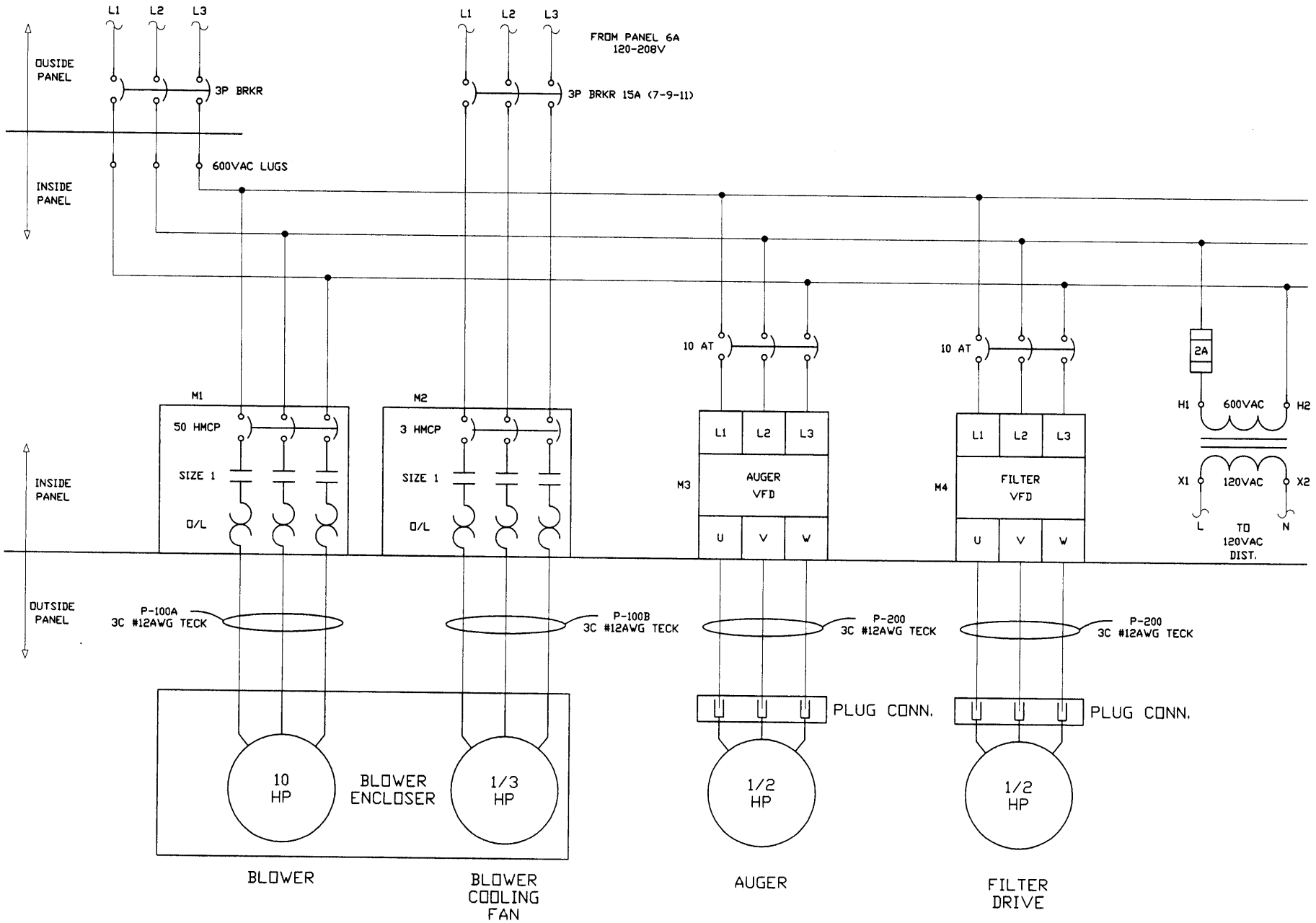
AHU 3 : EXHAUST FAN



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 :	- - -

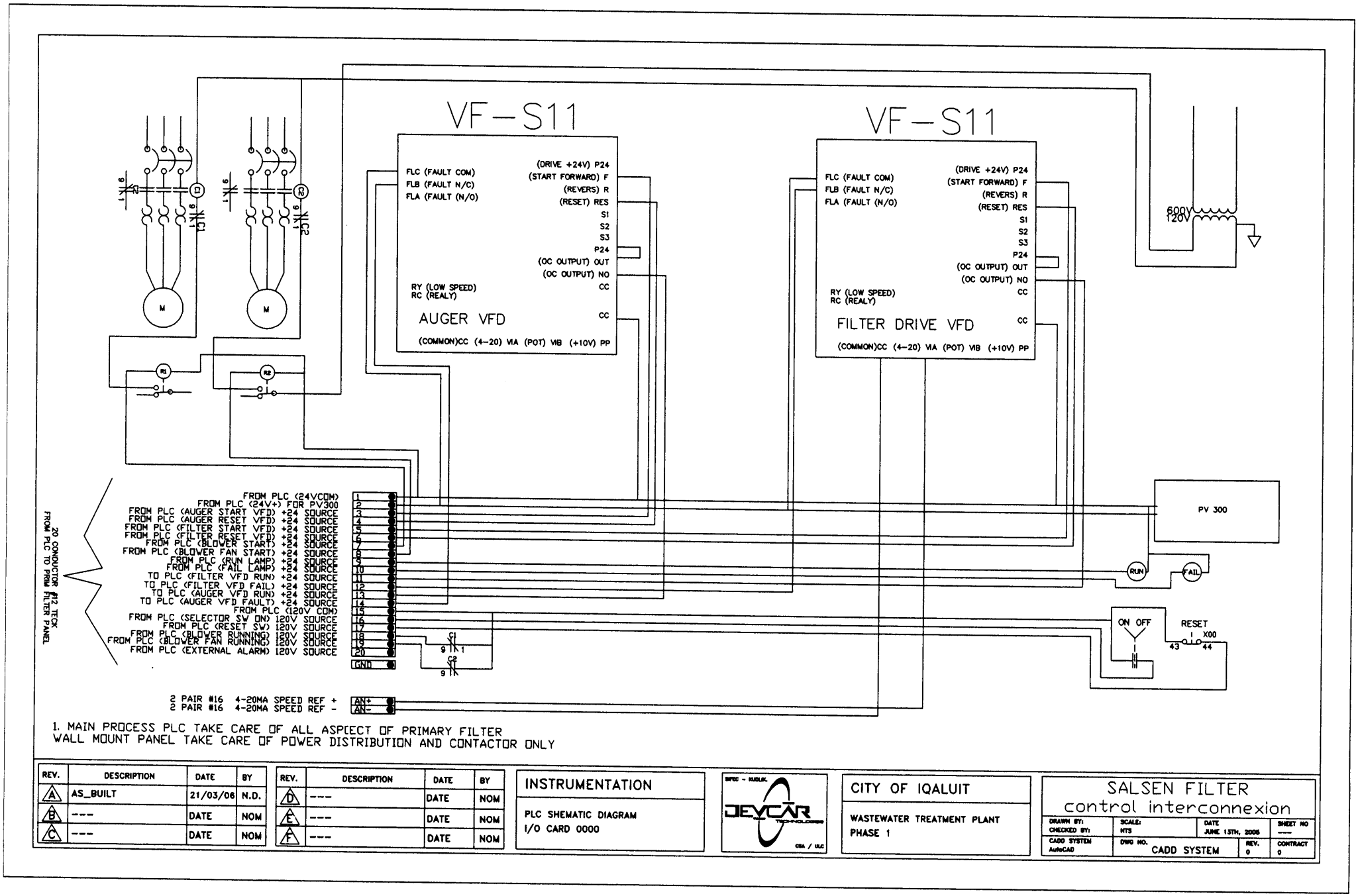
SALSEN FILTER



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. * (Possible to edit)	-		4.1.4
RU1	0000	Automatic acceleration/ deceleration	-	-	0: Disabled (manual) 1: Automatic 2: Automatic (only at acceleration)	0		5.1.1
RU2	0001	Torque boost setting macro function	-	-	0: Disabled 1: Automatic torque boost + auto-tuning 2: Vector control + auto-tuning 3: Energy saving + auto-tuning	0		5.2
RU4	0040	Parameter setting macro function	-	-	0: Disabled 1: Coast stop 2: 3-wire operation 3: External input UP/DOWN setting 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 1: Operation panel	1	0	5.4 7.2
FNOd	0004	Frequency setting mode selection 1	-	-	0: Built-in potentiometer 1: VIA 2: VIB 3: Operation panel 4: Serial communication 5: UP/DOWN from external contact 6: VIA + VIB (Override)	0	1	5.4 6.5.1 7.1

11

1

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 1: Output current 2: Set frequency 3: DC voltage 4: Output voltage command value 5: Input power 6: Output power 7: Torque 8: Torque current 9: Motor cumulative load factor 10: Inverter cumulative load factor 11: PBR (braking reactor) cumulative load factor 12: Frequency setting value (after PID) 13: VIA Input value 14: VIB Input value 15: Fixed output 1 (Output current: 100%) 16: Fixed output 2 (Output current: 50%) 17: Fixed output 3 (Other than the output current: 100%) 18: Serial communication data 19: For adjustments (FM set value is displayed.)	0	0	5.5
FM	0006	Meter adjustment	-	-	-	-		5.5
TYP	0007	Default setting	-	-	0: - 1: 50Hz default setting 2: 60Hz default setting 3: Default setting (Initialization) 4: Trip record clear 5: Cumulative operation time clear 6: Initialization of type information 7: Save user setting parameters 8. Load user setting parameters 9. Cumulative fan operation time record clears	0		4.2.6 4.2.7 5.6
Fr	0008	Forward/reverse run selection (Operation panel)	-	-	0: Forward run 1: Reverse run 2: Forward run (F/R switching possible) 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) 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) 60.0 (WN, AN)	60	5.10
ULV	0409	Base frequency voltage 1	V	1/0.1	50-330 (240V class) 50-660 (500/600V class)	*3	575	5.10 6.13.6

*3 : 230 (240V class), 460 (500V class), 575V (600V class)

(2)

12.2.3

FILTER

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 1: Variable torque 2: Automatic torque boost control 3: Vector control 4: Energy-saving 5: Dynamic energy-saving (for fans and pumps) 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 6.19.1
OLn	0017	Electronic-thermal protection characteristic selection *2	-	-	Setting / Overload protection / OL stall 0 (Standard motor): O / × 1 (Standard motor): O / O 2 (Standard motor): × / × 3 (Standard motor): × / O 4 (VF motor): O / × 5 (VF motor): O / O 6 (VF motor): × / × 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

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*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 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 VIB - analog input 1: VIA - analog input VIB - contact input (Sink) 2: VIA - analog input VIB - contact input (Source) 3: VIA - contact input (Sink) VIB - contact input (Sink) 4: VIA - contact input (Source) 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 1: F130 or F137 F131 and F138 2: F130 and F137 F131 or F138 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) 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 1: VIA 2: VIB 3: Operation panel 4: Serial communication 5: UP/DOWN from external contact 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 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 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 1: Coast stop 2: DC braking	0		
F262	0262	Panel jog run operation mode	-	-	0: Invalid 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 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		

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12.2.3

AUGER VFD

AS BUILT
MAY 28 2006
CARL FAUTEUX

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. * (Possible to edit)	-		4.1.4
AU1	0000	Automatic acceleration/ deceleration	-	-	0: Disabled (manual) 1: Automatic 2: Automatic (only at acceleration)	0		5.1.1
AU2	0001	Torque boost setting macro function	-	-	0: Disabled 1: Automatic torque boost + auto-tuning 2: Vector control + auto-tuning 3: Energy saving + auto-tuning	0		5.2
AU4	0040	Parameter setting macro function	-	-	0: Disabled 1: Coast stop 2: 3-wire operation 3: External input UP/DOWN setting 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 1: Operation panel	1	0	5.4 7.2
FMOd	0004	Frequency setting mode selection 1	-	-	0: Built-in potentiometer 1: VIA 2: VIB 3: Operation panel 4: Serial communication 5: UP/DOWN from external contact 6: VIA + VIB (Override)	0	0	5.4 6.5.1 7.1

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12.2.4

AUTER

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
FMSL	0005	Meter selection	-	-	0: Output frequency 1: Output current 2: Set frequency 3: DC voltage 4: Output voltage command value 5: Input power 6: Output power 7: Torque 8: Torque current 9: Motor cumulative load factor 10: Inverter cumulative load factor 11: PBR (braking reactor) cumulative load factor 12: Frequency setting value (after PID) 13: VIA Input value 14: VIB Input value 15: Fixed output 1 (Output current: 100%) 16: Fixed output 2 (Output current: 50%) 17: Fixed output 3 (Other than the output current: 100%) 18: Serial communication data 19: For adjustments (FM set value is displayed.)	0		5.5
FM	0006	Meter adjustment	-	-	-	-		5.5
TYP	0007	Default setting	-	-	0: - 1: 50Hz default setting 2: 60Hz default setting 3: Default setting (Initialization) 4: Trip record clear 5: Cumulative operation time clear 6: Initialization of type information 7: Save user setting parameters 8. Load user setting parameters 9. Cumulative fan operation time record clears	0		4.2.6 4.2.7 5.6
Fr	0008	Forward/reverse run selection (Operation panel)	-	-	0: Forward run 1: Reverse run 2: Forward run (F/R switching possible) 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) 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) 60.0 (WN, AN)		5.10
ULV	0409	Base frequency voltage 1	V	1/0.1	50-330 (240V class) 50-660 (500/600V class)	*3		5.10 6.13.6

*3 : 230 (240V class), 460 (500V class), 575V (600V class)

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12.2.4

AUFER

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 1: Variable torque 2: Automatic torque boost control 3: Vector control 4: Energy-saving 5: Dynamic energy-saving (for fans and pumps) 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 6.19.1
OLn	0017	Electronic-thermal protection characteristic selection *2	-	-	Setting / Overload protection / OL stall 0 Standard motor: O / × 1 Standard motor: O / O 2 Standard motor: × / × 3 Standard motor: × / O 4 VF motor: O / × 5 VF motor: O / O 6 VF motor: × / × 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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12.2.4

AUFER

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 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 VIB - analog input 1: VIA - analog input VIB - contact input (Sink) 2: VIA - analog input VIB - contact input (Source) 3: VIA - contact input (Sink) VIB - contact input (Sink) 4: VIA - contact input (Source) 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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12.2.4

AUFER

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 1: F130 or F137 F131 and F138 2: F130 and F137 F131 or F138 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) 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 1: VIA 2: VIB 3: Operation panel 4: Serial communication 5: UP/DOWN from external contact 6: VIA + VIB (Override)	1		6.3.5 6.5.1 7.1

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12.2.4

AUGER

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 1: At auto-restart after momentary stop 2: ST terminal on or off 3: At auto-restart or when turning ST-CC on or off 4: At start-up	0		6.13.1
F302	0302	Regenerative power ride-through control (Deceleration stop)	-	-	0: Disabled 1: Automatic setting 2: Slowdown stop	0		6.13.2
F303	0303	Retry selection (number of times)	Times	1/1	0: Disabled 1-10	0		6.13.3
F304	0304	Dynamic braking selection	-	-	0: Disabled 1: Enabled (Resistor overload protection enabled)	0		6.13.4
F305	0305	Overvoltage limit operation (Slowdown stop mode selection)	-	-	0: Enabled 1: Disabled 2: Enabled (Quick deceleration) 3: Enabled (Dynamic quick deceleration)	2		6.13.5

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12.2.4

AUFER

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 1: Supply voltage corrected, output voltage limited 2: Supply voltage uncorrected, output voltage unlimited 3: Supply voltage corrected, output voltage unlimited	2 (WP, WN) 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 1: Reverse run prohibited 2: Forward run prohibited	0		6.13.7
F312	0312	Random mode	-	-	0: Disabled 1: Automatic setting	0		6.12
F316	0316	Carrier frequency control mode selection	-	-	0: Carrier frequency not reduced automatically 1: Carrier frequency reduced automatically 2: Carrier frequency not reduced automatically Support for 500V/600V models 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 1: Enabled (forward run) 2: Enabled (reverse run) 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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12.2.4

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.

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2004 Ver. 108/109

12.2.5

(1)

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). What is prohibited will be described in or near the symbol in either text or picture form.
●	Indicates something mandatory (must be done). What is mandatory will be described in or near the symbol in either text or picture form.
◇	Indicates danger. What is dangerous will be described in or near the symbol in either text or picture form.
△	Indicates warning. 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. 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. 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. 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.). This can result in electric shock or fire.	2.
	• Do not allow water or any other fluid to come in contact with the inverter. 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. 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. 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. 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. 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.	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

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■ Transportation & installation

Danger		See item
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.	1.4.4
	• Do not place any inflammable objects nearby. 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. This can result in electric shock or fire.	2.
Mandatory	• Must be used in the environmental conditions prescribed in the instruction manual. Use under any other conditions may result in malfunction.	1.4.4
	• 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.	1.4.4
	• Do not operate with the front panel cover removed. This can result in electric shock. 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. 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. 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. 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. 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. 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). 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). That may cause a fire. 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. That could result in electric shock.	2.2

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Danger		See item
Mandatory	• Electrical installation work must be done by a qualified expert. 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. 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. 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. (1) Turn off all input power. (2) Wait at least ten minutes and check to make sure that the charge lamp is no longer lit. (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. 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. 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). 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. If the ground is not securely connected, it could lead to electric shock or fire when a malfunction or current leak occurs.	2.1 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. 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. 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. Such practices may result in electric shock.	3.
	• Do not go near the motor in alarm-stop status when the retry function is selected. The motor may suddenly restart and that could result in injury. 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. 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. If the inverter is reset before turning off the operating signal, the motor may restart suddenly causing injury.	3.

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Warning		See item
Prohibited	• Observe all permissible operating ranges of motors and mechanical equipment. (Refer to the motor's instruction manual.) 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. 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. 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. 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. 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. (1) Turn off all input power to the inverter. (2) Wait at least ten minutes and check to make sure that the charge lamp is no longer lit. (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. If inspection is performed without performing these steps first, it could lead to electric shock.	14.

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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. (*) 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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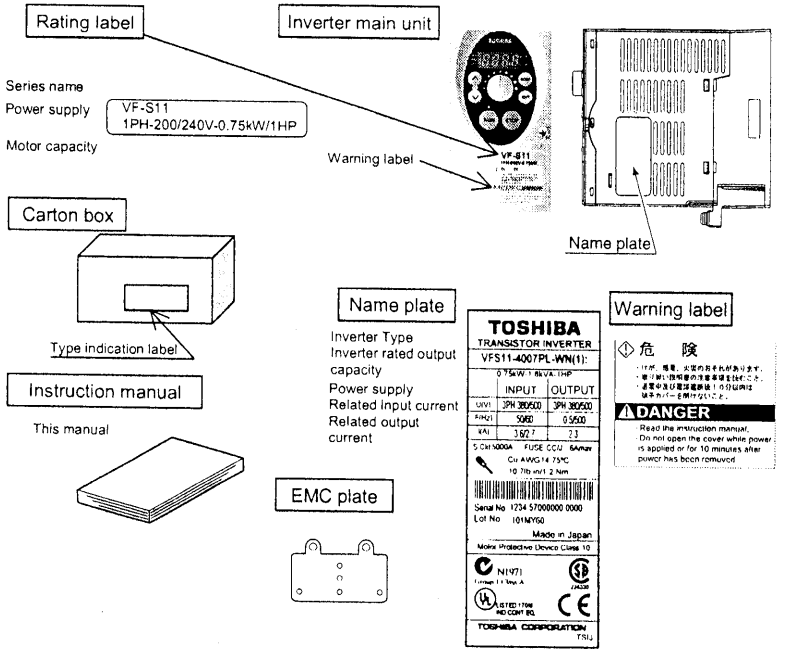
1. Read first

1.1 Check product purchase

Before using the product you have purchased, check to make sure that it is exactly what you ordered.

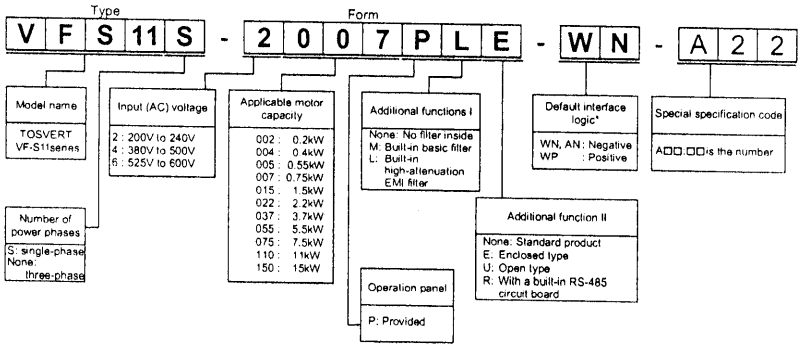
⚠ Warning

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.



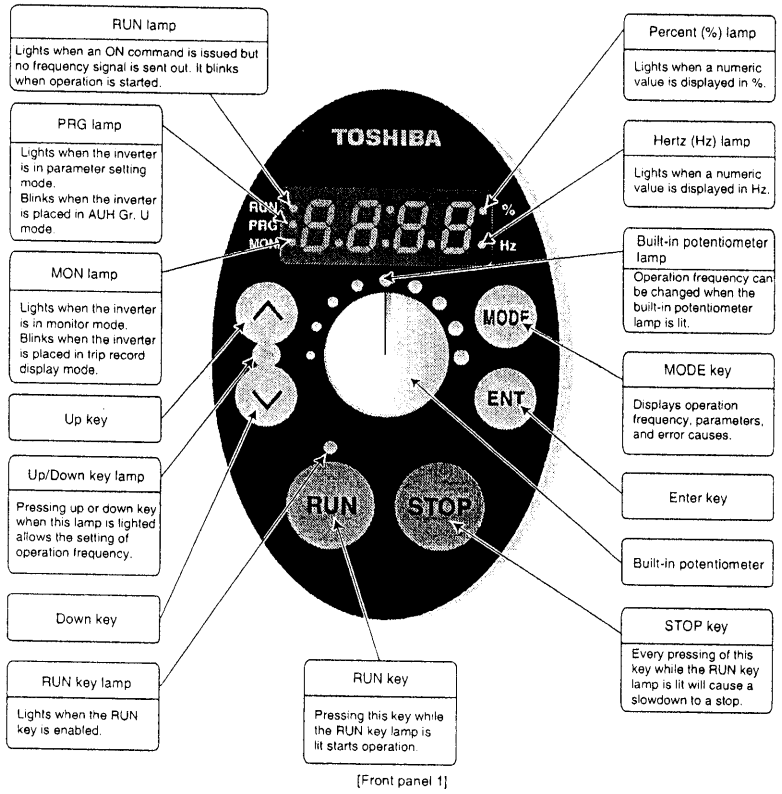
* This code represents the factory default logic setting. You can switch from one input/output logic to the other using slide switch SW1. (See 2.3.2)

Warning: Always shut power off first then check the ratings label of inverter held in a cabinet.

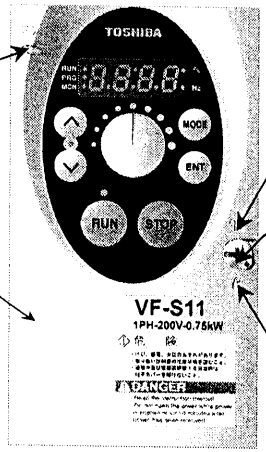
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1.3 Names and functions

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

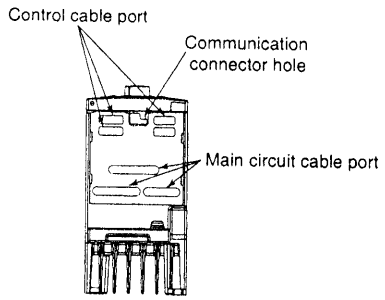
The front panel is unlocked when the dot on the locking screw is on this (upper) side.

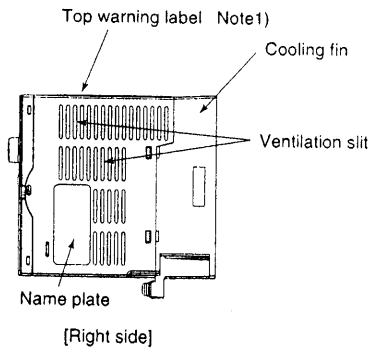
Front panel locking screw

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

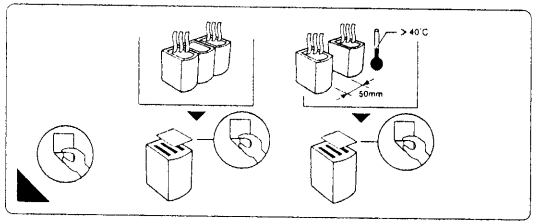
The front panel is locked when the dot on the locking screw is on this (lower) side.





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.

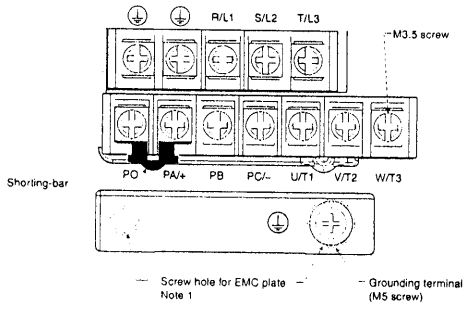
Note 1: EMC plate is supplied as standard.

1) Power circuit terminal board

In case of the lug connector, cover the lug connector with insulated tube, or use the insulated lug connector.

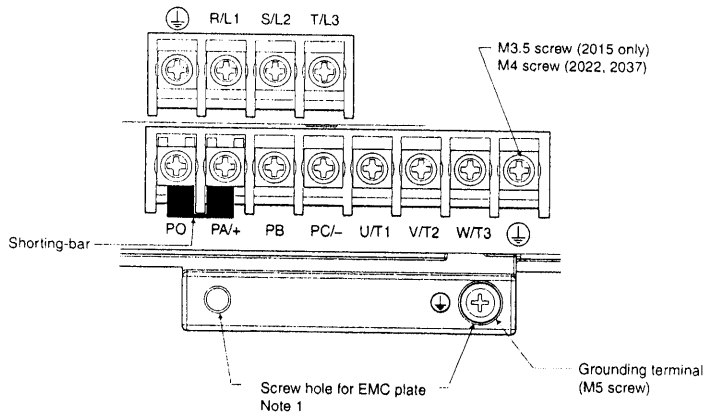
Screw size	tightening torque	
M3.5 screw	0.9Nm	7.1lb • in
M4 screw	1.3Nm	10.7lb • in
M5 screw	2.5Nm	22.3lb • in
M6 screw	4.5Nm	40.1lb • in

VFS11-2002 ~ 2007PM

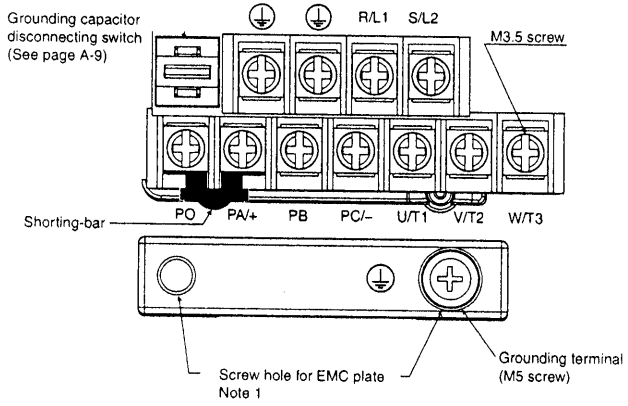


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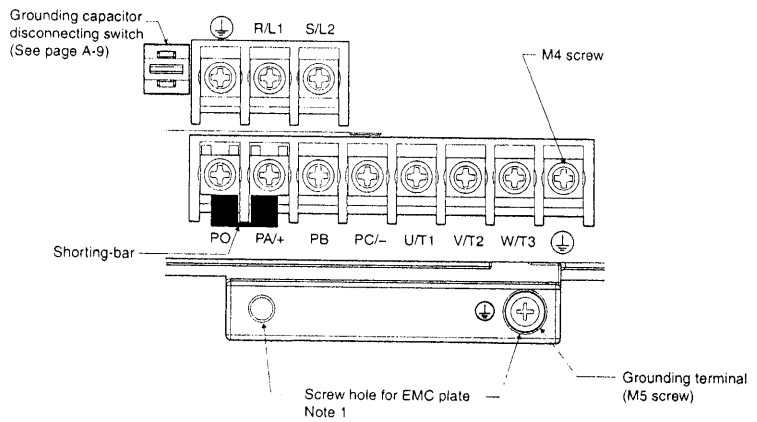
VFS11-2015 ~ 2037PM



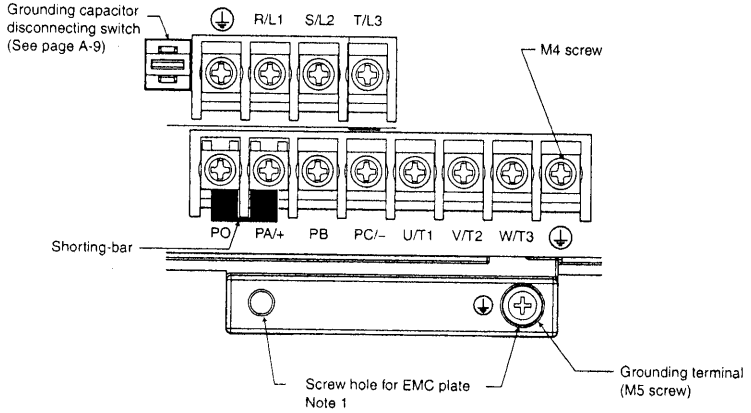
VFS11S-2002 ~ 2007PL



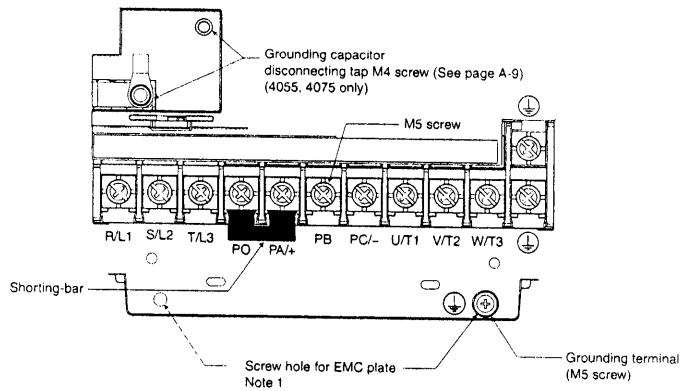
VFS11S-2015, 2022PL



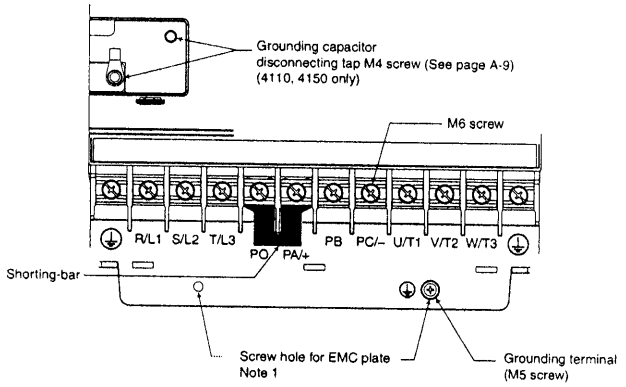
VFS11-4004 ~ 4037PL, 6007 ~ 6037P



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.

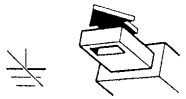
Every single-phase 240V/three-phase 500V model has a built-in high-attenuation noise filter, which is grounded through a capacitor.
If you want to disconnect the capacitor from the grounding line to reduce the amount of leakage current, you can do so easily using the switch or tap. Keep in mind, however, 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

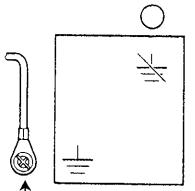


← To connect the capacitor to ground, push this switch. (Factory default position)



← To disconnect the capacitor from ground, pull up this switch.

5.5kW or more : Tap



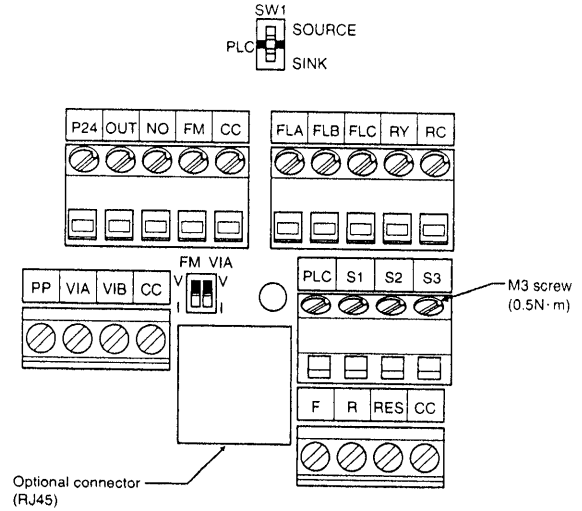
← To disconnect the capacitor from ground, connect the lug terminal to this tap.

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

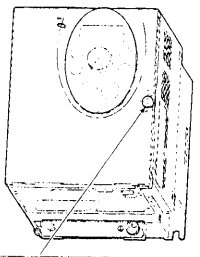
See 2.3.2 for details on all terminal functions.

12.2.5

1.3.3 How to open the front (terminal board) cover

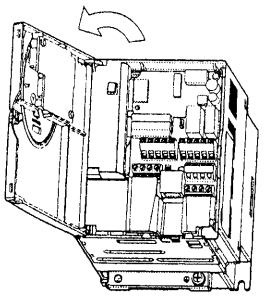
To wire the terminal board, remove the front lower cover in line with the steps given below.

(1)



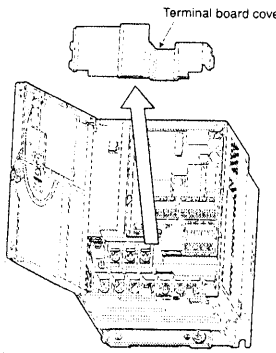
Turn the locking screw on the right side of the front panel 90° counterclockwise to align the dot on the screw with the unlock position mark (upper side). To avoid damage to the screw, do not apply excessive force to turn the screw more than 90 degrees.

(2)



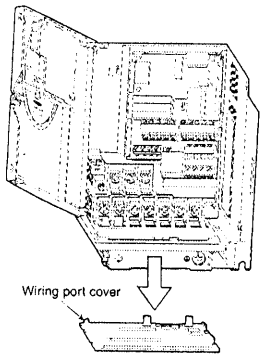
Pull the front panel toward you and swing it open to the left.

(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

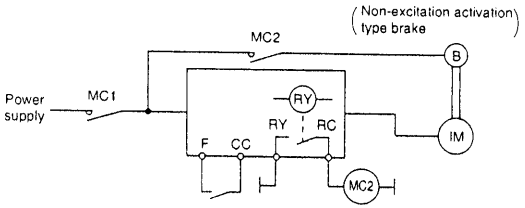
When combined with a load that produces regenerative torque, the overvoltage or overcurrent protection function may be activated to trip the inverter. For this kind of situation, you must install a dynamic braking resistor that complies with the load conditions, or increase deceleration time.

/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

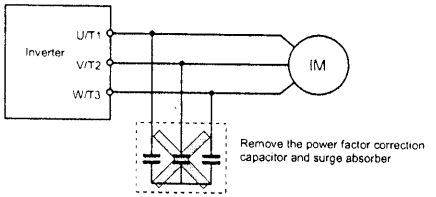
The inverter has an overcurrent protection function. The programmed current level is set to the inverter's maximum applicable motor. If the motor used has a small capacity, the overcurrent level and the electronic thermal protection must be readjusted. If adjustment is necessary, see 5-13, and make adjustments 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.

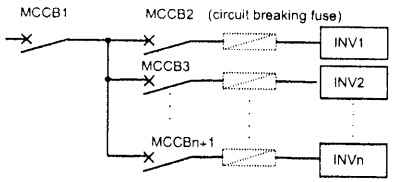


Power factor correction capacitor

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.

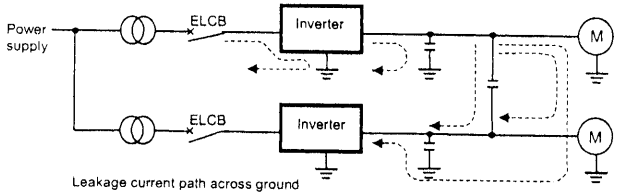
1.4.3 What to do about the leak current

⚠ 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.

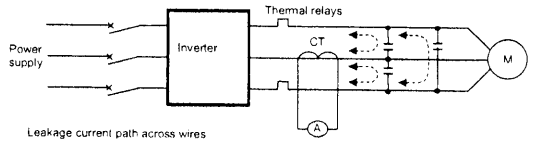


Leakage current path across ground

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

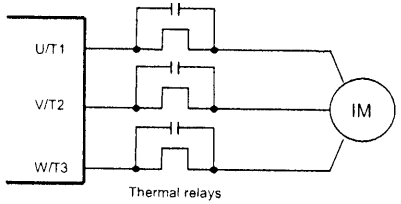


Leakage current path across wires

(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

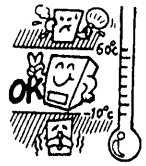
Acetone
Benzene
Chloroform
Ethylene chloride
Ethyl acetate
Glycerin
Tetrachloroethylene
Trichloroethylene
Xylene

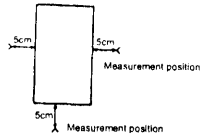
Note: The plastic cover has resistance to deformation by the above applicable solvents. They are not examples for resistance to fire or explosion.



- 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.





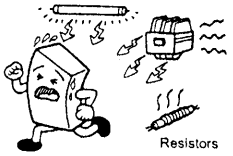
Note: The inverter is a heat-emitting body. Make sure proper space and ventilation is provided when installing in the cabinet. When installing inside a cabinet, we recommend the top seal peeled off although 40°C or less.

- 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.

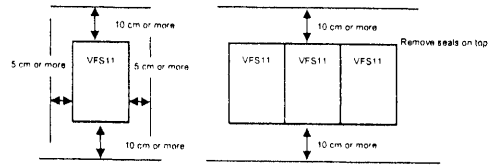
■ How to install

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. • Do not operate with the front panel cover removed. This can result in electric shock. • 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. • 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. • 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

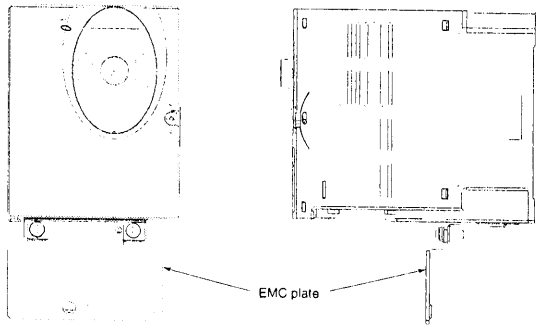
Voltage class	Operating motor capacity (kW)	Inverter type		Calorific Values: Carrier frequency 4kHz	Calorific Values: Carrier frequency 12kHz	Amount of forcible air cooling ventilation required (m^3/min)	Heat discharge surface area required for sealed storage cabinet(m^2)
Single-phase 240V class	0.2	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.

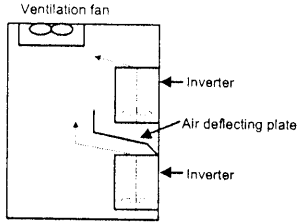
- Install EMC plate and use shielded wires.



■ 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. 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. This can result in electric shock or other injury. • 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. • Do not allow water or any other fluid to come in contact with the inverter. That may result in electric shock or fire.

Warning	
Prohibited	• When transporting or carrying, do not hold by the front panel covers. 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. 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. 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. • Electrical construction work must be done by a qualified expert. Connection of input power by someone who does not have that expert knowledge may result in fire or electric shock. • Connect output terminals (motor side) correctly. If the phase sequence is incorrect, the motor will operate in reverse and that may result in injury. • Wiring must be done after installation. If wiring is done prior to installation that may result in injury or electric shock. • The following steps must be performed before wiring. (1) Shut off all input power. (2) Wait at least ten minutes and check to make sure that the charge lamp is no longer lit. (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. If these steps are not properly performed, the wiring will cause electric shock. • Tighten the screws on the terminal board to specified torque. If the screws are not tightened to the specified torque, it may lead to fire.

Danger	
Be Grounded	• Ground must be connected securely. 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. 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.

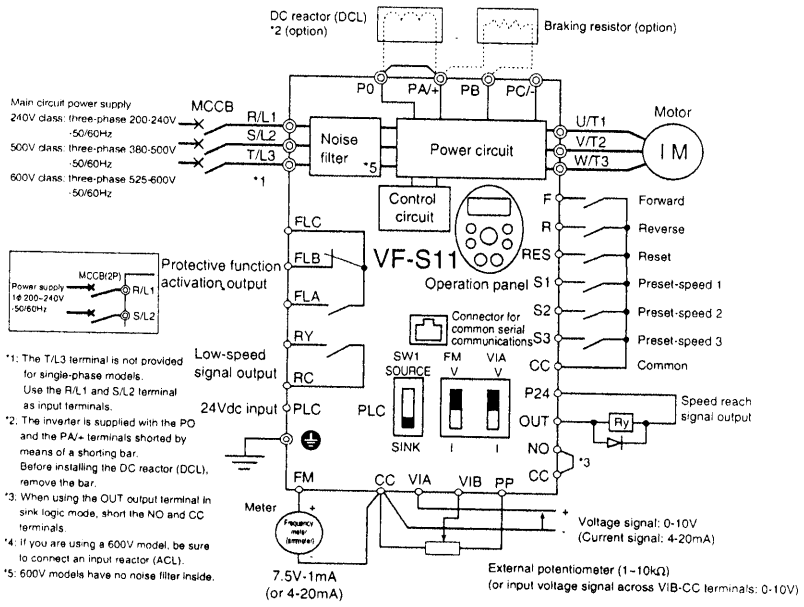
2.2 Standard connections

Danger	
Prohibited	• Do not connect input power to the output (motor side) terminals (U/T1, V/T2, W/T3). Connecting input power to the output could destroy the inverter or cause a fire. • Do not insert a resistor between DC terminals (between PA/+ and PC/-, or between PO and PC/-). It could cause a fire. See 6.13.4 for the connection of a resistor. • First shut off input power and wait at least 10 minutes before touching wires on equipment (MCCB) that is connected to inverter power side. 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.

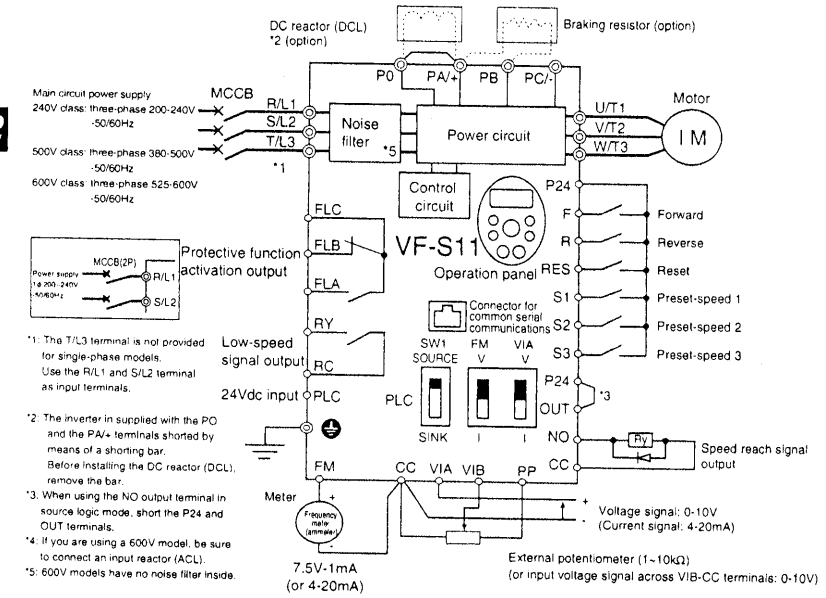
Standard connection diagram - SINK (Negative) (common:CC)



*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.

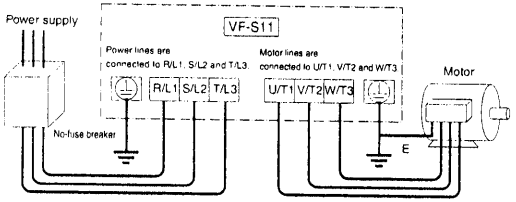
12.8.5

2.3 Description of terminals

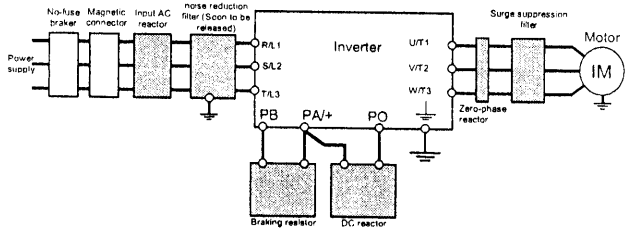
2.3.1 Power circuit terminals

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

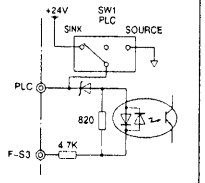
Terminal symbol	Terminal function
⏚	Grounding terminal for connecting inverter. There are 3 terminals in total. 2 terminals in the terminal board, 1 terminal in the cooling fin.
R/L1,S/L2,T/L3	240V class: single-phase 200 to 240V-50/60Hz three-phase 200 to 240V-50/60Hz 500V class: three-phase 380 to 500V-50/60Hz 600V class: three-phase 525 to 600V-50/60Hz * 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. 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).

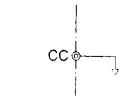
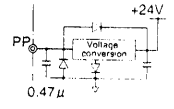
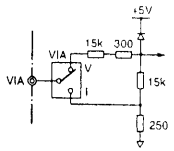
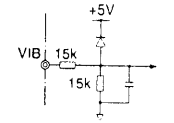
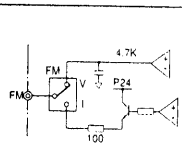
2.3.2 Control circuit terminals

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.

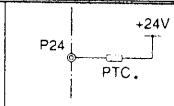
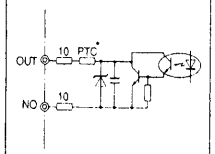
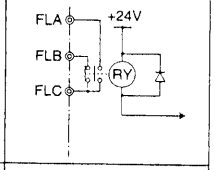
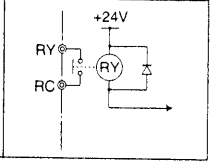
■ Control circuit terminals

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 *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. 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) 4-20mA (internal impedance: 250Ω)	
VIB	Input	Multifunction programmable analog input. Standard default setting: 0~10Vdc input and 0~60Hz (0~50Hz) frequency 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. 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 0-20mA (4-20mA) DC ammeter 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 NO	Output	Multifunction programmable open collector output. Standard default settings detect and output speed reach signal output frequencies. Multifunction output terminals to which two different functions can be assigned. The NO terminal is an isoelectric output terminal. It is insulated from the CC terminal. By changing parameter settings, these terminals can also be used as multifunction programmable pulse train output terminals.	Open collector output 24Vdc-50mA To output pulse trains, a current of 10mA or more needs to be passed Pulse frequency range: 38~1600Hz	
FLA FLB FLC	Output	Multifunction programmable relay contact output. Detects the operation of the inverter's protection function. 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 RC	Output	Multifunction programmable relay contact output. Standard default settings detect and output low-speed signal output frequencies. 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

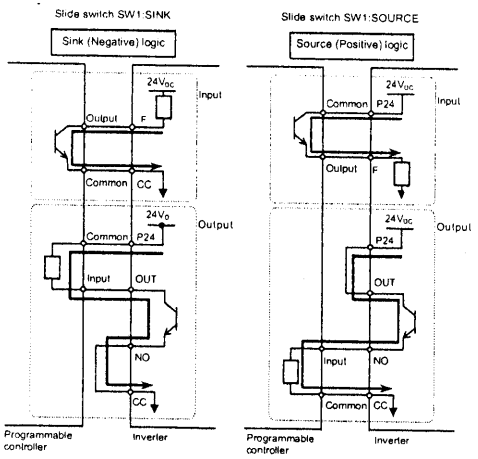
* PTC (Positive Temperature Coefficient) : Resettable thermal fuse resistor for over current protection

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.

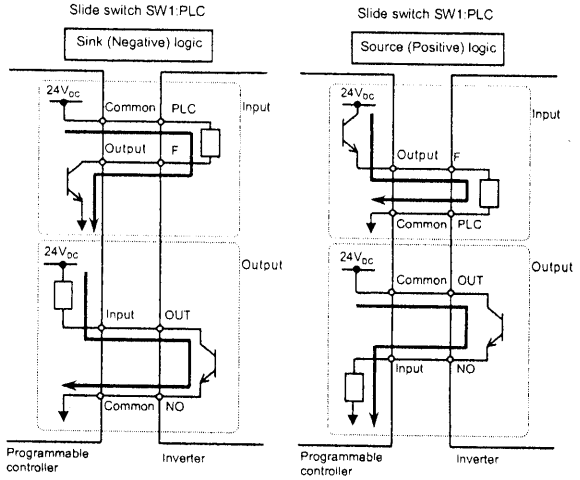
<Examples of connections when the inverter's internal power supply is used>



■ 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.

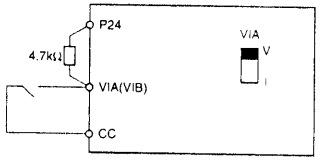
<Examples of connections when an external power supply is used>



■ 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

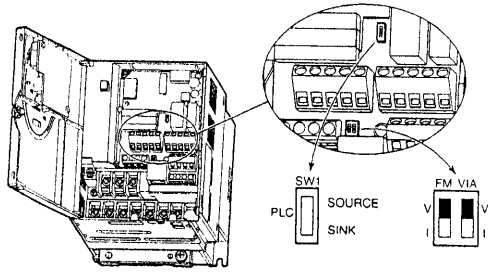
Use SW1 to switch between logics.

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. Touching the inverter terminals while power is connected to it may result in electric shock. • Do not touch switches when the hands are wet and do not try to clean the inverter with a damp cloth. Such practices may result in electric shock. • Do not go near the motor in alarm-stop status when the retry function is selected. The motor may suddenly restart and that could result in injury. 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. 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. • If the inverter begins to emit smoke or an unusual odor, or unusual sounds, immediately turn power off. If the equipment is continued in operation in such a state, the result may be fire. Call your local sales agency for repairs. • Always turn power off if the inverter is not used for long periods of time. • Turn input power on after attaching the front cover. 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. • Make sure that operation signals are off before resetting the inverter after malfunction. 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. 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.) 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 1: Panel	1
FMOD	Frequency setting mode	0: Internal potentiometer setting 1: VIA 2: VIB 3: Operation panel 4: Serial communication 5: External contact up/down 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.

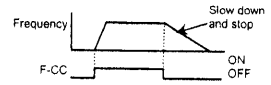
☆ To switch between forward run and reverse run from the control panel, the parameter Fr (forward/reverse run selection) needs to be set to 2 or 3.

(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.

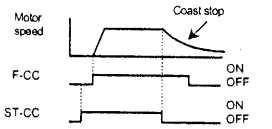
Short F and CC terminals: run forward

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

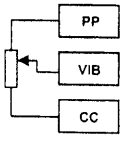
■ Example of operating a run from the panel

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.

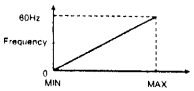
(3) Setting the frequency using the operation panel (FnOd= 1 or 2)

■ Frequency setting

1) Setting the frequency using external potentiometer

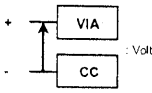


★Potentiometer
Setting frequency using the potentiometer (1-10kΩ, 1/4W)
For more detailed information on adjustments, see 6.5.



* 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)



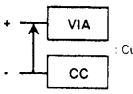
★Voltage signal
Setting frequency using voltage signals (0~10V).
For more detailed information on adjustments, see 6.5.



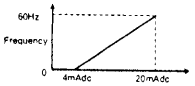
* The input terminal VIB can be used in the same way.
FnOd= 1: VIA effective, FnOd=2: VIB effective
For more details, see 6.5.

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.

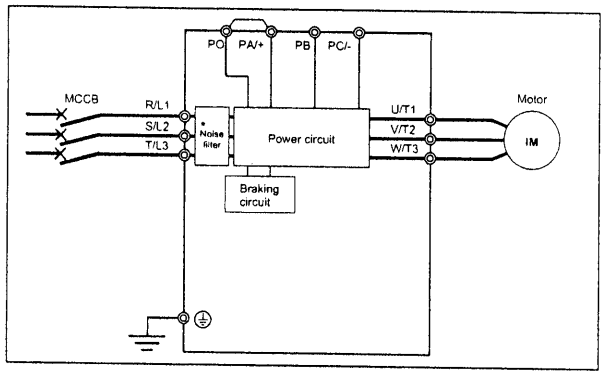
Note: Be sure to turn the VIA slide switch to the I (current) position.

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

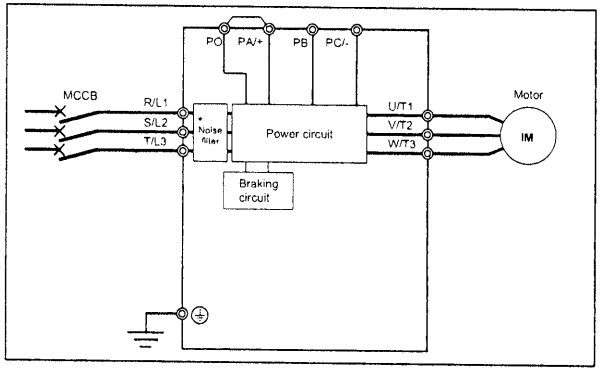
Run/stop: Press the (RUN) and (STOP) keys on the panel.

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.

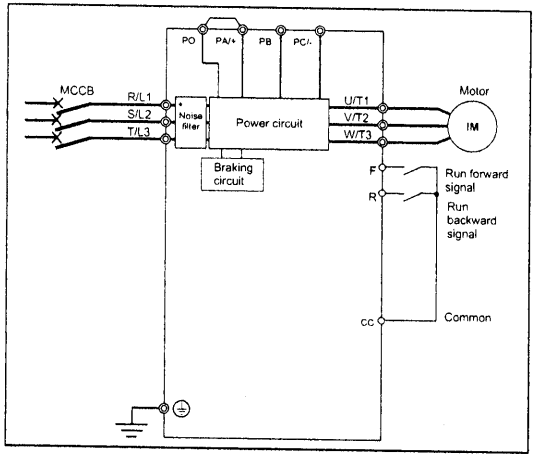
To store the set frequencies in memory, press the (ENT) key.

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

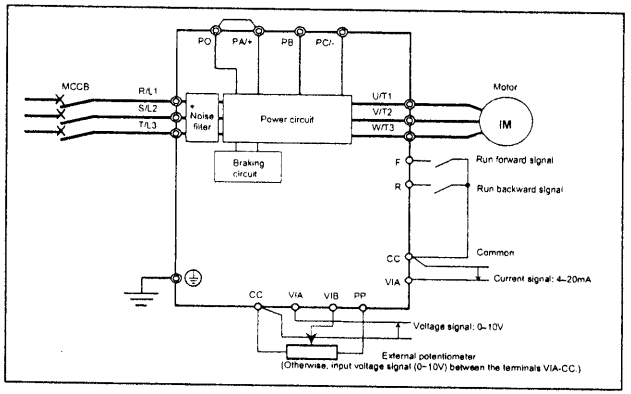
Run/stop: ON/OFF input to F-CC, R-CC. (Set SW1 to Sink logic)

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.

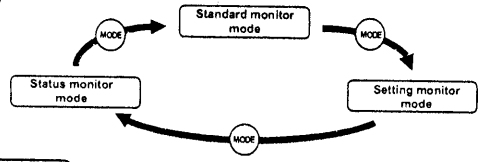
How to set parameters ⇒ see 4.2

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.



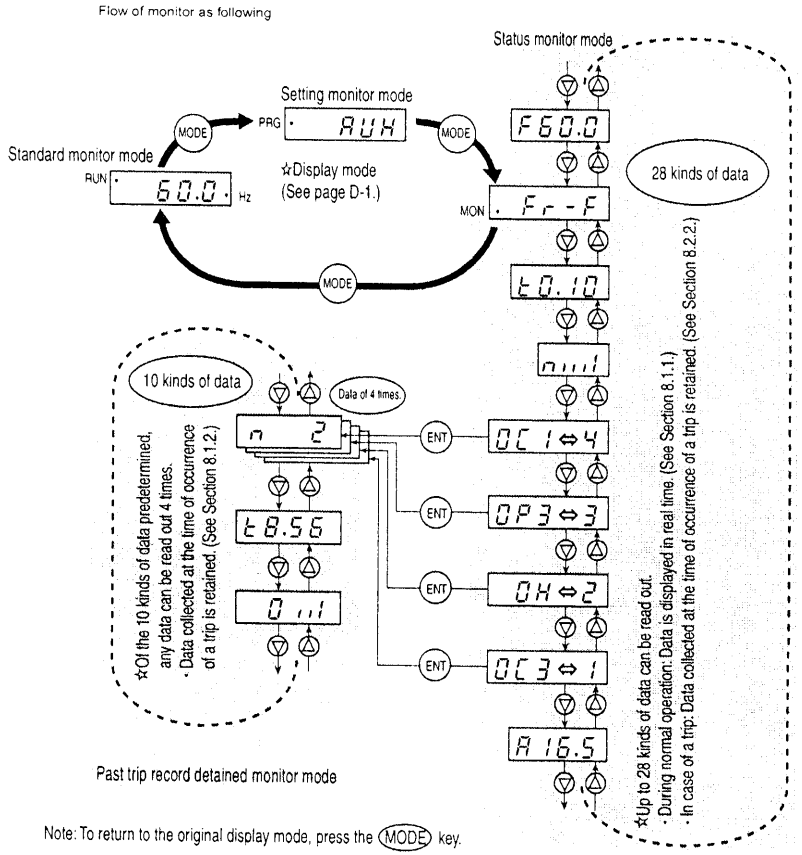
Panel jog mode : This mode allows you to jog the motor by controlling the operation from the operation panel.
This mode is hidden by default.

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.

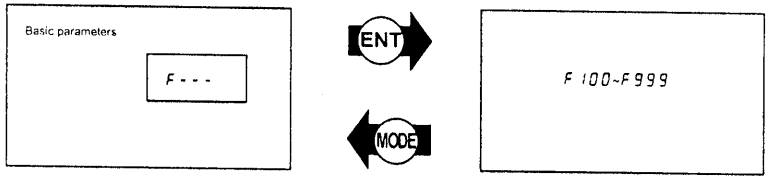
Steps in setting are as follows (example of changing the maximum frequency from 80Hz to 60Hz).

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

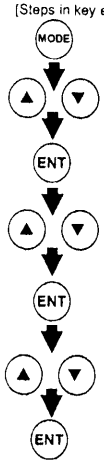
The VF-S11 has extended parameters to allow you to make full use of its functions.
All extended parameters are expressed with F and three digits.



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 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

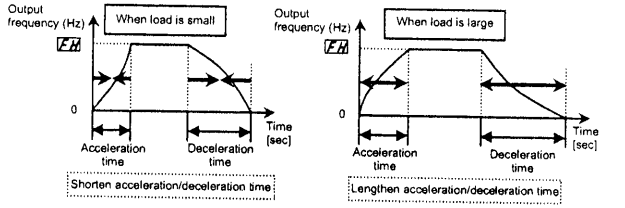
This automatically adjusts acceleration and deceleration time in line with load size.

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) 1: Automatic 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.

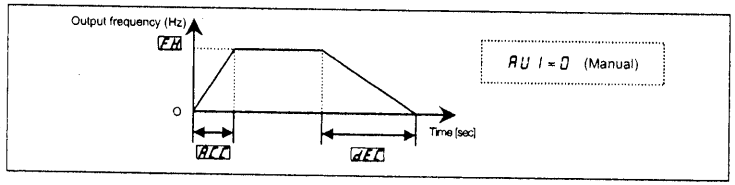
☆ When the inverter is used with a load that fluctuates considerably, it may fail to adjust the acceleration or deceleration time in time, and therefore may be tripped

[Methods of setting automatic acceleration/deceleration]

Key operated	LED display	Operation
	0.0	Displays the operation frequency. (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 1: Automatic torque boost + auto-tuning 2: Vector control + auto-tuning 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 1: Coast stop 2: 3-wire operation 3: External input UP/DOWN setting 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.

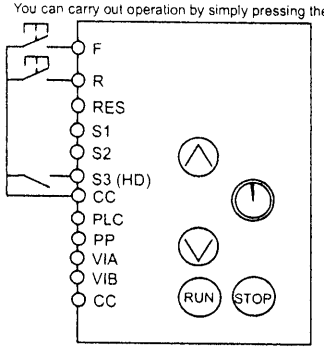
Refer to 3.1.1 (3) and 6.3.1 for details.

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.

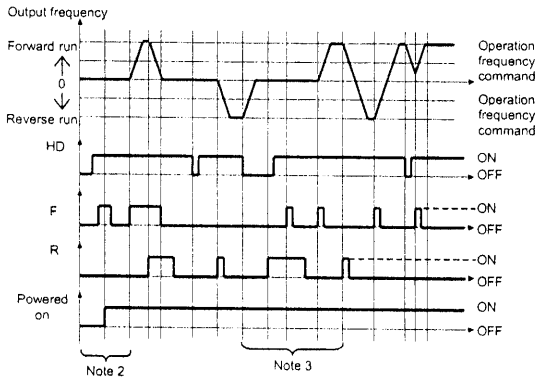
Note 1 : To carry out three-wire operation, set F110 to 1 (ST) and CNOd to 0 (terminal board).
To assign HP (operation holding) to input terminal S3, set parameter F116 to 49 (operation holding).

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)

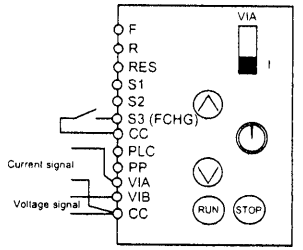
Allows setting of frequency with the Input from an external contact. Can be applied to changes of frequencies from several locations.

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 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 1: VIA 2: VIB 3: Operation panel 4: Serial communication 5: UP/DOWN from external contact 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).

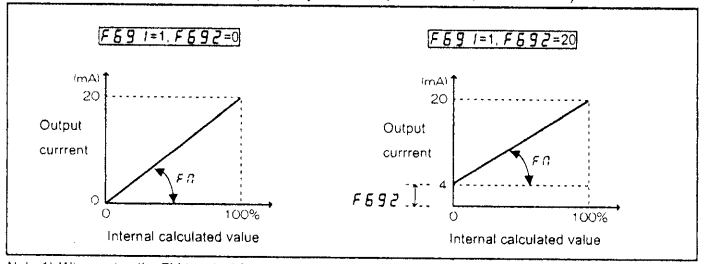
[Connected meter selection parameters]

Title	Function	Adjustment range	Supposition output at FMSL = 17	Default setting
FMSL	Meter selection	0: Output frequency 1: Output current 2: Set frequency 3: DC voltage 4: Output voltage command value 5: Input power 6: Output power 7: Torque 8: Torque current 9: Motor cumulative load factor 10: Inverter cumulative load factor 11: PBR (braking resistor) cumulative load factor 12: Frequency setting value (after PID) 13: VIA/II Input value 14: VIB Input value 15: Fixed output 1 (Output current: 100%) 16: Fixed output 2 (Output current: 50%) 17: Fixed output 3 (Other than the output current: 100%) 18: Serial communication data 19: For adjustments (FM set value is displayed.)	Maximum frequency (FH) - Maximum frequency (FH) 1.5 times of rated voltage 1.5 times of rated voltage 1.85 times of rated power 1.85 times of rated power 2.5 times of rated torque 2.5 times of rated torque Rated load factor Rated load factor Rated load factor Maximum frequency (FH) Maximum input value Maximum input value - - - - -	0
FM	Meter adjustment	-	-	-

■ Resolution

All FM terminals have a maximum of 1/1000.

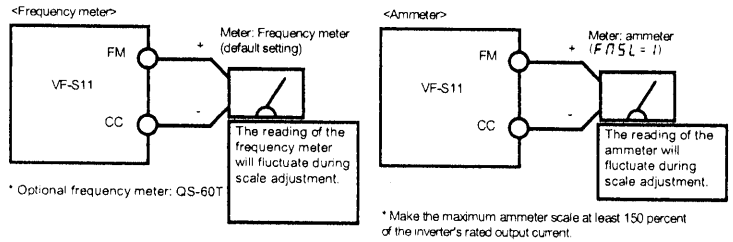
■ Example of 4-20mA output adjustment (for details, see 6.20.2)



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.

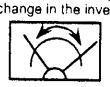
■ Adjustment scale with parameter FM (Meter adjustment)

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. (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. 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.  [Hint] 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. (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: - 1: 50Hz default setting 2: 60Hz default setting 3: Standard default setting (Initialization) 4: Trip record clear 5: Cumulative operation time clear 6: Initialization of type information 7: Save user-defined parameters 8: Call user-defined parameters 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 1: Reverse run 2: Forward run (F/R switching possible) 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.

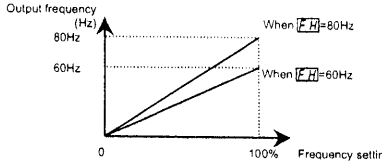
★ The inverter was factory-configured by default so that shorting terminals F-CC and terminals R-CC simultaneously would cause the motor to slow down to a stop. Using parameter F 105, however, you can choose between stop and reverse run.
Using the parameter F 105, however, you can select between forward 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

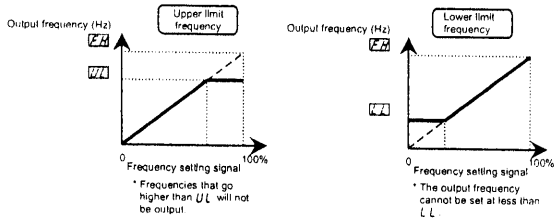
Title	Function	Adjustment range	Default setting
FH	Maximum frequency	30.0-500.0 (Hz)	80.0

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) 60.0 (WN, AN type)
LL	Lower limit frequency	0.0 - UL (Hz)	0.0

5.10 Base frequency

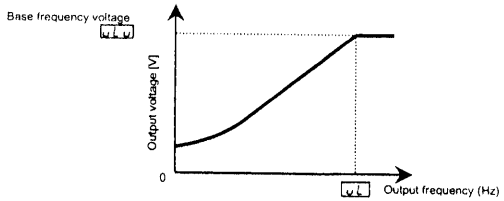
5

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) 60.0 (WN, AN type)
ULV	Base frequency voltage1	50-330 (V) : 240V class 50-660 (V) : 500/600V class	230 (240V class) 460 (500V class) 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 1: Variable torque 2: Automatic torque boost control 3: Vector control 4: Energy-saving 5: Dynamic energy-saving (for fans and pumps) 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.

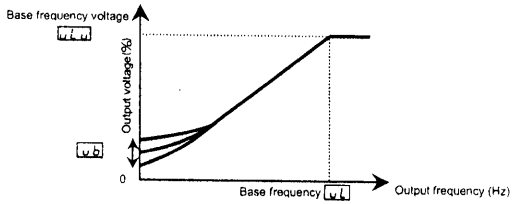
F415 (Motor rated current): See the motor's nameplate.
F416 (No-load current of motor): Refer to the motor test report.
F417 (Rated rotational speed of motor): See the motor's nameplate.

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.



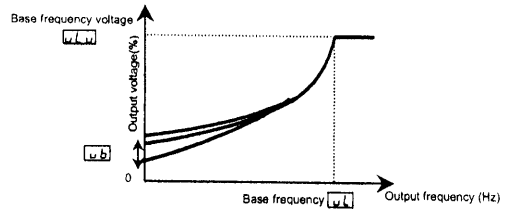
* To increase the torque further, increase the setting value of the manual torque boost vb.

⇒ For more details, see 5.12.

2) Setting for fans and pumps

Setting of V/F control mode selection Pt to 1 (variable torque)

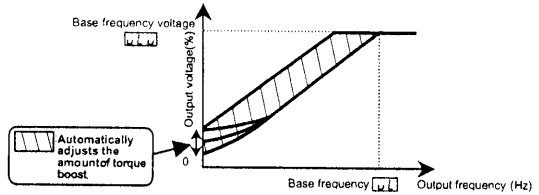
This is appropriate for load characteristics of such things as fans, pumps and blowers in which the torque in relation to load rotation speed is proportional to its square.



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

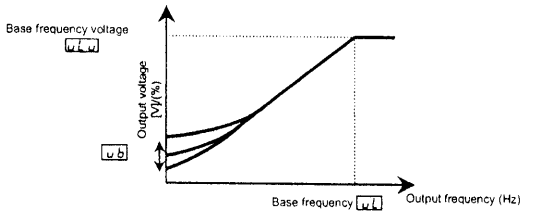
Title	Function	Parameter Pt (V/F control mode selection)					
		0 V/F constant	1 Variable torque	2 Automatic torque boost control	3 Vector control	4 Energy-saving	5 Dynamic energy-saving
AU2	Torque boost setting macro function	×	×	○	○	○	×
UL	Base frequency 1	◉	◉	◉	◉	◉	◉
ULV	Base frequency voltage 1	◉	◉	◉	◉	◉	◉
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.

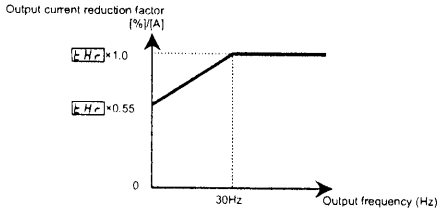
■ Setting of electronic thermal protection characteristics selection OLn

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

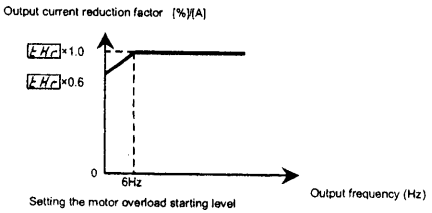
O : valid, × : invalid

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

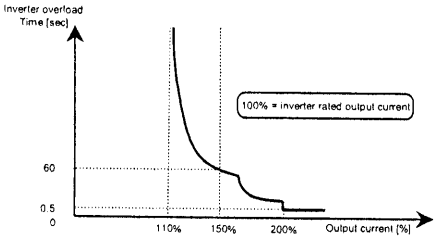
2) Motor 150%-overload time limit [F607]

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 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

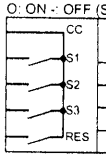
Title	Funtion	Adjustment range	Setting value
Sr1 - Sr7	Preset-speed operation frequencies 1-7	LL - UL (Hz)	0.0

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)

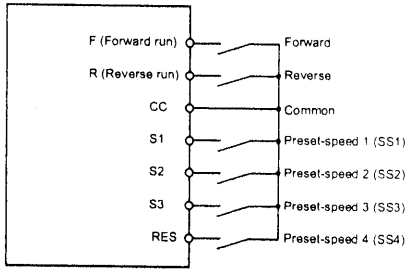
Terminal S2..... Input terminal function selection 5 (S2)
F115=7 (Preset-speed command 2: SS2)

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)

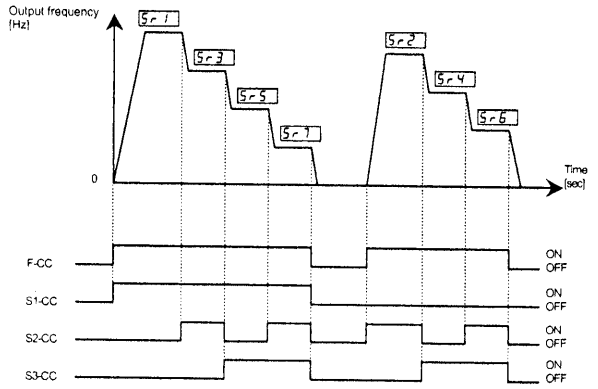


3) Using other speed commands with preset-speed command

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

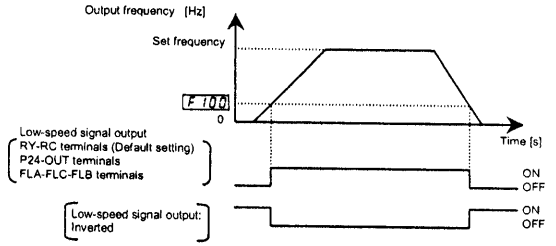
6.1.1 Low-speed signal

F100: Low-speed signal output frequency

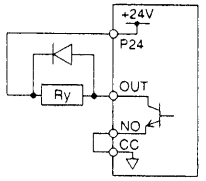
- Function
  When the output frequency exceeds the setting of F100 an ON signal will be generated. This signal can be used as an electromagnetic brake excitation/release signal.
  This signal can also be used as an operation signal when F100 is set to 0.0Hz, because an ON signal is put out if the output 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]

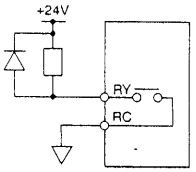
Title	Function	Adjustment range	Default setting
F100	Low-speed signal output frequency	0.0 ~ FH (Hz)	0.0



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.

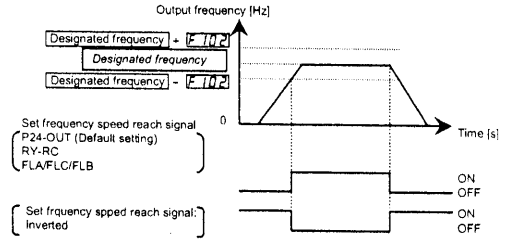
■ Parameter setting of designated frequency and detection band

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

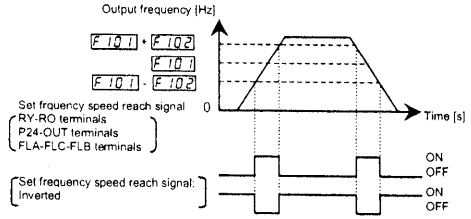
Title	Function	Adjustment range	Default setting
F101	Speed reach setting frequency	0.0 ~ FH (Hz)	0.0
F102	Speed reach detection band	0.0 ~ FH (Hz)	2.5

■ 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

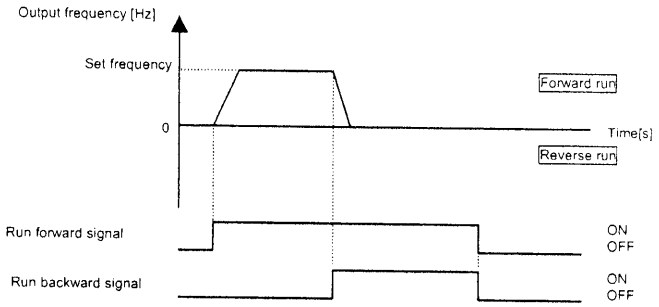
F105: Priority selection (both F-CC, R-CC are ON)

- 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

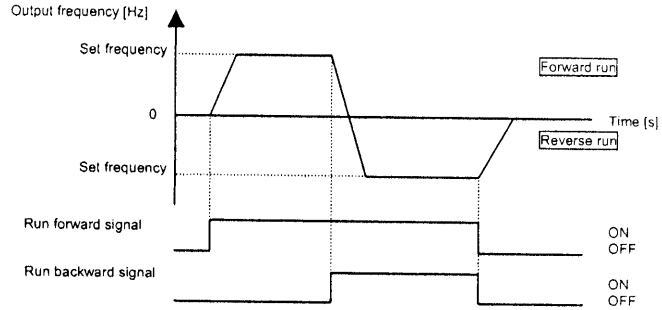
■ Parameter setting

Title	Function	Adjustment range	Default setting
F105	Priority selection (both F-CC, R-CC are ON)	0: Reverse 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

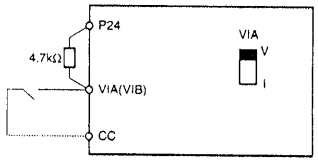
Title	Function	Adjustment range	Default setting
F 109	Analog/contact input function selection (VIA/VIB terminal)	0: VIA - analog input VIB - anolog input 1: VIA - anolog input VIB - contact input (Sink) 2: VIA - analog input VIB - contact input (Source) 3: VIA - contact input (Sink) VIB - contact input (Sink) 4: VIA - contact input (Source) 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

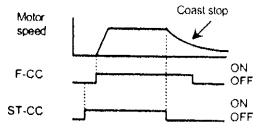
F 110: Always-active function selection 2

- 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.

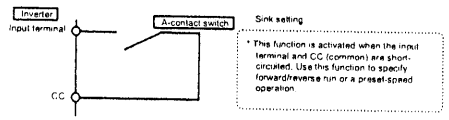
Note 2. When using the VIA and VIB terminals as contact input terminals in sink logic connection, be sure to insert a resistor between the P24 terminal and the VIA/VIB terminals. (Recommended resistance: 4.7kΩ-1/2W)
Be sure to turn the VIA slide switch to the V position.

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.

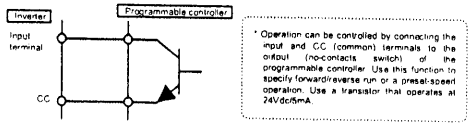
Note 4. F 118 (VIA): Enabled only when F 109=3 or 4
Disabled and the set value cannot be read out, if F 109 is set at 0 to 2.

■ Connection method

1) A-contact input



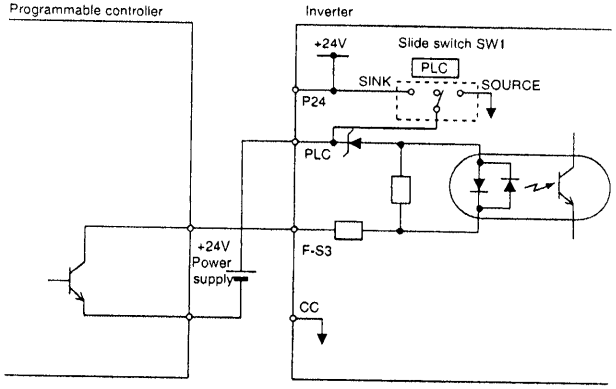
2) Connection with transistor output



* 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.



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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)

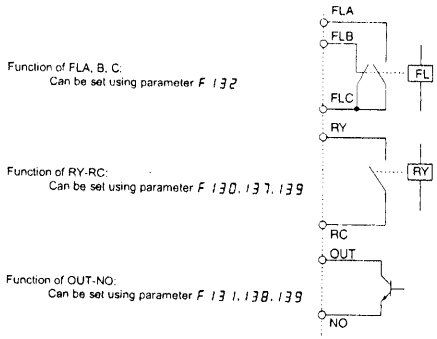
F132: Output terminal selection 3 (FLA, FLB, FLC)

- 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.

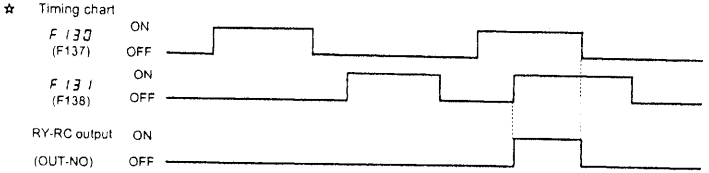
(1) A signal is sent out when the two functions assigned are activated simultaneously.

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.

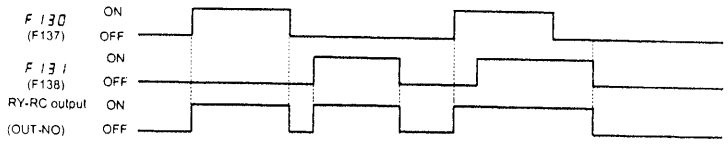
(2) A signal is sent out when either of the two functions assigned is activated.

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 1: F130 or F137 F131 and F138 2: F130 and F137 F131 or F138 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 1: F130 or F137 F131 and F138 2: F130 and F137 F131 or F138 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. 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. 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

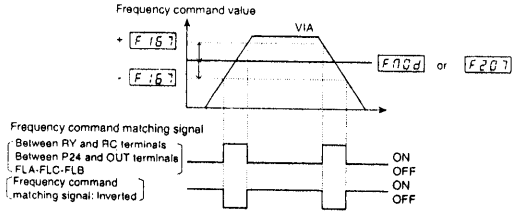
- Function
  If the frequency command value specified using FNOd (or F207) almost agrees with the frequency command value from the VA terminal with an accuracy of ± the setting of F167, an ON or OFF signal will be sent out.

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) 60.0 (WN, AN type)
F171	Base frequency voltage 2	50-330 (V) : 240V class 50-660 (V) : 500 / 600V class	230 (240V class) 460 (500V class) 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), 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 1: VIA 2: VIB 3: Operation panel 4: Serial communication 5: UP/DOWN from external contact 6: VIA + VIB (Override)	0
F200	Frequency priority selection	0: F100 (Switchable to F207 by the input terminal) 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 1: VIA 2: VIB 3: Operation panel 4: Serial communication 5: UP/DOWN from external contact 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.

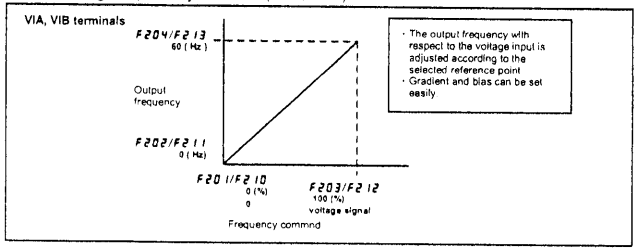
☆ To fine adjust the frequency command characteristics for VIA/VIB input, use the parameters F470 to F473. (See section 6.5.4.)

■ Parameter setting

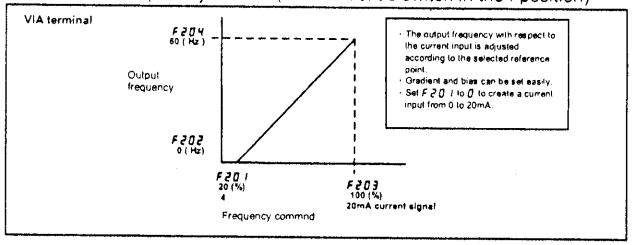
Title	Function	Adjustment range	Default setting
F201	VIA input point 1 setting	0-100 (%)	0
F202	VIA input point 1 frequency	0.0-500.0 (Hz)	0.0
F203	VIA input point 2 setting	0-100 (%)	100
F204	VIA input point 2 frequency	0.0-500.0 (Hz)	50.0 (WP type) 60.0 (WN, AN type)
F210	VIB input point 1 setting	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) 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 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

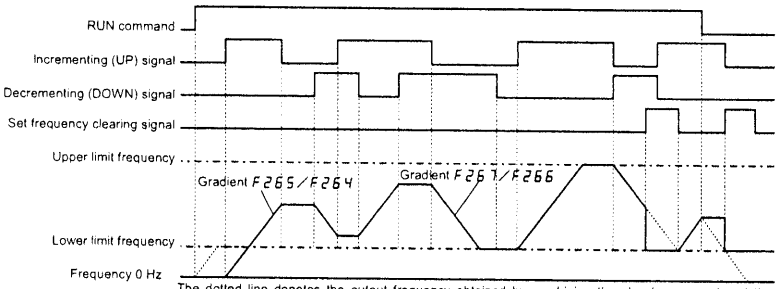
Set parameters as follows to adjust the output frequency up or down almost in synchronization with the adjustment by the panel frequency command:

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)

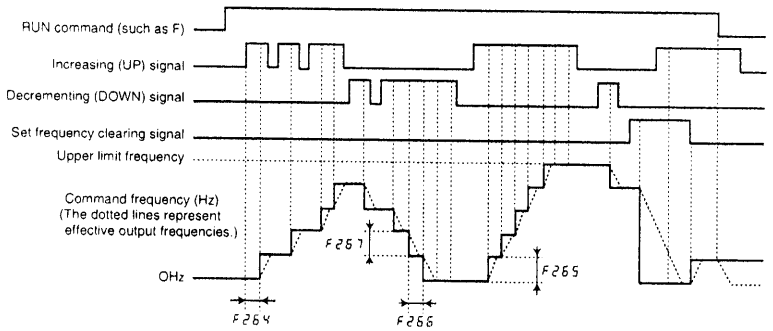
Set parameters as follows to adjust the frequency in steps of one pulse:

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

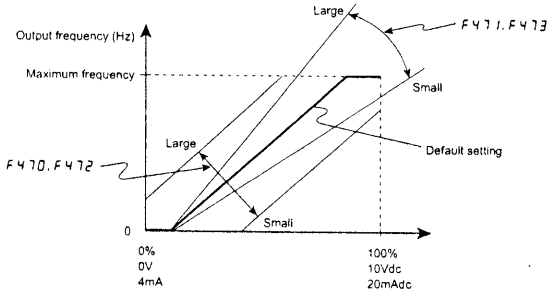
If F702 (Frequency free unit magnification) is set to 1.00, the output frequency can be adjusted in steps of 0.01Hz.

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

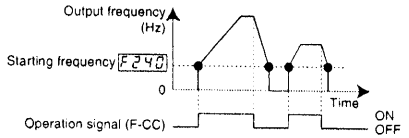
6.6.1 Starting frequency

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

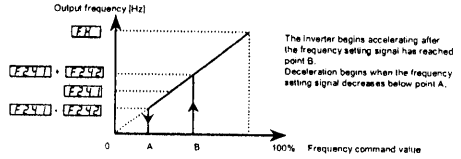
F241: Operation starting frequency

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

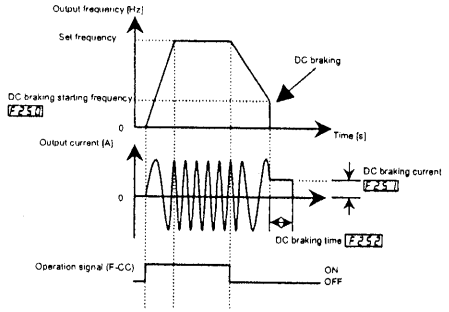
F251: DC braking current

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

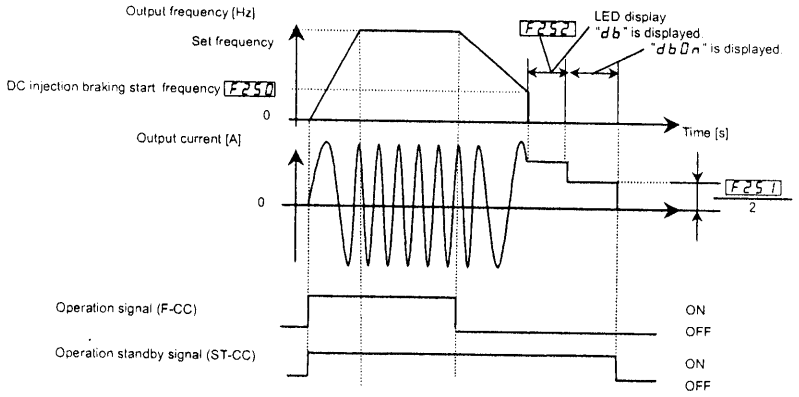
F254: Motor shaft fixing control

- 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

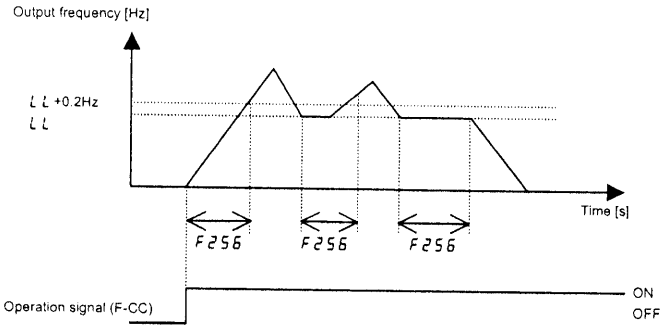
6.8.1 Auto-stop in case of lower-limit frequency continuous operation

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 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 1: Coast stop 2: DC braking	0
F262	Panel jug run mode	0: Disabled 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 (jog run setting terminal)

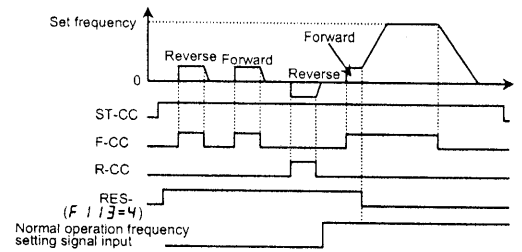
Note 1: During the jog run mode, there is LOW (low speed detection signal) output but no RCH (designated frequency reach signal) output, and PID control does not work.

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)

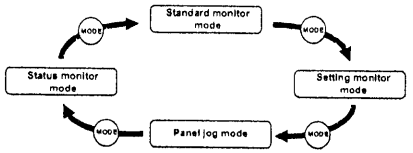


- The jog run setting terminal (RES-CC) is enabled when the operation frequency is below the jog run frequency.
  This connection does not function at an operation frequency exceeding the jog run frequency.
- The motor can be operated in jog mode while the jog run setting terminals are connnected (RES-CC).
- 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.



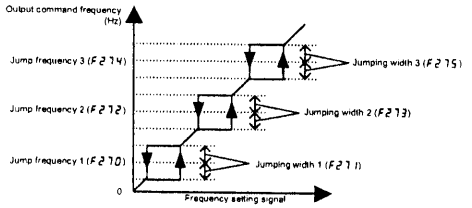
Note: When the inverter is in operation (RUN lamp is blinking) or when an operation command is issued (RUN lamp is lit), the inverter cannot be switched to panel jog mode.

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 1: Carrier frequency reduced automatically 2: Carrier frequency not reduced automatically Support for 500V/600V models 3: Carrier frequency reduced automatically 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- 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

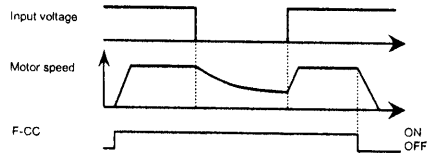
Caution	
Mandatory	• Stand clear of motors and mechanical equipment If the motor stops due to a momentary power failure, the equipment will start suddenly when power is restored. This could result in unexpected injury. • Attach warnings about sudden restart after a momentary power failure on inverters, 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 1: At auto-restart after momentary stop 2: When turning ST-CC on or off 3: At auto-restart or when turning ST-CC on or off 4: At start-up	0

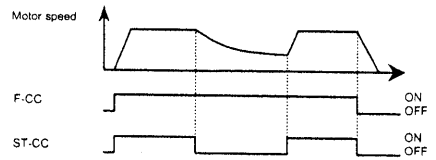
* If the motor is restarted in retry mode, this function will operate, regardless of the setting of this parameter.

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

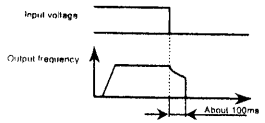
- Function
  1) Regenerative power ride-through control continues the operation of the motor by utilizing motor regenerative energy in the event of momentary power failure.
  2) Slowdown stop in the event of momentary power failure: If a momentary power failure occurs during operation, the inverter stops 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 1: Enabled 2: Slowdown stop	0

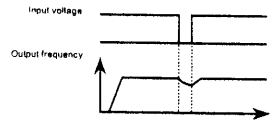
Note: Even when this parameter is set, the particular load conditions may cause the motor to coast. In this case, use the auto-restart function F301 along with this parameter function.

[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. • 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 Overcurrent Overvoltage Overload Overheating	Up to 10 times in succession 1st retry: About 1 sec after tripping 2nd retry: About 2 sec after tripping 3rd retry: About 3 sec after tripping : 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. 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

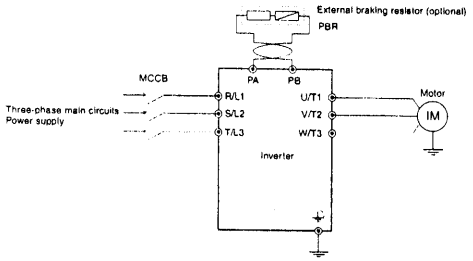
- Function
  The VFS11 does not contain a braking resistor. Connect an external braking resistor in the following cases to enable dynamic braking function:
  1) when decelerating the motor abruptly or if overvoltage tripping (OP) occurs during deceleration stop
  2) when a continuous regenerative status 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]

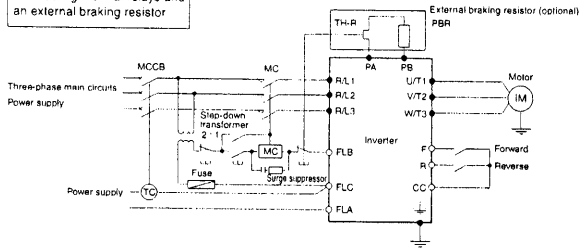
Title	Function	Adjustment range	Default setting
F304	Dynamic braking selection	0: Disabled 1: Enabled (Resistor overload protection enabled)	0
F308	Dynamic braking resistance	1.0-1000 (Ω)	Depending on models (See Section 11, K-15)
F309	Dynamic braking resistor capacity	0.01-30.00 (kW)	

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 VFS11-2002PM to 2007PM	PBR-2007	120W-200Ω
VFS11S-2015PL to 2022PL 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.

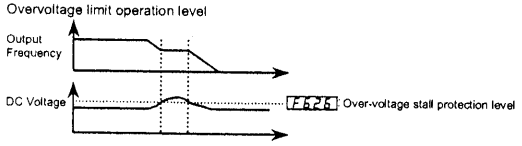
6.13.5 Avoiding overvoltage tripping

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 1: Disabled 2: Enabled (Quick deceleration) 3: Enabled (Dynamic quick deceleration)	2
F626	Overvoltage limit operation level	100-150%	240V/600V: 134% 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 50-660 (V) : 500 / 600V class	230 (240V class) 460 (500V class) 575 (600V class)
F307	Supply voltage correction (output voltage limited)	0: Supply voltage uncorrected, output voltage limited 1: Supply voltage corrected, output voltage limited 2: Supply voltage uncorrected, output voltage unlimited 3: Supply voltage corrected, output voltage unlimited	2 (WP, WN) 3 (AN)

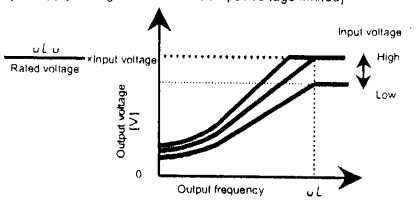
☆ If F307 is set to "0" or "2", the output voltage will change in proportion to the input voltage.

☆ 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.

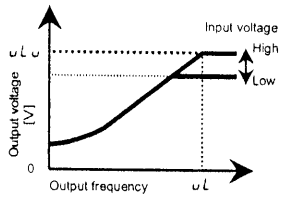
[0: Supply voltage uncorrected, output voltage limited]



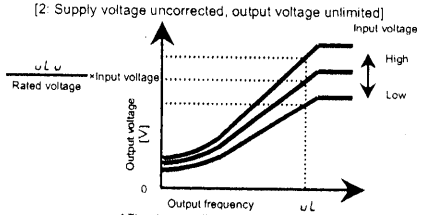
* The above applies when V/F control mode selection parameter Pt is set to "0" or "1".

ULU / Rated voltage >1 the output voltage can be prevented from exceeding the input voltage.

[1: Supply voltage corrected, output voltage limited]



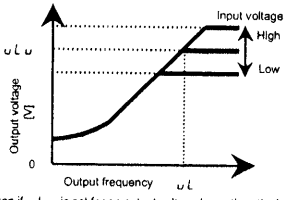
[2: Supply voltage uncorrected, output voltage unlimited]



* 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 1: Reverse run prohibited 2: Forward run prohibited	0

6.14 Droop control

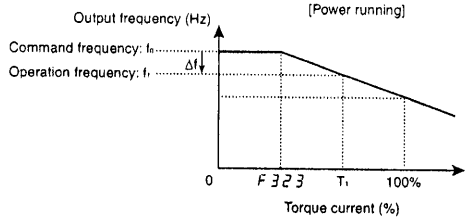
F320: Droop gain

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 Δf (Hz) when the torque current is T_1 (%). (See the above figure.)

- The droop frequency Δf can be calculated, using the following expression.
  Droop frequency Δf (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 Δf 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 Δf (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 Δf (Hz)=UL × F320 × (T_1 - F323)
=60 (Hz) × 10 (%) × (100 (%) - 30 (%))
=4.2 (Hz)
Operation frequency f_1 (Hz) = f_0 - Δf = 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

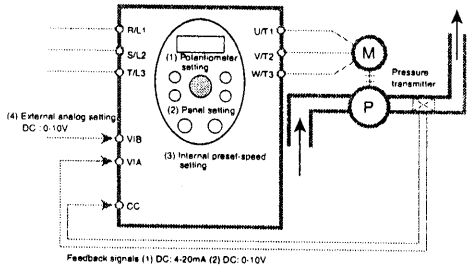
- Function
  Using feedback signals (4 to 20mA, 0 to 10V) from a detector, process control can be exercised, for example, to keep the airflow, amount of flow or pressure constant.

[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

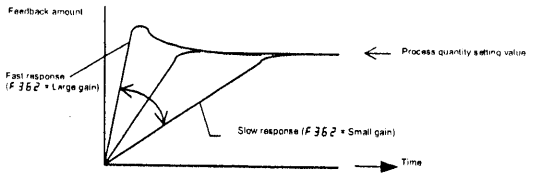
Adjust the PID control gain level according to the process quantities, the feedback signals and the object to be controlled.

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

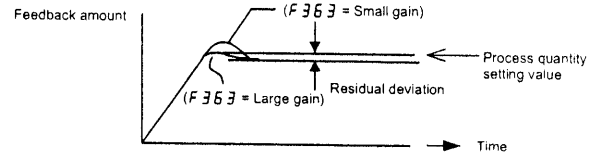
F362 (P-gain adjustment parameter)

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)

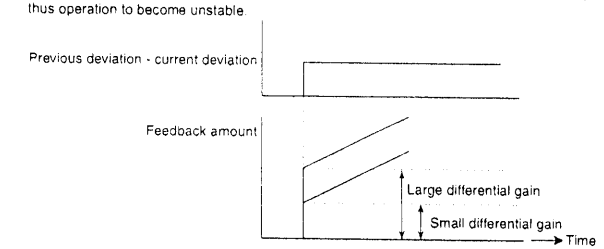
This parameter adjusts the integral gain level during PID control. Any deviations remaining unremoved during proportional action are cleared to zero (residual deviation offset function).
A larger I-gain adjustment value reduces residual deviations. Too large an adjustment value, however, results in an 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)

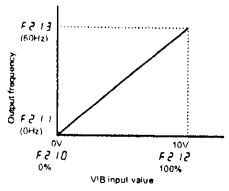
This parameter adjusts the differential gain level during PID control. This gain increases the speed of response to a rapid change in deviation (difference between the frequency setting and the amount of feedback).
Note that setting the gain more than necessary may cause great fluctuations in output frequency, and thus operation to become unstable.



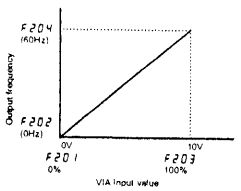
5) Adjusting analog command voltages

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.

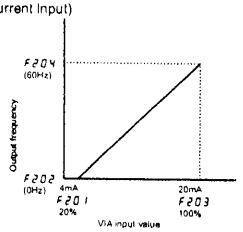
Example of VIB terminal setting



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) 1: Application of individual settings of F402 (after execution: 0) 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

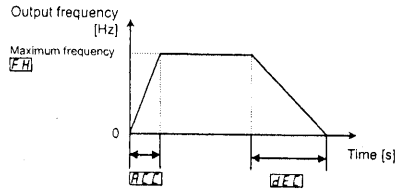
- Function

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%

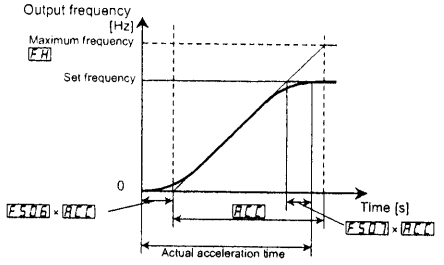
1) Linear acceleration/deceleration

A general acceleration/deceleration pattern. This pattern can usually be used.

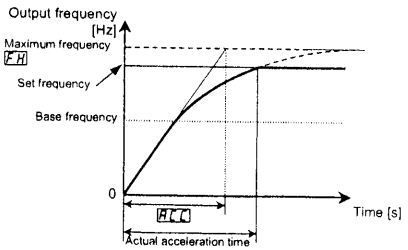


2) S-pattern acceleration/deceleration 1

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.



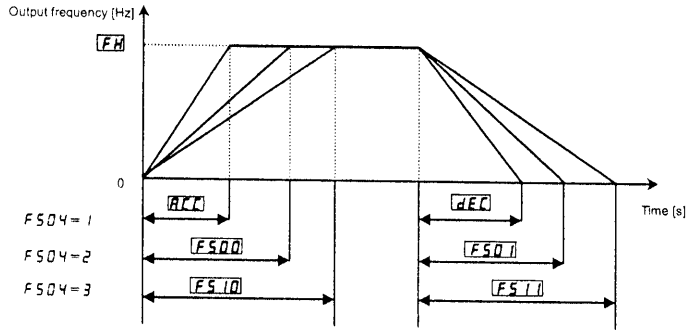
6.18.2 Selecting an acceleration/deceleration pattern

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 2: Acc / dec 2 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

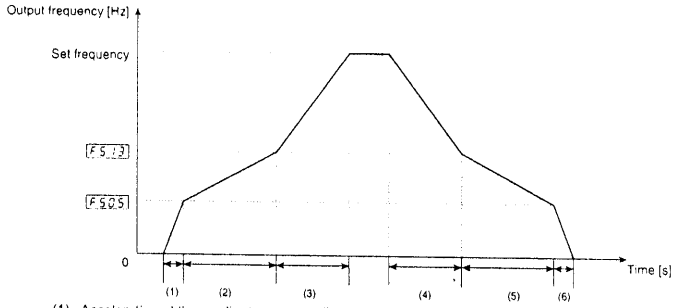


Acceleration/deceleration time 1 is initially set as the default. Acceleration/deceleration time 2 and 3 can be selected by changing the setting of the F504.
Enabled if CMOd=1 (panel input enabled)

2) Switching by frequencies - Switching the acceleration/deceleration time automatically at the frequency setting of F505.

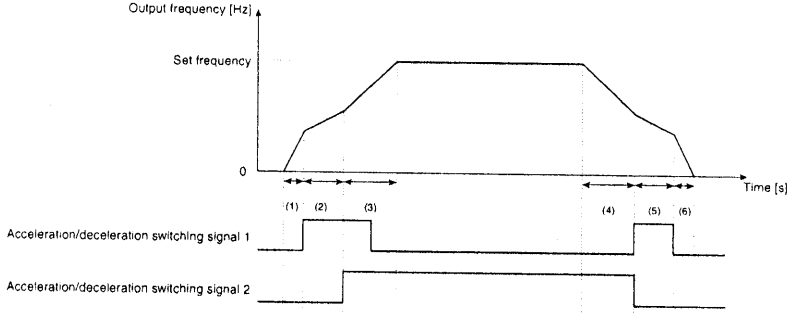
Title	Function	Adjustment range	Default setting
F505	Acceleration/deceleration 1 and 2 switching frequency	0.0-UL	0.0
F513	Acceleration/deceleration 2 and 3 switching frequency	0.0-UL	0.0

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 1: S-pattern 1 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]

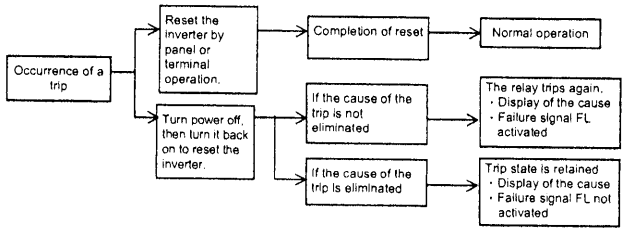
Title	Function	Adjustment range	Default setting
F602	Inverter trip retention selection	0: Cleared if power is turned off 1: Retained even if power is turned off	0

★ 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 1: Slowdown stop 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 1: At start-up (Only one time after power is turned on) 2: At start-up (each time) 3: During operation 4: At start-up + during operation 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

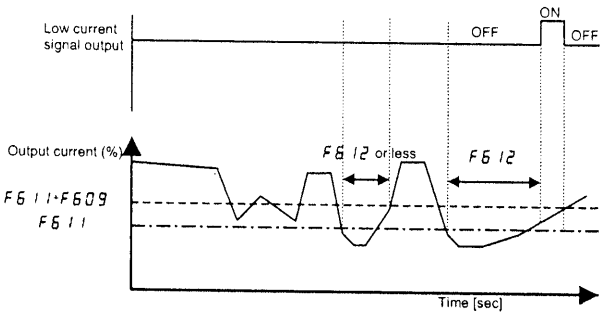
F609: Small current detection current hysteresis
F610: Small current trip/alarm selection
F611: Small current detection current
F612: Small current detection time

- 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 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) 1: Only one time after power is turned on (standard pulse) 2: Each time (short-time pulse) 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".

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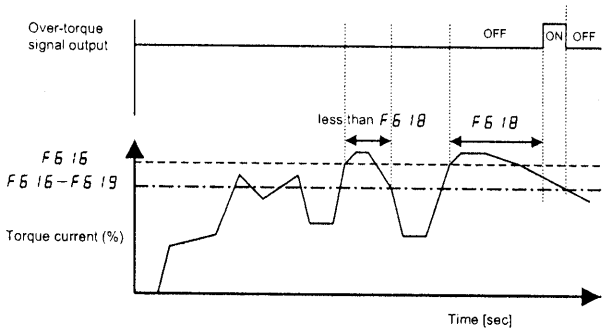
F6 15=0: ..... No tripping (FL relay deactivated).
An over-torque alarm can be put out by setting the output terminal function selection parameter.

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 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>

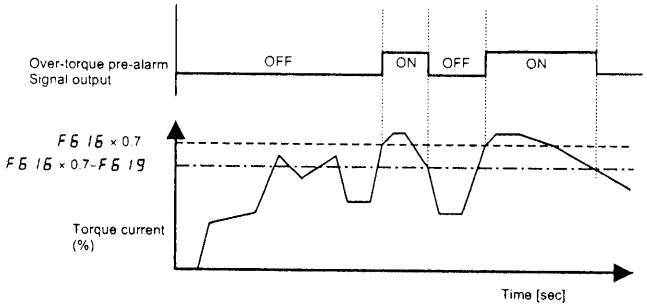
1) Output terminal function: 12 (OT) Over-torque detection
F6 15=0 (Alarm only)



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%) 1: Tripping (detection level below 60%) 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 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 2: 11-20°C 3: 21-30°C 4: 31-40°C 5: 41-50°C 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 1: Pulse train output	–	0
F676	Pulse train output function selection (OUT-NO)	0: Output frequency 1: Output current 2: Set frequency 3: DC voltage 4: Output voltage command value 5: Input power 6: Output power 7: Torque 8: Torque current 9: Motor cumulative load factor 10:Inverter cumulative load factor 11:PBR (braking reactor) cumulative load factor 12:Frequency setting value (after PID) 13:VIA Input value 14:VIB Input value 15:Fixed output 1 (Output current: 100%) 16:Fixed output 2 (Output current: 50%) 17:Fixed output 3 (Other than the output current: 100%)	FH 185% FH 150% 150% 185% 185% 250% 250% 100% 100% 100% FH 10V/20mA 10V 185% 185% 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

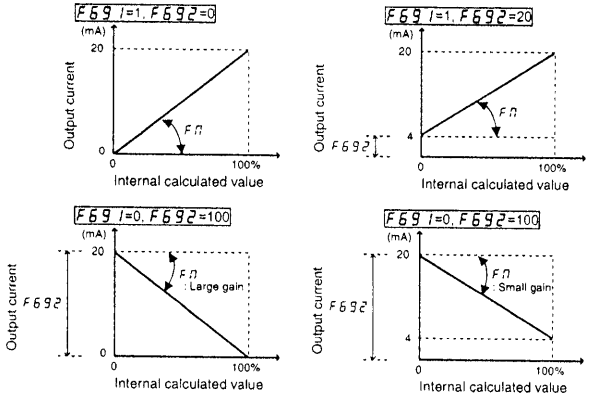
F692: Bias of analog output

- 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) 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}

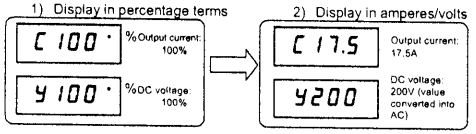
F701: Current/voltage display mode

- 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: % 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

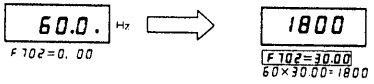
F706: Bias of free unit display

- 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.

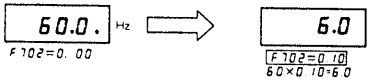
The value obtained by multiplying the displayed frequency by the F702-set value will be displayed as follows:

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)

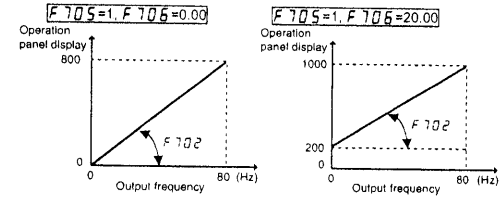


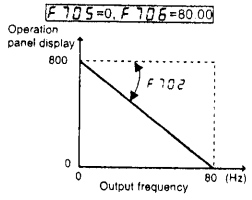
Note: This parameter displays the inverter output frequency as the value obtained by multiplying it by a positive number. This does not mean that the actual motor speed or line speed are indicated with accuracy.

Title	Function	Adjustment range	Default setting
F702	Frequency free unit magnification	0.00: Free unit display disabled (display of frequency) 0.01-200.0	0.00
F705	Inclination characteristic of free unit display	0: Negative inclination (downward slope) 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.

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■ 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 0.01-FH (Hz)	0.00
F708	Free step 2 (panel display)	0: Disabled 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) 1: Frequency command (Hz/free unit/step) 2: Output current (%/A) 3: Inverter rated current (A) 4: Inverter load factor (%) 5: Output power (kW) 6: Frequency command after PID control (Hz/free unit/step) 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) 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 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 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps	3
F801	Parity	0: NON (No parity) 1: EVEN (Even parity) 2: ODD (Odd parity)	1
F802	Inverter number	0-255	0
F803	Communication error trip time	0: Desabled (*) 1-100 (s)	0
F805	Communication waiting time	0.00: Regular communication 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) 1: Slave (Operation continued in case the master inverter fails) 2: Slave (Emergency stop tripping in case the master inverter fails) 3: Master (transmission of frequency commands) 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) 60.0 (WN, AN type)
F829	Selection of communication protocol	0: Toshiba inverter protocol 1: ModbusRTU protocol	0
F870	Block write data 1	0: No selection 1: Command 1 2: Command 2 3: Frequency command 4: Output data on the terminal board 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 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	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.

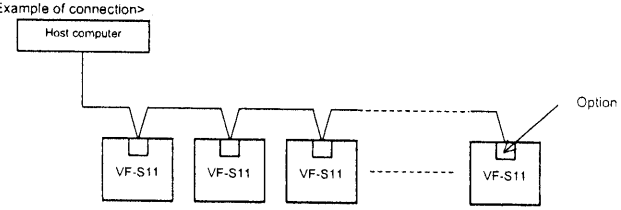
However, when the input terminal function selection parameter is set to 48: SC/LC (Serial/Local selection), the inverter can be operated with the settings of the command mode (CMOd) or the frequency setting mode (FMOd) by external input.

■ Transmission specifications

Item	Specifications
Transmission scheme	Half-duplex
Connection scheme	Centralized control
Synchronization scheme	Asynchronous
Transmission rate	Default: 9600 baud (parameter setting) Option: Either 1200, 2400, 4800, 9600, or 19200baud
Character transmission	ASCII code: JIS X 0201 8, 8-bit (fixed) 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; 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

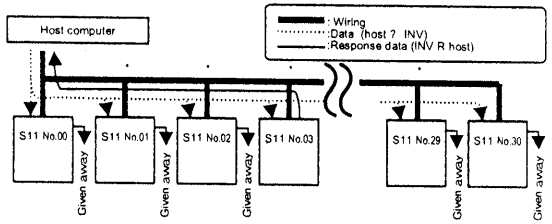
■ Example of connection for RS485-communication

<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

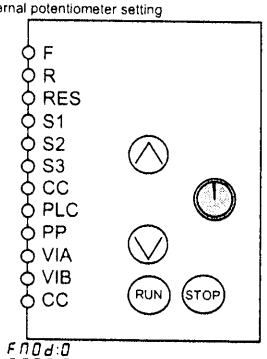
Note 1: When using an PM motor, consult your Toshiba dealer, since the inverter is not compatible with all types of PM motors.
Note 2: The inverter may fail to detect step-out in some cases, because it uses an electrical method to detect step-out. To avoid detection failures, you are recommended to install 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

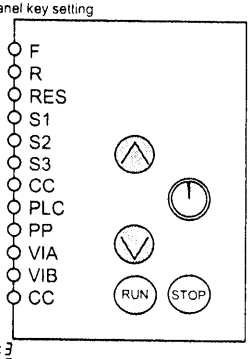
Applied operation can be performed by selecting the inverter frequency setting. To make settings for applied operation, use the basic parameter F N0d (selection of frequency setting mode 1), and the extended parameters F200 (frequency priority selection) and F207 (selection of frequency setting mode 2).

(1) Internal potentiometer setting



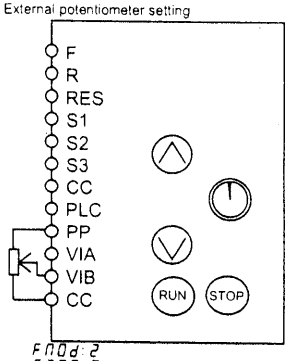
F N0d:0
F200:0

(2) Operation panel key setting



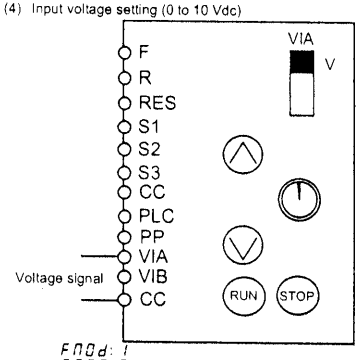
F N0d:3
F200:0
Enter the number with the operation panel keys, then press the ENT key to conform. (Save the setting)

(3) External potentiometer setting



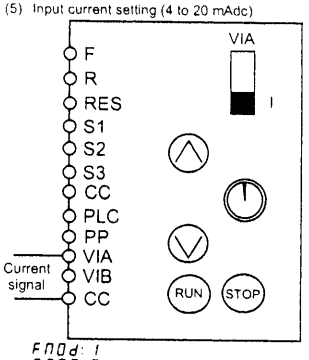
F N0d: 2
F200: 0
Use the parameters F210 to F213 for this setting.

(4) Input voltage setting (0 to 10 Vdc)



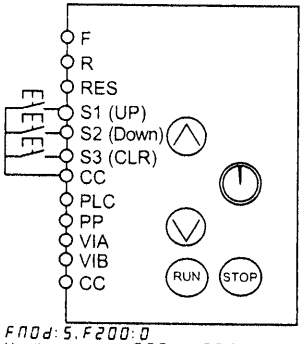
F N0d: 1
F200: 0
Use the parameters F201 to F204 for this setting.
(To use VIB, set F N0d at 2)

(5) Input current setting (4 to 20 mAdc)



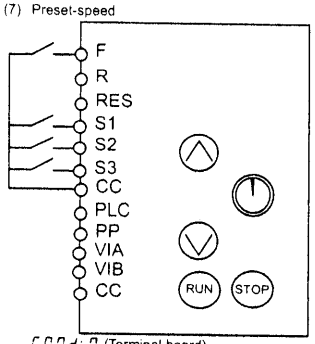
F N0d: 1
F200: 0
Use parameters F201 to F204 for this setting.
(F201: 20%)

(6) External contact UP/DOWN



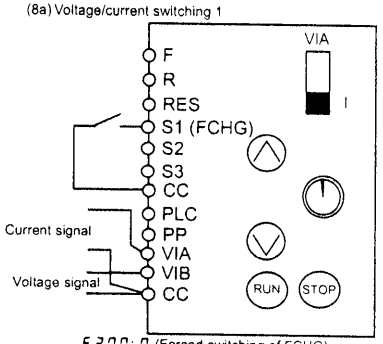
F N0d: 5, F200: 0
Use the parameters F264 to F268 for this setting.
To change the frequency when power is off, set F269: 1 (Rewriting of F268 when power is turned off.)
F114: 41 (Allocation of UP)
F115: 42 (Allocation of DOWN)
F116: 43 (Allocation of CLR)

(7) Preset-speed



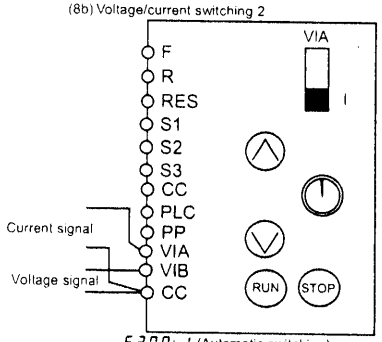
CnOd: 0 (Terminal board)
Sr 1 to Sr 7: 1-7-speed run
F287 to F294: 8-15-speed run
To select 7-speed run, use the terminals S1 to S3.
To select 15-speed run, allocate the input terminal function SS4.

(8a) Voltage/current switching 1



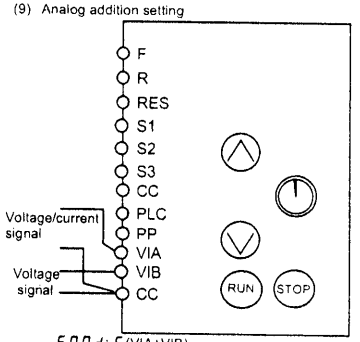
F200: 0 (Forced switching of FCHG)
F114: 38 (Allocation of FCHG)
FnOd: 2
F207: 1

(8b) Voltage/current switching 2



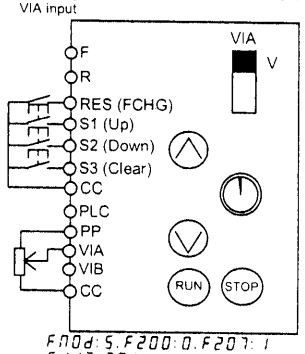
F200: 1 (Automatic switching)
FnOd: 2
F207: 1

(9) Analog addition setting



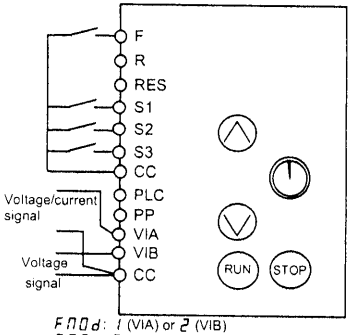
FnOd: 6 (VIA+VIB)
F200: 0

(10) Switching between external contact UP/DOWN and VIA input



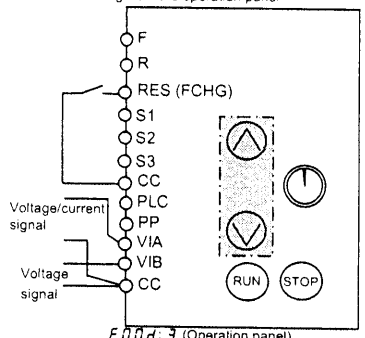
FnOd: 5, F200: 0, F207: 1
F113: 38 (Allocation of FCHG)
To switch to VIA setting, enter the command through FCHG.
F114: 41 (Allocation of UP)
F115: 42 (Allocation of DOWN)
F116: 43 (Allocation of CLR)

(11) Switching between analog setting and preset speed setting



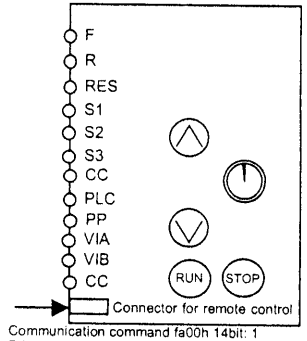
FnOd: 1 (VIA) or 2 (VIB)
CnOd: 0 (Terminal board)
F200: 0
To switch to preset-speed setting, use the external terminals S1 to S3

(12) Switching between analog setting and terminal setting from the operation panel



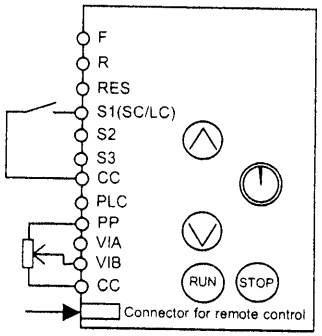
FnOd: 3 (Operation panel)
F113: 38 (Allocation of FCHG)
To switch to F207 setting, enter the command through FCHG.
F200: 0
F207: 1(VIA) or 2 (VIB).

(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

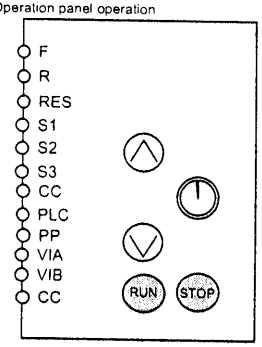


Communication command fa00h 14bit: 1
F114: 48 (Allocation of SL/LC)
Switched to local when a command is entered through SC and LC during operation by means of a remote input device
Activated if the parameter FNOd, F200 or F207 is so set

7.2 Setting the operation mode

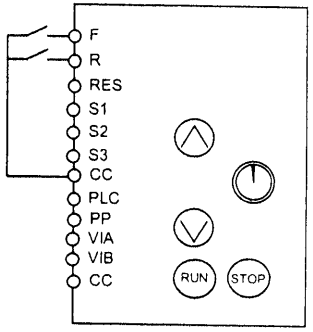
Applied operation can be performed by selecting the operation mode. To set the operation mode, use the basic parameter CNOd (command mode selection) and the input terminal selection parameter.

(1) Operation panel operation



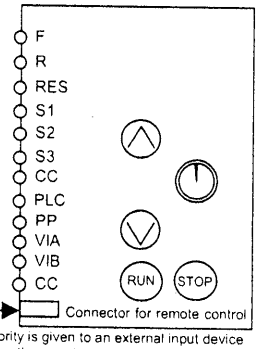
CNOd: 1 (Operation panel)

(2) Terminal board operation



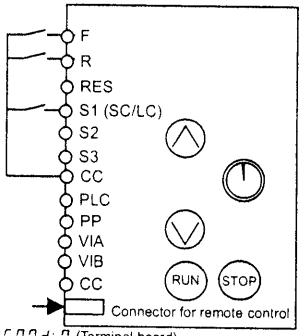
CNOd: 0 (Terminal board)

(3) Operation from an external input device



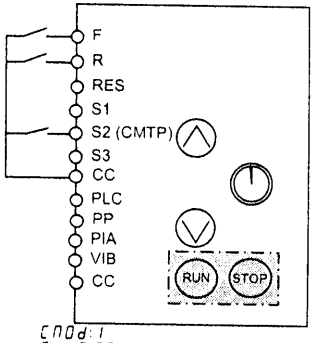
Priority is given to an external input device when the remote command fa00h 15-bit is set at 1.

(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:

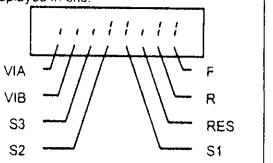
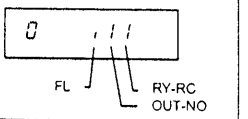
Press the (MODE) key twice.

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