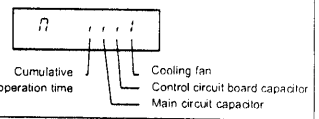
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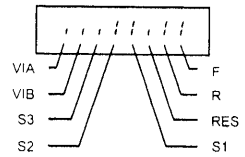
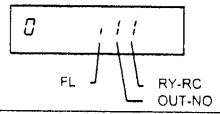
	Item displayed	Key operated	LED display	Communication No.	Description
Note 7	Past trip 4	▲	nErr⇔4	FE13	Past trip 4 (displayed alternately)
Note 8	Parts replacement alarm information	▲	0 ,,,,	FE79	The ON/OFF status of each of the cooling fan, circuit board capacitor, main circuit capacitor of parts replacement alarm or cumulative operation time are displayed in bits. ON: 1 OFF: , 
Note 9	Cumulative operation time	▲	t0.10	FE14	The cumulative operation time is displayed. (0.01=1 hour, 1.00=100 hours)
	Default display mode	MODE	60.0		The operation frequency is displayed (Operation at 60Hz).

8

8.1.2 Display of detailed information on a past trip

Details on a past trip (of trips 1 to 4) can be displayed, as shown in the table below, by pressing the ENT key when the trip record is selected in the status monitor mode.

Unlike the "Display of detailed trip information at the occurrence of a trip" in 8.2.2, details on a past trip can be displayed, even after the inverter is turned off or reset.

	Item displayed	Key operated	LED display	Description
Note 11	Past trip 1		OC 1⇔1	Past trip 1 (displayed alternately)
	Continuous trips	ENT	n 2	The number of time the same trip occurred in succession is displayed. (Unit: times)
Note 1	Operation frequency	▲	o60.0	The operation frequency when the trip occurred is displayed.
	Direction of rotation	▲	Fr-F	The direction of rotation when the trip occurred is displayed. (Fr-F: Forward run, Fr-r: Reverse run)
	Operation frequency command	▲	F80.0	The operation command value when the trip occurred is displayed.
Note 2	Load current	▲	C150	The inverter output current when the trip occurred is displayed. (%/A)
Note 3	Input voltage	▲	V120	The inverter input voltage (DC) when the trip occurred is displayed. (%/V).
	Output voltage	▲	P100	The inverter output voltage when the trip occurred is displayed. (%/V)
Note 4	Input terminal	▲	,,,,,,,,	The ON/OFF statuses of the control input terminals (F, R, RES, S1, S2, S3, VIB and VIA) are displayed in bits. ON: 1 OFF: , 
Note 5	Output terminal	▲	0 ,,,	The ON/OFF statuses of the control output terminals (RY, OUT and FL) are displayed in bits. ON: 1 OFF: , 
Note 9	Cumulative operation time	▲	t8.56	The cumulative operation time when the trip occurred is displayed. (0.01=1 hour, 1.00=100 hours)
	Past trip 1	MODE	OC 1⇔ 1	Press this key to return to past trip 1.

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8.2 Display of trip information

8.2.1 Trip code display

If the inverter trips, an error code is displayed to suggest the cause. Since trip records are retained, information on each trip can be displayed anytime in the status monitor mode.

■ Display of trip information

Error code	Failure code	Description
nErr(*)	0000	No error
OC 1	0001	Overcurrent during acceleration
OC2	0002	Overcurrent during deceleration
OC3	0003	Overcurrent during constant speed operation
OCL	0004	Load-side overcurrent during start-up
OCA	0005	Armature-side overcurrent during start-up
EPH1	0008	Input phase failure or exhaustion of main circuit capacitor
EPHO	0009	Output phase failure
OP1	000A	Overvoltage during acceleration
OP2	000B	Overvoltage during deceleration
OP3	000C	Overvoltage during constant-speed operation
OL1	000D	Inverter overload trip
OL2	000E	Motor overload trip
OLr	000F	Dynamic braking register overload trip
OH	0010	Overheating trip or thermal detector failure
E	0011	Emergency stop
EEP1	0012	E²PROM fault 1 (writing error)
EEP2	0013	E²PROM fault 2 (initialization error) or power-off during the setting of tYP
EEP3	0014	E²PROM fault 3 (reading error)
Err2	0015	Inverter RAM fault
Err3	0016	Inverter ROM fault
Err4	0017	CPU fault trip 1
Err5	0018	Communication error
Err7	001A	Current defector fault
Err8	001B	Optional circuit board format error
UC	001D	Small-current trip
UP1	001E	Undervoltage trip
Ot	0020	Over-torque trip
EF2	0022	Ground fault

(Continued overleaf)

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(Continued)

Error code	Failure code	Description
OC 1P	0025	Overcurrent flowing in element during acceleration
OC2P	0026	Overcurrent flowing in element during deceleration
OC3P	0027	Overcurrent flowing in element during constant-speed operation
Etn1	0054	Auto-tuning error
EtYP	0029	Inverter type error
OH2	002E	External thermal input
E-18	0032	VIA cable break
E-19	0033	Communication error between CPUs
E-20	0034	V/F control error
E-21	0035	CPU fault 2
SOUt	002F	Step-out (for PM motors only)

(Note) Past trip records (trip records retained or trips that occurred in the past) can be called up.
(Refer to 8.1 "Status monitor mode" for the call-up procedure.)
(*) Strictly speaking, this code is not an error code; this code is displayed to show the absence of error when the past trip monitor mode is selected.

8.2.2 Display of trip information at the occurrence of a trip

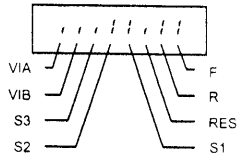
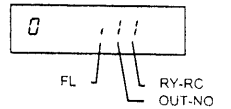
At the occurrence of a trip, the same information as that displayed in the mode described in 8.1.1, "Status monitor under normal conditions," can be displayed, as shown in the table below, if the inverter is not turned off or reset. To display trip information after turning off or resetting the inverter, follow the steps described in 8.1.2, "Display of detailed information on a past trip."

■ Example of call-up of trip information

	Item displayed	Key operated	LED display	Communication No.	Description
	Cause of trip		OP2		Status monitor mode (The code blinks if a trip occurs.) The motor coasts and comes to a stop (coast stop).
	Parameter setting mode	MODE	AUH		The first basic parameter "AUH" (history function) is displayed.
	Direction of rotation	MODE	Fr-F	FE01	The direction of rotation at the occurence of a trip is displayed. (Fr-F: forward run, Fr-r: reverser run)
Note 1	Operation frequency command	▲	F60.0	FE02	The operation frequency command value (Hz/free unit) at the occurrence of a trip is displayed.
Note 2	Load current	▲	C130	FE03	The output power of the inverter at the occurrence of a trip (%/A) is displayed.
Note 3	Input voltage	▲	V141	FE04	The inverter input (DC) voltage (%/V) at the occurrence of a trip is displayed.
	Output voltage	▲	P100	FE05	The output voltage of the inverter at the occurrence of a trip (%/V) is displayed.

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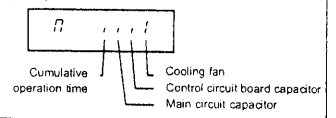
(Continued)

	Item displayed	Key operated	LED display	Communication No.	Description
	Torque	▲	9 60	FE18	The torque at the occurrence of a trip (%) is displayed.
	Torque current	▲	c 90	FE20	The torque current (%/A) at the occurrence of a trip is displayed.
	Inverter load factor	▲	L 70	FE27	The inverter load factor (%) at the occurrence of a trip is displayed.
	PBR cumulative load factor	▲	r 50	FE25	The cumulative load factor (%) of the resistor at the occurrence of a trip is displayed.
	Input power	▲	h 80	FE29	The inverter input power (kW) at the occurrence of a trip is displayed.
	Output power	▲	H 75	FE30	The inverter output power (kW) at the occurrence of a trip is displayed.
	Operation frequency	▲	o60.0	FE00	The inverter output frequency (Hz/free unit) at the occurrence of a trip is displayed.
Note 4	Input terminal	▲	, , , ! ! , ! !	FE06	The ON/OFF statuses of the control input terminals (F, R, RES, S1, S2, S3, VIB and VIA) are displayed in bits. ON: ! OFF: , 
Note 5	Output terminal	▲	0 , ! !	FE07	The ON/OFF status of each of the control signal output terminals (RY, OUT and FL) at the occurrence of a trip is displayed in bits. ON: ! OFF: , 
	CPU1 version	▲	u 10 1	FE08	The version of the CPU1 is displayed.
	CPU2 version	▲	uc0 1	FE73	The version of the CPU2 is displayed.
	Memory version	▲	uE0 1	FE09	The version of the memory mounted is displayed.
	PID feedback	▲	d 50	FE22	The PID feedback value at the occurrence of a trip is displayed. (Hz/free unit)
	Frequency command value (PID-computed)	▲	b 70	FE15	The PID-computed frequency command value at the occurrence of a trip is displayed. (Hz/free unit)
	Integral input power	▲	h 85	FE76	The integrated amount of power (kWh) supplied to the inverter is displayed. (0.01=1kWh, 1.00=100kWh)

(Continued overleaf)

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(Continued)

	Item displayed	Key operated	LED display	Communication No.	Description
	Integral output power	▲	H 75	FE77	The integrated amount of power (kWh) supplied from the inverter is displayed. (0.01=1kWh, 1.00=100kWh)
	Rated current	▲	A 16.5	FE70	The inverter rated current (A) at the occurrence of a trip is displayed.
Note 7	Past trip 1	▲	0P2 ⇔ 1	FE10	Past trip 1 (displayed alternately)
Note 7	Past trip 2	▲	0H ⇔2	FE11	Past trip 2 (displayed alternately)
Note 7	Past trip 3	▲	0P3 ⇔3	FE12	Past trip 3 (displayed alternately)
Note 7	Past trip 4	▲	nErr ⇔4	FE13	Past trip 4 (displayed alternately)
Note 8	Parts replacement alarm information	▲	0 , , , !	FE79	The ON/OFF status of each of the cooling fan, circuit board capacitor, main circuit capacitor of parts replacement alarm or cumulative operation time are displayed in bits. ON: ! OFF: , 
Note 9	Cumulative operation time	▲	t0.10	FE14	The cumulative operation time is displayed. (0.01=1 hour, 1.00=100 hours)
	Default display mode	MODE	0P2		The cause of the trip is displayed.

Note 1: Items displayed can be changed by pressing ▲ or ▼ key in the each monitor mode.

Note 2: You can switch between % and A (ampere)/V (volt), using the parameter F 70 1 (current/voltage unit selection).

Note 3: The input (DC) voltage displayed is 1.√2 times as large as the rectified d.c. input voltage.

Note 4: The number of bars displayed varies depending on the setting of F 109 (analog input/logic input function selection). The bar representing VIA or VIB is displayed only when the logic input function is assigned to the VIA or VIB terminal, respectively.
If F 109 = 0: Neither the bar representing VIA nor the bar representing VIB is displayed.
If F 109 = 1 or 2: The bar representing VIA is not displayed.
The bar representing VIB is displayed.
If F 109 = 3 or 4: Both the bar representing VIA and VIB are displayed.

Note 5: The number of bars displayed varies depending on the setting of F669 (logic output/pulse train output selection). The bar representing the OUT-NO terminal is displayed only when logic output function is assigned to it.
If F669 = 0: The bar representing OUT-NO is displayed.
If F669 = 1: The bar representing OUT-NO is not displayed.

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Note 6: The integrated amounts of input and output power will be reset to zero, if you press and hold down the (ENT) key for 3 seconds or more when power is off or when the input terminal function CKWH (input terminal function: 51) is turned on or displayed.

Note 7: Past trip records are displayed in the following sequence: 1 (latest trip record) ⇔2⇔3⇔4 (oldest trip record). If no trip occurred in the past, the message "nErr" will be displayed. Details on past trip record 1, 2, 3 or 4 can be displayed by pressing the (ENT) key when past trip 1, 2, 3 or 4 is displayed. For more information, see 8.1.2.

Note 8: Parts replacement alarm is displayed based on the value calculated from the annual average ambient temperature, the ON time of the inverter, the operating time of the motor and the output current (load factor) specified using F634. Use this alarm as a guide only, since it is based on a rough estimation.

Note 9: The cumulative operation time increments only when the machine is in operation.

Note 10: At the occurrence of a trip, maximum values are not always recorded and displayed for reasons of detecting time.

Note11: If there is no trip record, nErr is displayed.

☆ Of the items displayed on the monitor, the reference values of items expressed in percent are listed below.

- Load current: The current monitored is displayed. The reference value (100% value) is the rated output current indicated on the nameplate. That is, it corresponds to the rated current at the time when the PWM carrier frequency (F300) is 4kHz or less. The unit can be switched to A (amperes).
- Input voltage: The voltage displayed is the voltage determined by converting the voltage measured in the DC section into an AC voltage. The reference value (100% value) is 200 volts for 240V models, 400 volts for 500V models or 575 volts for 600V models. The unit can be switched to V (volts).
- Torque: The torque generated by the drive motor is displayed. The reference value (100% value) is the rated torque of the motor.
- Torque current: The current required to generate torque is calculated from the load current by vector operations. The value thus calculated is displayed. The reference value (100% value) is the value at the time when the load current is 100%.
- Load factor of inverter: Depending on the PWM carrier frequency (F300) setting and so on, the actual rated current may become smaller than the rated output current indicated on the nameplate. With the actual rated current at that time (after a reduction) as 100%, the proportion of the load current to the rated current is indicated in percent. The load factor is also used to calculate the conditions for overload trip (OL 1).
- PBR cumulative load factor: The load factor of the braking resistor that may come up to the level at which an overload trip (OLr) occurs is indicated in percent. An overload trip occurs when it reaches 100%.

9. Measures to satisfy the standards

9.1 How to cope with the CE directive

In Europe, the EMC directive and the low-voltage directive, which took effect in 1996 and 1997, respectively, make it obligatory to put the CE mark on every applicable product to prove that it complies with the directives. Inverters do not work alone but are designed to be installed in a control panel and always used in combination with other machines or systems which control them, so they themselves are not considered to be subject to the EMC directive. However, the CE mark must be put on all inverters because they are subject to the low-voltage directive.

The CE mark must be put on all machines and systems with built-in inverters because such machines and systems are subject to the above directives. It is the responsibility of the manufacturers of such final products to put the CE mark on each one. If they are "final" products, they might also be subject to machine-related directives.
It is the responsibility of the manufacturers of such final products to put the CE mark on each one. In order to make machines and systems with built-in inverters compliant with the EMC directive and the low-voltage directive, this section explains how to install inverters and what measures should be taken to satisfy the EMC directive.

We have tested representative models with them installed as described later in this manual to check for conformity with the EMC directive. However, we cannot check all inverters for conformity because whether or not they conform to the EMC direction depends on how they are installed and connected. In other words, the application of the EMC directive varies depending on the composition of the control panel with a built-in inverter(s), the relationship with other built-in electrical components, the wiring condition, the layout condition, and so on. Therefore, please verify yourself whether your machine or system conforms to the EMC directive.

9.1.1 About the EMC directive

Inverters themselves are not subject to approval for CE marking.

The CE mark must be put on every final product that includes an inverter(s) and a motor(s). The VF-S11 series of inverters complies with the EMC directive if an EMI filter recommended by Toshiba is connected to it and wiring is carried out correctly.

- EMC directive 89/336/EEC

The EMC standards are broadly divided into two categories, immunity- and emission-related standards, each of which is further categorized according to the operating environment of each individual machine. Since inverters are intended for use with industrial systems under industrial environments, they fall within the EMC categories listed in Table 1 below. The tests required for machines and systems as final products are almost the same as those required for inverters.

Table 1 EMC standards

Category	Subcategory	Product standards	Test standard and level
Emission	Radiation noise	IEC 61800-3	EN55011 Class A Group 1
	Transmission noise		EN55011 Class A Group 1
Immunity	Static discharge		IEC61000-4-2
	Radioactive radio-frequency magnetic contactor field		IEC61000-4-3
	First transient burst		IEC61000-4-4
	Lightning surge		IEC61000-4-5
	Radio-frequency induction/transmission interference		IEC61000-4-6
	Voltage dip/Interruption of power		IEC61000-4-11

Emission standards other than the above are applied to inverters when used in a commercial environment but not an industrial environment.

Category	Subcategory	Product standards	Test standard and level
Emission	Radiation noise	IEC 61800-3	EN55011 Class B Group 1
	Transmission noise		EN55011 Class B Group 1

9.1.2 Measures to satisfy the EMC directive

This subsection explains what measures must be taken to satisfy the EMC directive.

(1) Insert a recommended EMI filter (Table 2) on the input side of the inverter to reduce and transmission noise and radiation noise from input cables.

In the combinations listed in Table 2, Inverters are tested in these combination to see if they comply with transmission noise standards. For inverters used in Japan, it is recommended to use the NF series of noise filters.

Table 2 lists noise filters recommended for the inverters.

Table 2 Combinations of inverter and EMI filter

Three-phase 240V class

Inverter	Combination of inverter and filter	
	Transmission noise EN55011 Class A Group 1 Applicable filters (Length of motor connecting cable: Max. 5 m)	Transmission noise EN55011 Class B Group 1 Applicable filters (Length of motor connecting cable: Max. 1 m)
VFS11-2002PM	EMFS11-2007AZ	
VFS11-2004PM	EMFS11-2007AZ	
VFS11-2005PM	EMFS11-2007AZ	
VFS11-2007PM	EMFS11-2007AZ	
VFS11-2015PM	EMFS11-4015BZ	
VFS11-2022PM	EMFS11-4015BZ	
VFS11-2037PM	EMFS11-4025CZ	
VFS11-2055PM	EMFS11-4047DZ	
VFS11-2075PM	EMFS11-4047DZ	
VFS11-2110PM	EMFS11-2083EZ	
VFS11-2150PM	EMFS11-2083EZ	

Three-phase 500V class

Inverter	Combination of inverter and filter		
	Transmission noise EN55011 Class A Group 1 Applicable filters (Length of motor connecting cable: Max. 5 m)	Transmission noise EN55011 Class B Group 1 Applicable filters (Length of motor connecting cable: Max. 20 m)	Transmission noise EN55011 Class A Group 1 Applicable filters (Length of motor connecting cable: Max. 50 m)
VFS11-4004PL	With a built-in filter	EMFS11-4015BZ	
VFS11-4007PL	With a built-in filter	EMFS11-4015BZ	
VFS11-4015PL	With a built-in filter	EMFS11-4015BZ	
VFS11-4022PL	With a built-in filter	EMFS11-4025CZ	
VFS11-4037PL	With a built-in filter	EMFS11-4025CZ	
VFS11-4055PL	With a built-in filter	EMFS11-4047DZ	
VFS11-4075PL	With a built-in filter	EMFS11-4047DZ	
VFS11-4110PL	With a built-in filter	EMFS11-4049EZ	
VFS11-4150PL	With a built-in filter	EMFS11-4049EZ	

Single-phase 240V class

Inverter	Combination of inverter and filter		
	Transmission noise EN55011 Class A Group 1 Applicable filters (Length of motor connecting cable: Max. 5 m)	Transmission noise EN55011 Class B Group 1 Applicable filters (Length of motor connecting cable: Max. 20 m)	Transmission noise EN55011 Class A Group 1 Applicable filters (Length of motor connecting cable: Max. 50 m)
VFS11S-2002PL	With a built-in filter	EMFS11S-2009AZ	
VFS11S-2004PL	With a built-in filter	EMFS11S-2009AZ	
VFS11S-2007PL	With a built-in filter	EMFS11S-2009AZ	
VFS11S-2015PL	With a built-in filter	EMFS11S-2016BZ	
VFS11S-2022PL	With a built-in filter	EMFS11S-2022CZ	

Note : For 600V models compliant with EU standards, contact your nearest Toshiba inverter distributor.

(2) Use shielded power cables, such as inverter output cables, and shielded control cables. Route the cables and wires so as to minimize their lengths. Keep a distance between the power cable and the control cable and between the input and output wires of the power cable. Do not route them in parallel or bind them together, instead cross at right angle.

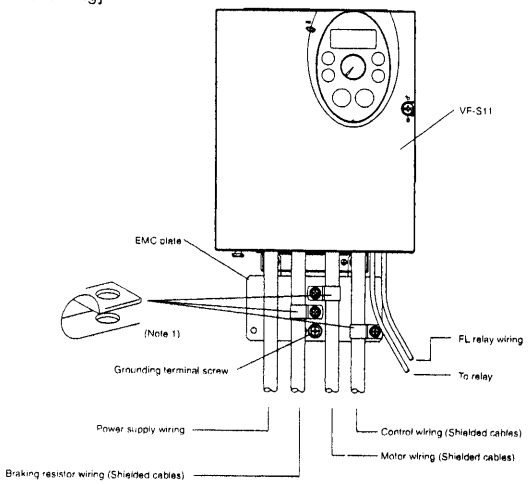
(3) Install the inverter and the filter on the same metal plate. It is more effective in limiting the radiation noise to install the inverter in a sealed steel cabinet. Using wires as thick and short as possible, earth the metal plate and the control panel securely with a distance kept between the earth cable and the power cable.

(4) Route the EMI filter input and output wires apart from each other.

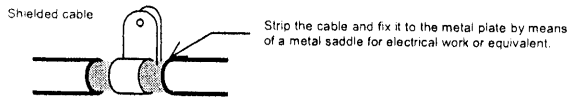
(5) To suppress radiation noise from cables, ground all shielded cables through a noise cut plate.
It is effective to earth shielded cables in the vicinity of the inverter, cabinet and filter (within a radius of 10cm from each of them). Inserting a ferrite core in a shielded cable is even more effective in limiting the radiation noise.

(6) To further limit the radiation noise, insert a zero-phase reactor in the inverter output line and insert ferrite cores in the earth cables of the metal plate and cabinet.

[Example of wiring]



Note 1: Strip and earth the shielded cable, following the example shown in Fig.



9.1.3 About the low-voltage directive

The low-voltage directive provides for the safety of machines and systems. All Toshiba inverters are CE-marked in accordance with the standard EN 50178 specified by the low-voltage directive, and can therefore be installed in machines or systems and imported without problem to European countries.

Applicable standard: EN50178
Electronic equipment for use in power installations
Electronic equipment for use in power installations
Pollution level: 2 (5.2.15.2)
Overvoltage category: 3
240V class - 3.0mm (5.2.16.1)
500V class - 5.5mm (5.2.16.1)

EN 50178 applies to electrical equipment intended specially for use in power installations, and sets out the conditions to be observed for electric shock prevention when designing, testing, manufacturing and installing electronic equipment for use in power installations.

9.1.4 Measures to satisfy the low-voltage directive

When incorporating the inverter into a machine or system, it is necessary to take the following measures so that the inverter satisfies the low-voltage directive.

(1) Install the inverter in a cabinet and ground the inverter enclosure. When doing maintenance, be extremely careful not to put your fingers into the inverter through a wiring hole and touch a charged part, which may occur depending on the model and capacity of the inverter used.
(2) Do not connect two or more wires to the main circuit earth terminal of the inverter. If necessary, install an additional earth terminal on the metal plate on which the inverter is installed and connect another cable to it. Or install the EMC plate (attached as standard) and another cable connect to earth terminal on the EMC plate. Refer to the table 10.1 for earth cable sizes.
(3) Install a non-fuse circuit breaker or a fuse on the input side of the inverter.

9.2 Compliance with UL Standard and CSA Standard

The VF-S11 models, that conform to the UL Standard and CSA Standard have the UL/CSA mark on the nameplate.

9.2.1 Compliance with Installation

The VF-S11 inverter must be installed in a panel, and used within the ambient temperature specification. (See section 1.4.4)

9.2.2 Compliance with Connection

Use the UL conformed cables (Rating 75 °C or more) to the main circuit terminals (R/L1, S/L2, T/L3, U/T1, V/T2, W/T3, PA/+, PB, PC/-, PO).
Refer to the table of next page about wire sizes.

9.2.3 Compliance with Peripheral devices

Use the UL listed fuses at connecting to power supply.
Short circuit test is performed under the condition of the power supply short-circuit currents in below.
These interrupting capacities and fuse rating currents depend on the applicable motor capacities.

12.2.5

■ AIC, Fuse and Wire sizes

Voltage class	Capacity of applicable motor (kW)	Inverter model	AIC (A) (Interrupting capacity)	Fuse class and current (A)	Wire sizes of power circuit
Single-phase 240V class	0.2	VFS11S-2002PL	AIC 1000A	CC/J 6A max.	AWG14
	0.4	VFS11S-2004PL	AIC 1000A	CC/J 10A max.	AWG14
	0.75	VFS11S-2007PL	AIC 1000A	CC/J 15A max.	AWG14
	1.5	VFS11S-2015PL	AIC 1000A	CC/J 20A max.	AWG12
	2.2	VFS11S-2022PL	AIC 1000A	CC/J 30A max.	AWG10
Three-phase 240V class	0.4	VFS11-2004PM	AIC 5000A	CC/J 6A max.	AWG14
	0.55	VFS11-2005PM	AIC 5000A	CC/J 10A max.	AWG14
	0.75	VFS11-2007PM	AIC 5000A	CC/J 10A max.	AWG14
	1.5	VFS11-2015PM	AIC 5000A	CC/J 15A max.	AWG14
	2.2	VFS11-2022PM	AIC 5000A	CC/J 20A max.	AWG12
	4.0	VFS11-2037PM	AIC 5000A	J 35A max.	AWG10
	5.5	VFS11-2055PM	AIC 22000A	J 50A max.	AWG8
	7.5	VFS11-2075PM	AIC 22000A	J 60A max.	AWG6
	11	VFS11-2110PM	AIC 22000A	J 80A max.	AWG4
	15	VFS11-2150PM	AIC 22000A	J 110A max.	AWG6 x 2
Three-phase 500V class	0.4	VFS11-4004PL	AIC 5000A	CC/J 3A max.	AWG14
	0.75	VFS11-4007PL	AIC 5000A	CC/J 6A max.	AWG14
	1.5	VFS11-4015PL	AIC 5000A	CC/J 10A max.	AWG14
	2.2	VFS11-4022PL	AIC 5000A	CC/J 15A max.	AWG14
	4.0	VFS11-4037PL	AIC 5000A	CC/J 20A max.	AWG12
	5.5	VFS11-4055PL	AIC 22000A	CC/J 30A max.	AWG10
	7.5	VFS11-4075PL	AIC 22000A	J 35A max.	AWG8
	11	VFS11-4110PL	AIC 22000A	J 50A max.	AWG8
	15	VFS11-4150PL	AIC 22000A	J 70A max.	AWG6
Three-phase 600V class	0.75	VFS11-6007P	AIC 5000A	CC/J 6A max.	AWG14
	1.5	VFS11-6015P	AIC 5000A	CC/J 6A max.	AWG14
	2.2	VFS11-6022P	AIC 5000A	CC/J 10A max.	AWG14
	4.0	VFS11-6037P	AIC 5000A	CC/J 15A max.	AWG14
	5.5	VFS11-6055P	AIC 22000A	CC/J 20A max.	AWG10
	7.5	VFS11-6075P	AIC 22000A	CC/J 25A max.	AWG10
	11	VFS11-6110P	AIC 22000A	J 30A max.	AWG8
	15	VFS11-6150P	AIC 22000A	J 45A max.	AWG8

9.2.4 Motor thermal protection

Selects the electronic thermal protection characteristics that fit with the ratings and characteristics of the motor. In case of multi motor operation with one inverter, thermal relay should be connected to each motor.

10. Peripheral devices

Danger	
Mandatory	• When using switchgear for the inverter, it must be installed in a cabinet. Failure to do so can lead to risk of electric shock and can result in death or serious injury.
Prohibited	• Connect earth cables securely. Failure to do so can lead to risk of electric shock or fire in case of a failure or short-circuit or electric leak.

10.1 Selection of wiring materials and devices

Voltage class	Capacity of applicable motor (kW)	Inverter model	Wire size (See Note 4) Power circuit (mm^2) (Note 1.)	DC reactor (optional) (mm^2)	Braking resistor/ Braking unit (optional) (mm^2)	Earth cable (mm^2)
Single-phase 240V class	0.2	VFS11S-2002PL	2.0 (2.0)	2.0	2.0	3.5
	0.4	VFS11S-2004PL	2.0 (2.0)	2.0	2.0	3.5
	0.75	VFS11S-2007PL	2.0 (2.0)	2.0	2.0	3.5
	1.5	VFS11S-2015PL	2.0 (2.0)	2.0	2.0	3.5
	2.2	VFS11S-2022PL	2.0 (2.0)	3.5	2.0	3.5
Three-phase 240V class	0.4	VFS11-2004PM	2.0 (2.0)	1.25	2.0	3.5
	0.55	VFS11-2005PM	2.0 (2.0)	2.0	2.0	3.5
	0.75	VFS11-2007PM	2.0 (2.0)	2.0	2.0	3.5
	1.5	VFS11-2015PM	2.0 (2.0)	2.0	2.0	3.5
	2.2	VFS11-2022PM	2.0 (2.0)	2.0	2.0	3.5
	4.0	VFS11-2037PM	2.0 (2.0)	3.5	2.0	3.5
	5.5	VFS11-2055PM	5.5 (2.0)	8.0	2.0	5.5
	7.5	VFS11-2075PM	8.0 (5.5)	14	3.5	5.5
	11	VFS11-2110PM	14 (8.0)	14	5.5	8.0
	15	VFS11-2150PM	22 (14)	22	14	8.0
Three-phase 500V class	0.4	VFS11-4004PL	2.0 (2.0)	2.0	2.0	3.5
	0.75	VFS11-4007PL	2.0 (2.0)	2.0	2.0	3.5
	1.5	VFS11-4015PL	2.0 (2.0)	2.0	2.0	3.5
	2.2	VFS11-4022PL	2.0 (2.0)	2.0	2.0	3.5
	4.0	VFS11-4037PL	2.0 (2.0)	2.0	2.0	3.5
	5.5	VFS11-4055PL	2.0 (2.0)	3.5	2.0	3.5
	7.5	VFS11-4075PL	3.5 (2.0)	5.5	2.0	3.5
	11	VFS11-4110PL	5.5 (2.0)	8.0	2.0	5.5
	15	VFS11-4150PL	8.0 (5.5)	14	3.5	5.5
Three-phase 600V class	0.75	VFS11-6007P	2.0	2.0	2.0	3.5
	1.5	VFS11-6015P	2.0	2.0	2.0	3.5
	2.2	VFS11-6022P	2.0	2.0	2.0	3.5
	4.0	VFS11-6037P	2.0	2.0	2.0	3.5
	5.5	VFS11-6055P	2.0	2.0	2.0	3.5
	7.5	VFS11-6075P	2.0	2.0	2.0	3.5
	11	VFS11-6110P	3.5	3.5	2.0	3.5
	15	VFS11-6150P	5.5	5.5	2.0	5.5

Note 1: Sizes of the wires connected to the input terminals R/L1, S/L2 and T/L3 and the output terminals U/T1, V/T2 and W/T3 when the length of each wire does not exceed 30m.
The numeric values in parentheses refer to the sizes of wires to be used when a DC reactor is connected.

Note 2: For the control circuit, use shielded wires 0.75 mm^2 or more in diameter.

Note 3: For grounding, use a cable with a size equal to or larger than the above.

Note 4: The wire sizes specified in the above table apply to HIV wires (cupper wires shielded with an insulator with a maximum allowable temperature of 75°C) used at an ambient temperature of 50°C or less.

Note 5: If there is a need to bring the inverter into UL compliance, use wires specified in Chapter 9.

■ Selection of wiring devices

Voltage class	Capacity of applicable motor (kW)	Inverter model	Molded case circuit breaker (MCCB) Earth leakage circuit breaker (ELCB) Note 3) Rated current (A)		Magnetic contactor (MC) Rated current (A)		Overload relay (THR) Adjusted current (A) (For reference)
			Without reactor	With DC reactor	Without reactor	With DC reactor	
Single-phase 240V class	0.2	VFS11S-2002PL	5	5	9	9	1.3
	0.4	VFS11S-2004PL	10	5	9	9	2.3
	0.75	VFS11S-2007PL	15	10	9	9	3.6
	1.5	VFS11S-2015PL	20	15	18	12	6.8
	2.2	VFS11S-2022PL	30	30	25	18	9.3
Three-phase 240V class	0.4	VFS11-2004PM	5	5	9	9	2.3
	0.55	VFS11-2005PM	10	5	9	9	2.7
	0.75	VFS11-2007PM	10	5	9	9	3.6
	1.5	VFS11-2015PM	15	10	9	9	6.8
	2.2	VFS11-2022PM	20	15	12	12	9.3
	4.0	VFS11-2037PM	30	30	25	18	15
	5.5	VFS11-2055PM	50	40	32	25	22
	7.5	VFS11-2075PM	60	50	38	38	28
	11	VFS11-2110PM	100	75	65	50	44
	15	VFS11-2150PM	125	100	80	65	57
Three-phase 500V class (Note 4)	0.4	VFS11-4004PL	5	5	9	9	1.0
	0.75	VFS11-4007PL	5	5	9	9	1.6
	1.5	VFS11-4015PL	10	10	9	9	3.6
	2.2	VFS11-4022PL	15	10	9	9	5.0
	4.0	VFS11-4037PL	20	15	12	9	6.8
	5.5	VFS11-4055PL	30	20	18	18	11
	7.5	VFS11-4075PL	30	30	25	18	15
	11	VFS11-4110PL	50	40	32	25	22
	15	VFS11-4150PL	60	50	38	38	28
Three-phase 600V class (Note 4)	0.75	VFS11-6007P	5	5	9	9	1.0
	1.5	VFS11-6015P	10	10	9	9	1.6
	2.2	VFS11-6022P	10	10	9	9	3.6
	4.0	VFS11-6037P	15	15	12	12	5.0
	5.5	VFS11-6055P	20	20	18	18	6.8
	7.5	VFS11-6075P	30	30	25	25	11
	11	VFS11-6110P	30	30	25	25	15
	15	VFS11-6150P	40	40	33	33	22

Note 1: Be sure to attach a surge killer to the exciting coil of the relay and the magnetic contactor.

Note 2: When using the auxiliary contacts 2a of the magnetic contactor MC for the control circuit, connect the contacts 2a in parallel to increase reliability.

Note 3: Select an MCCB with a current breaking rating appropriate to the capacity of the power supply, because short-circuit currents vary greatly depending on the capacity of the power supply and the condition of the wiring system. The MCCB, MC, THR and ELCB in this table were selected, on the assumption that a power supply with a normal capacity would be used.

Note 4: 500 / 600V class: For the operation and control circuits, regulate the voltage at 240V or less with a step-down transformer.

10.2 Installation of a magnetic contactor

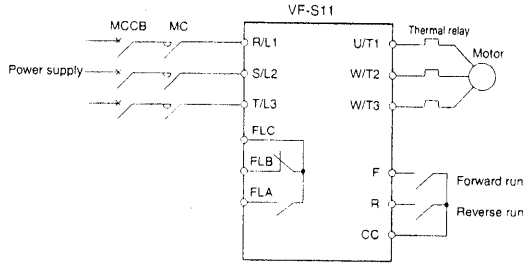
If using the inverter without installing a magnetic contactor (MC) in the primary circuit, use an MCCB (with a power cutoff device) to open the primary circuit when the inverter protective circuit is activated.
If using a braking resistor or braking resistor unit, install a magnetic contactor (MC) or non-fuse circuit breaker with a power cutoff device to the power supply of the inverter, so that the power circuit opens when the failure detection relay (FL) in the inverter or the external overload relay is activated.

■ Magnetic contactor in the primary circuit

To detach the inverter from the power supply in any of the following cases, insert a magnetic contactor (primary-side magnetic contactor) between the inverter and the power supply.

(1) If the motor overload relay is tripped
(2) If the protective detector (FL) built into the inverter is activated
(3) In the event of a power failure (for prevention of auto-restart)
(4) If the resistor protective relay is tripped when a braking resistor or braking resistor unit is used

When using the inverter with no magnetic contactor (MC) on the primary side, install a non-fuse circuit breaker with a voltage tripping coil instead of an MC and adjust the circuit breaker so that it will be tripped if the protective relay referred to above is activated. To detect a power failure, use an undervoltage relay or the like



Example of connection of a magnetic contactor in the primary circuit

Notes on wiring

- When frequently switching between start and stop, do not use the magnetic contactor on the primary side as an on-off switch for the inverter.
  Instead, stop and start the inverter by using terminals F and CC (forward run) or R and CC (reverse run).
- Be sure to attach a surge killer to the exciting coil of the magnetic contactor (MC).

■ Magnetic contactor in the secondary circuit

A magnetic contactor may be installed on the secondary side to switch controlled motors or supply commercial power to the load when the inverter is out of operation.

Notes on wiring

- Be sure to interlock the magnetic contactor on the secondary side with the power supply to prevent commercial power from being applied to the inverter output terminals.
- When installing a magnetic contactor (MC) between the inverter and the motor, avoid turning the magnetic contactor on or off during operation. Turning the magnetic contactor on or off during operation causes a current to rush into the inverter which could lead to malfunction.

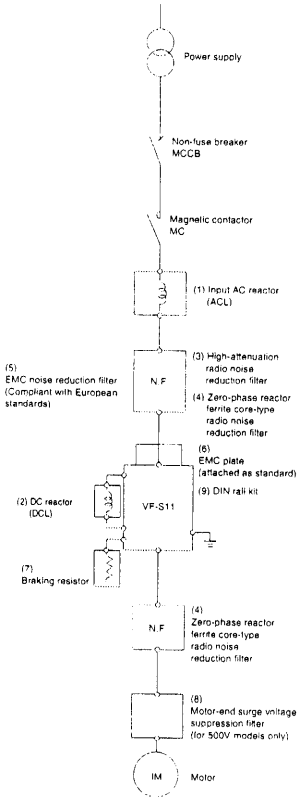
10.3 Installation of an overload relay

1) The VF-S11 inverter has an electronic-thermal overload protective function.
In the following cases, however, an overload relay suitable for the adjustment of the motor electronic thermal protection level (tHr) and appropriate to the motor used should be installed between the inverter and the motor.
   - When using a motor with a current rating different to that of the corresponding Toshiba general-purpose motor
   - When operating a single motor with an output smaller than that of the applicable standard motor or more than one motor simultaneously.
2) When using the VF-S11 inverter to operate a constant-torque motor, such as the Toshiba VF motor, adjust the protection characteristic of the electronic thermal protection unit (OLn) to the VF motor use.
3) It is recommended to use a motor with a thermal relay embedded in the motor coil to give sufficient protection to the motor, especially when it runs in a low-speed range.

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10.4 Optional external devices

The following external devices are optionally available for the VF-S11 series of inverters.



(10) Parameter writer
(11) Extension panel
(12) Internal PS485 communication circuit board
(13) Internal DeviceNet communication circuit board
(14) Internal LONWORKS communication circuit board
(15) RS485 communication converter unit
(16) RS232C communication converter cable
(17) Remote panel
(18) Application control unit
(19) Conduit pipe attachment kit

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Optional external devices

No	Device	Function and purpose
(1)	Input AC reactor	Used to improve the input power factor, reduce the harmonics, and suppress external surge on the inverter power source side. Install when the power capacity is 200 kVA or more and 10 times or more than the inverter capacity or when a distorted wave generation source such as a thyristor unit or a large-capacity inverter is connected in the same distribution system.
(2)	DC reactor	Improves the power factor more than the input reactor. When the facility applying the inverter requires high reliability, it is recommended to use the DC reactor with an input reactor effective for external surge suppression.
(3)	Radio noise reduction filter: High-attenuation (NF type)	These types of filters are not necessary because all single-phase 200V or 3-phase 400V models have a built-in EMI noise filter, conforming to Class A, as standard. But install these filters if necessarily of noise reduction move and more. • Effective to prevent interference in audio equipment used near the inverter. • Install on the input side of the inverter. • Provided with wide-range attenuation characteristics from AM radio bands to near 10MHz. • Use when equipment readily affected by noise is installed in the peripheral area.
(4)	Radio noise reduction filter: Zero-phase reactor ferrite core-type	• Effective to prevent interference in audio equipment used near the inverter. • Effective in noise reduction on both input and output sides of the inverter. • Provided with attenuation characteristics of several dB in frequencies from AM radio bands to 10MHz. • For noise countermeasures, insert on the secondary side of the inverter.
(5)	Radio noise reduction filter: EMC Noise reduction filter (Compliant with European standards)	A high-attenuation compact EMI noise filter that can be Foot-mounted and Side-mounted. With this filter on, the inverter complies with the following stndards. Three-phase 240V model: EN55011: Class A, Group 1 (Motor connecting cable length: 5 m or less) And EN55011: Class B, Group 1 (Motor connecting cable length: 1 m or less) Single-phase 240V, three-phase 500V models: And EN55011: Class A, Group 1 (Motor connecting cable length: 50 m or less) EN55011: Class B, Group 1 (Motor connecting cable length: 20 m or less)
(6)	EMC plate (attached as standard)	A steel plate used to connect shielded earth wires from inverter's power cables or to connect earth wires from external devices.
(7)	Braking resistor	Use when rapid deceleration or stop is frequently required or when it is desired to reduce the deceleration time with large load. This resistor consumes regenerative energy during power generation braking. • Braking resistor - With (resistor + protective thermal relay) built in.
(8)	Motor - end surge voltage suppression filter (500V class only)	Use an insulation-reinforced motor or install the surge voltage restraint filter to prevent degrading motor insulation caused by surge voltage generation depending on cable length and wiring method, or use of a 500V class motor driven with an inverter.

Reactor type	Effect: Improvement of power factor	Effect: Suppression of harmonic: 240V-4.0kW or less	Effect: Suppression of harmonic: Other model	Effect: Suppression of external surge
Input AC reactor	O	O	O	O
DC reactor	O Large	O	O Large	×

O Large : Large effective. O : effective. × : ineffective

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No.	Device	Function and purpose
(9)	DIN rail kit	Available for 2.2kW or 1.5kW models and lower. (Model: DIN003Z, DIN005Z)
(10)	Parameter writer Note 1)	Use this unit for batch read, batch copy, and batch writing of setting parameters. (Model: PWU001Z)
(11)	Extension panel Note 1)	Extended operation panel kit provided with LED indication section, RUN/STOP key, UP/DOWN key, Monitor key, and Enter key. (Model: RKP001Z)
(12)	Internal RS485 communication circuit board	This unit allows you to connect a upper controller to multiple inverters for data transfer. (Model: RS4003Z)
(13)	Internal DeviceNet communication circuit board	This unit allows you to connect a upper controller to multiple inverters for data transfer. (Model : DEV001Z)
(14)	Internal LONWORKS communication circuit board	This unit allows you to connect a upper controller to multiple inverters for data transfer. (Model : LIU005Z)
(15)	RS485 communication converter unit Note 1)	This unit allows you to connect a upper controller to multiple inverters for data transfer. (Models: RS4001Z, RS4002Z)
(16)	RS232C communication converter cable	This unit allows you to connect a personal computer to inverters for data communications. (Model: RS20035)
(17)	Remote panel	This panel includes a frequency meter, a frequency regulator and RUN/STOP (forward/reverse run)switches. (Model: CBVR-7B1)
(18)	Application control unit	The AP series of control units is available for the inverter to allow it to perform various kinds of applied control. Contact your Toshiba representative for further information.
(19)	Conduit pipe attachment kit	Attachment kit used for conformance to NEMA TYPE1.

Note 1: Dedicated cables are needed to connect inverters to a personal computer.
Cable models: CAB0011 (1m)
CAB0013 (3m)
CAB0015 (5m)

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Table for selection of optional external devices

Voltage class	Capacity of applicable motor (kW)	Inverter model	Input AC reactor	DC reactor	Radio noise reduction filter: High-attenuation type	Radio noise reduction filter: Core type (Note 1.)	Braking resistor	Motor-end surge voltage suppression filter	EMC plate (Note 2)	EMC noise filter (Compliant with European standards)	DIN rail kit
Single-phase 240V class	0.2	VFS11S-2002PL	PFL-2002S	DCLS-2002	-	RC5078	PBR-2007	-	EMP003Z	EMFS11S-2009AZ	DIN003Z
	0.4	VFS11S-2004PL	PFL-2005S	DCL-2007	-	RC5078	PBR-2007	-	EMP003Z	EMFS11S-2009AZ	DIN003Z
	0.75	VFS11S-2007PL	PFL-2011S	DCL-2022	-	RC5078	PBR-2007	-	EMP003Z	EMFS11S-2009AZ	DIN003Z
	1.5	VFS11S-2015PL	PFL-2018S	DCL-2037	-	RC5078	PBR-2022	-	EMP004Z	EMFS11S-2016BZ	DIN005Z
	2.2	VFS11S-2022PL	PFL-2018S	DCL-2037	-	RC5078	PBR-2022	-	EMP004Z	EMFS11S-2022CZ	-
Three-Phase 240V class	0.2	VFS11-2002PM	PFL-2001S	DCL-2002	NF3005A-MJ	RC5078	PBR-2007	-	EMP003Z	EMFS11-2007AZ	DIN003Z
	0.4	VFS11-2004PM	PFL-2005S	DCL-2007	NF3005A-MJ	RC5078	PBR-2007	-	EMP003Z	EMFS11-2007AZ	DIN003Z
	0.55	VFS11-2005PM	PFL-2005S	DCL-2007	NF3005A-MJ	RC5078	PBR-2007	-	EMP003Z	EMFS11-2007AZ	DIN003Z
	0.75	VFS11-2007PM	PFL-2005S	DCL-2007	NF3005A-MJ	RC5078	PBR-2007	-	EMP003Z	EMFS11-2007AZ	DIN003Z
	1.5	VFS11-2015PM	PFL-2011S	DCL-2022	NF3015A-MJ	RC5078	PBR-2022	-	EMP004Z	EMFS11-4015BZ	DIN005Z
	2.2	VFS11-2022PM	PFL-2011S	DCL-2022	NF3015A-MJ	RC5078	PBR-2022	-	EMP004Z	EMFS11-4015BZ	DIN005Z
	3.7	VFS11-2037PM	PFL-2018S	DCL-2037	NF3020A-MJ	RC5078	PBR-2037	-	EMP004Z	EMFS11-4025CZ	-
	5.5	VFS11-2055PM	PFL-2025S	DCL-2055	NF3030A-MJ	RC9129	PBR3-2055	-	EMP005Z	EMFS11-4047DZ	-
	7.5	VFS11-2075PM	PFL-2050S	DCL-2110	NF3040A-MJ	RC9129	PBR3-2075	-	EMP005Z	EMFS11-4047DZ	-
	11	VFS11-2110PM	PFL-2050S	DCL-2110	NF3050A-MJ	RC9129	PBR3-2110	-	EMP006Z	EMFS11-2083EZ	-
	15	VFS11-2150PM	PFL-2100S	DCL-2220	NF3080A-MJ	RC9129	PBR3-2150	-	EMP006Z	EMFS11-2083EZ	-
Three-Phase 500V class	0.4	VFS11-4004PL	PFL-4012S	DCL-2007	NF3010C-MJ	RC5078	PBR-2007	MSF-4015Z	EMP004Z	EMFS11-4015BZ	DIN005Z
	0.75	VFS11-4007PL	PFL-4012S	DCL-2007	NF3010C-MJ	RC5078	PBR-2007	MSF-4015Z	EMP004Z	EMFS11-4015BZ	DIN005Z
	1.5	VFS11-4015PL	PFL-4012S	DCL-2007	NF3010C-MJ	RC5078	PBR-2007	MSF-4015Z	EMP004Z	EMFS11-4015BZ	DIN005Z
	2.2	VFS11-4022PL	PFL-4012S	DCL-2022	NF3010C-MJ	RC5078	PBR-2007	MSF-4037Z	EMP004Z	EMFS11-4025CZ	-
	3.7	VFS11-4037PL	PFL-4012S	DCL-2022	NF3010C-MJ	RC5078	PBR-4037	MSF-4037Z	EMP004Z	EMFS11-4025CZ	-
	5.5	VFS11-4055PL	PFL-4025S	DCL-4110	NF3015C-MJ	RC9129	PBR3-4055	MSF-4075Z	EMP005Z	EMFS11-4047DZ	-
	7.5	VFS11-4075PL	PFL-4025S	DCL-4110	NF3020C-MJ	RC9129	PBR3-4075	MSF-4075Z	EMP005Z	EMFS11-4047DZ	-
	11	VFS11-4110PL	PFL-4025S	DCL-4110	NF3030C-MJ	RC9129	PBR3-4110	MSF-4150Z	EMP006Z	EMFS11-4049EZ	-
	15	VFS11-4150PL	PFL-4050S	DCL-4220	NF3040C-MJ	RC9129	PBR3-4150	MSF-4150Z	EMP006Z	EMFS11-4049EZ	-
Three-Phase 600V class	0.75	VFS11-6007P	(Note 3)	(Note 3)	FN3359HV -150-28 by Schafener	RC5078	(Note 3)	-	EMP004Z	(Note 3)	DIN005Z
	1.5	VFS11-6015P				RC5078		-	EMP004Z		DIN005Z
	2.2	VFS11-6022P				RC5078		-	EMP004Z		-
	4.0	VFS11-6037P				RC5078		-	EMP004Z		-
	5.5	VFS11-6055P				RC9129		-	EMP005Z		-
	7.5	VFS11-6075P				RC9129		-	EMP005Z		-
	11	VFS11-6110P				RC9129		-	EMP006Z		-
	15	VFS11-6150P				RC9129		-	EMP006Z		-

Note 1: This filter is used wound around the input-side power line. (Number of turns: 4 or more) This filter can be installed on the output side, as well.

Note 2: EMC plate is attached as standard.

Note 3: For 600V models, contact your nearest Toshiba inverter distributor.

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12.2.5

Devices	External dimensions and connections
Input AC reactor (ACL)	

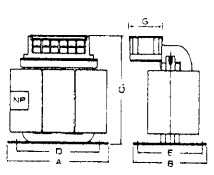


Fig. A

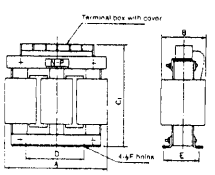
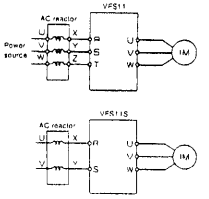


Fig. B



Model	Rating	Inverter type	Dimensions (mm) A	B	C	D	E	F	G	Diagram	Terminals	Approx. weight (kg)
PFLS2002S	1φ-240V-2.0A-50/60Hz	VFS11S-2002PL	80	55	115	63	45	5	45	A	Harmonica terminal M3.5	0.85
PFL2001S	3φ-240V-1.7A-50/60Hz	VFS11-2002PM	105	65	115	90	55	5	40		Harmonica terminal M3.5	1.0
PFL2005S	3φ-240V-5.5A-50/60Hz	VFS11-2004 ~ 2007PM VFS11S-2004PL	105	65	115	90	55	5	40		Harmonica terminal M3.5	1.2
PFL2011S	3φ-240V-11A-50/60Hz	VFS11-2015, 2022PM VFS11S-2007PL	130	70	140	115	60	5	50		Harmonica terminal M4	2.3
PFL2018S	3φ-240V-18A-50/60Hz	VFS11-2037PM VFS11S-2015, 2022PL	130	70	140	115	60	5	50		Harmonica terminal M4	2.5
PFL2025S	3φ-240V-25A-50/60Hz	VFS11-2055PM	125	100	130	50	83	7	-	B	Harmonica terminal M4	2.6
PFL2050S	3φ-240V-50A-50/60Hz	VFS11-2075, 2110PM	155	115	140	50	95	7	-		Harmonica terminal M6	3.4
PFL2100S	3φ-240V-100A-50/60Hz	VFS11-2150PM	230	150	210	60	90	8	-		Harmonica terminal M8	8.2
PFL4012S	3φ-500V-12.5A-50/60Hz	VFS11-4004 ~ 4037PL	125	95	130	50	79	7	-	B	Harmonica terminal M4	2.3
PFL4025S	3φ-500V-25A-50/60Hz	VFS11-4055 ~ 4110PL	155	110	155	50	94	7	-			4.9
PFL4050S	3φ-500V-50A-50/60Hz	VFS11-4150PL	155	140	165	50	112	7	-		Harmonica terminal M6	6.6

* PFLS2002S has 4 terminals.

10

Devices	External dimensions and connections
DC reactor (DCL)	

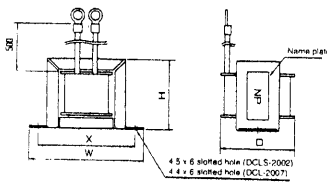


Fig. A

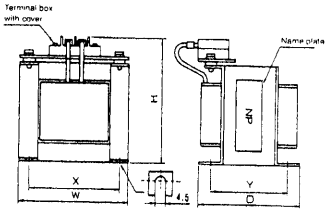


Fig. B

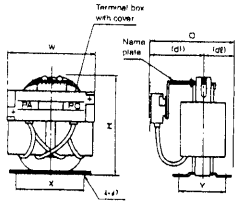
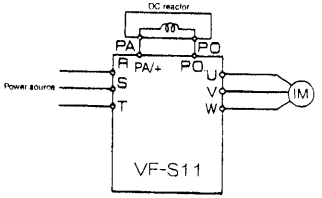


Fig. C

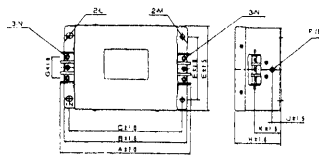


Model	Rated current (A)	Inverter type	Dimensions (mm) W	H	D	X	Y	d1	D2	Diagram	Terminals	Approx weight (kg)
DCL-2002	2	VFS11-2002PM	59	37	35	51	-	-	-	A	V1.25-3.5	0.2
DCLS-2002	2.5	VFS11-2002PM VFS11S-2002PL	79	50	44	68	-	-	-		V1.25-3.5	0.6
DCL-2007	7	VFS11-2004 ~ 2007PM VFS11S-2004PL	92	65	70	82	-	-	-	B	V2-3.5	1.2
DCL-2022	14	VFS11-2015, 2022PM VFS11S-2007PL	86	110	80	71	64	-	-		M4	2.2
DCL-2037	22.5	VFS11-2037PM VFS11S-2015, 2022PL	86	110	85	71	70	-	-		M4	2.5
DCL-2055	38	VFS11-2055PM	75	130	140	50	85	85	55	C	M5	1.9
DCL-2110	75	VFS11-2075 ~ 2110PM	100	150	150	65	85	95	55		M8	2.4
DCL-2220	150	VFS11-2150PM	117	170	190	90	90	130	60		M8	4.3
DCL-2007	7	VFS11-4004 ~ 4015PL (Note)	92	65	70	82	-	-	-	A	V2-3.5	1.2
DCL-2022	14	VFS11-4022, 4037PL (Note)	86	110	80	71	64	-	-		M4	2.2
DCL-4110	38	VFS11-4055 ~ 4110PL	95	150	165	70	90	105	60	B C	M5	3.0
DCL-4220	75	VFS11-4150PL	105	160	185	80	100	130	65		M8	3.7

Note: Use 240V class for VFS11-4004PL-4037PL DC reactor.

10

Devices	External dimensions and connections
High-attenuation radio noise reduction filter	



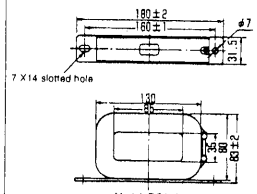
Notes: (1) Noise filter should be connected to the inverter main circuit and the control circuit primary-side.

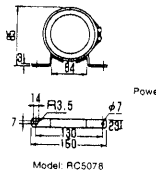
(2) Output cable should be kept away from the input cable.

Reactor model	Rated current (A)	Inverter type	A	B	C	E	F	G	H	J	K	M	N	P	Approx weight (kg)
NF3005A-MJ	5	VFS11-2002PM ~ VFS11-2007PM	174.5	160	145	110	80	32	70	20	45	ϕ5.5	M4	M4	1.0
NF3015A-MJ	15	VFS11-2015PM, VFS11-2022PM													1.4
NF3020A-MJ	20	VFS11-2037PM													1.6
NF3030A-MJ	30	VFS11-2055PM													
NF3040A-MJ	40	VFS11-2075PM	217.5	200	185	120	90	44	90	30	43		M5		2.7
NF3050A-MJ	50	VFS11-2110PM	267.5	250	235	170	140				60		M6		4.6
NF3080A-MJ	80	VFS11-2150PM	294.5	280	260	170	150	37	100		55		M6		7.0
NF3010C-MJ	10	VFS11-4004 ~ 4037PL	174.5	160	145	110	80	32	70	20	45	ϕ5.5	M4	M4	1.4
NF3015C-MJ	15	VFS11-4055PL													
NF3020C-MJ	20	VFS11-4075PL													1.6
NF3030C-MJ	30	VFS11-4110PL	177.5	200	185	120	90	44			43		M5		2.7
NF3040C-MJ	40	VFS11-4150PL	217.5												

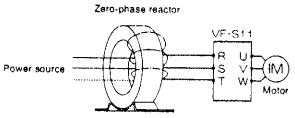
Note: Every inverter with a model number ending in -PL comes standard with a built-in noise filter almost equal in size and performance to this filter.

Zero-phase ferrite core-type radio noise reduction filter	





Unit: mm

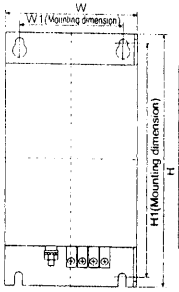


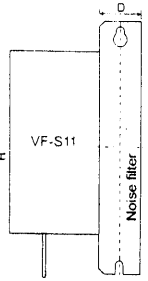
Input or output cable should be coiled over 4-times. RC5078 is recommended for the models 3.7kW or less.

10

Devices	External dimensions and connections
EMC noise filter (Compliant with European Standards)	

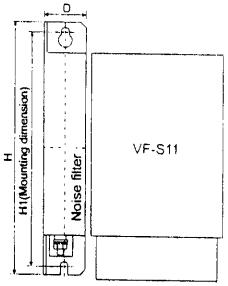
Foot mount installation







Side mount installation

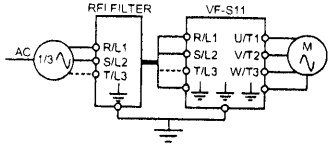


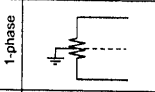
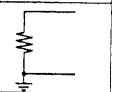
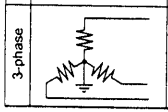
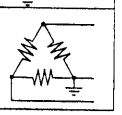
RFI filter type form	Rated current (A)	Inverter type form	Dimensions (mm) W	H	D	W1	H1	E	F	G	Leakage current (mA) Note 1) Power system A	Power system B
EMFS11S-2009AZ	9	VFS11S-2002~2007PL	72	195	37	52	180	5	8.5	10	3	47
EMFS11-2007AZ	7	VFS11-2002~2007PM	72	195	37	52	180	5	8.5	10	7	45
EMFS11S-2016BZ	16	VFS11S-2015PL	105	195	35	85	180	5	8.5	10	3	47
EMFS11-4015BZ	15	VFS11-2015,2022PM VFS11-4004~4015PL	105	195	42	85	180	5	8.5	10	8 15	48 96
EMFS11S-2022CZ	22	VFS11S-2022PL	140	235	35	120	215	5	8.5	10	5	103
EMFS11-4025CZ	25	VFS11-2037PM VFS11-4022,4037PL	140	235	50	120	215	5	8.5	10	20 40	125 248
EMFS11-4047DZ	47	VFS11-2055,2075PM VFS11-4055,4075PL	180	305	60	140	285	5.5	9.5	11	23 47	147 293
EMFS11-2083EZ	83	VFS11-2110,2150PM	245	395	80	205	375	5.5	9.5	11	17	104
EMFS11-4049EZ	49	VFS11-4110,4150PL	245	395	60	205	375	5.5	9.5	11	47	293

Note 1) These values are referential ones of single piece of RFI filter. For 240V class, 60Hz/200V power source. For 500V class, 60Hz/400V power source. For power system A and B, refer to table below.

Select an earth leakage breaker with consideration of leakage current above and leakage current from the inverter unit.

How to wire



	Power system A	Power system B
1-phase		
3-phase		

Note 2) For 600V models compliant with EU standards, contact your nearest Toshiba inverter distributor.

10

Devices	External dimensions and connections
Braking resistor	

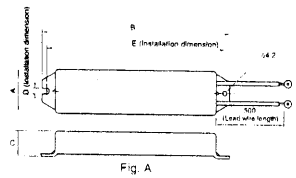


Fig. A

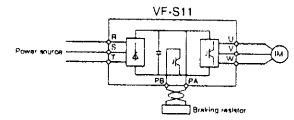


Fig. C

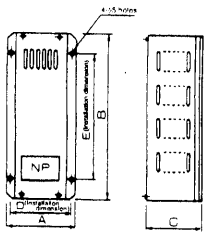
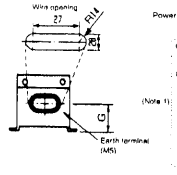


Fig. B



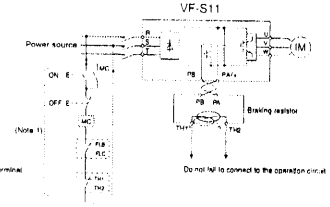


Fig. D

Model	Rating	Inverter type	Dimensions (mm) A	B	C	D	E	G	External dimensions and connections	Approx. weight (kg)
PBR-2007	120W-200Ω	VFS11-2002 ~ 2007PM VFS11S-2002 ~ 2007PL	42	182	20	4.2	172	-	A and C	0.28
PBR-2022	120W-75Ω	VFS11-2015, 2022PM VFS11S-2015, 2022PL								
PBR-2037	120W-40Ω	VFS11-2037PM								
PBR3-2055	240W-20Ω (40Ω×2P)	VFS11-2055PM	120	320	115	110	230	50	B and D	4
PBR3-2075	440W-15Ω (30Ω×2P)	VFS11-2075PM		350	190			150		4.5
PBR3-2110	660W-10Ω (30Ω×3P)	VFS11-2110PM								5
PBR3-2150	880W-7.5Ω (30Ω×4P)	VFS11-2150PM								5.5
PBR-2007	120W-200Ω	VFS11-4004 ~ 4022PL	42	182	20	4.2	172	-	A and C	0.28
PBR-4037	120W-160Ω	VFS11-4037PL								
PBR3-4055	240W-80Ω (160Ω×2P)	VFS11-4055PL	120	320	115	110	230	50	B and D	4
PBR3-4075	440W-60Ω (120Ω×2P)	VFS11-4075PL		350	190			150		4.5
PBR3-4110	660W-40Ω (120Ω×3P)	VFS11-4110PL								5
PBR3-4150	880W-30Ω (120Ω×4P)	VFS11-4150PL								5.5

Note1: Use the same type of braking resistor of VFS11-2002 ~ 2007PM for those of VFS11-4004 ~ 4022PL.

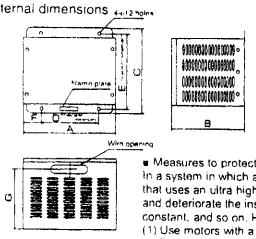
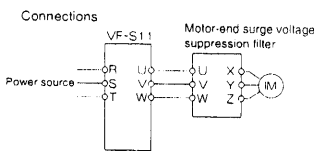
Note2: The data in Rating above refer to the resultant resistance capacities (watts) and resultant resistance values (Ω).

The numeric values inside parentheses refer to the internal compositions of resistors.

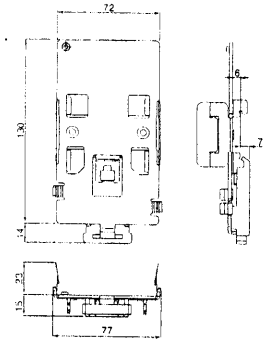
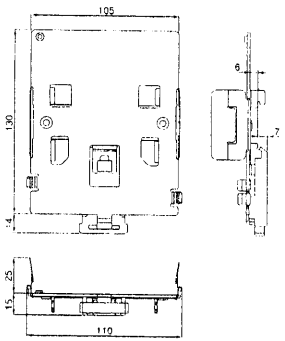
The resistances in the Rating column are combined resistances. The numeric values inside parentheses refer to the compositions of resistors (resistance of each resistor x number of resistors).

10

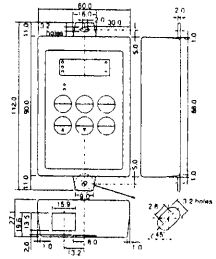
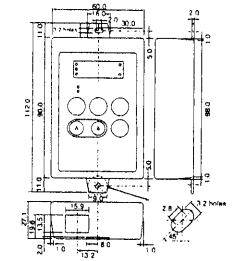
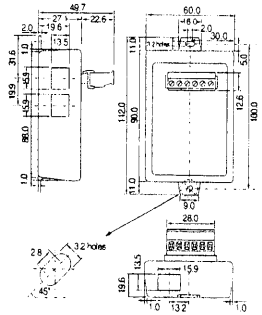
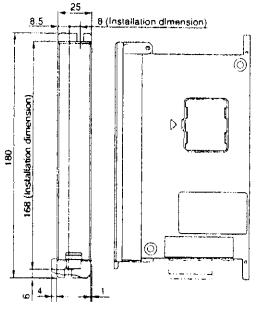
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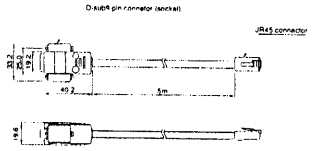
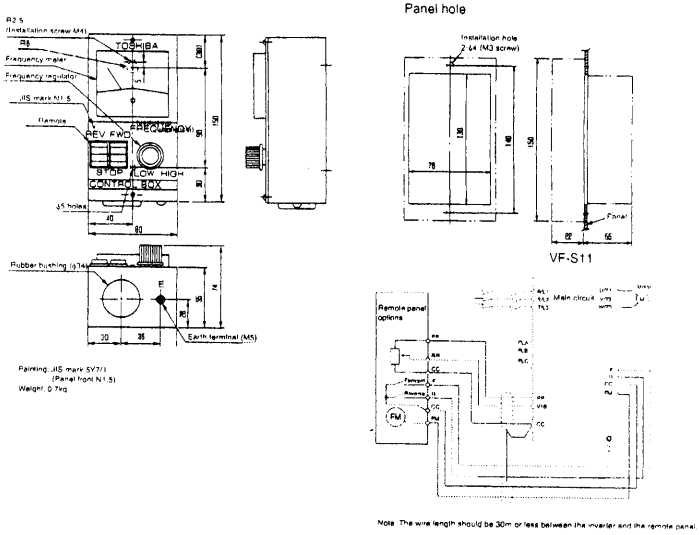
Devices	External dimensions and connections
Motor – end surge voltage suppression filter	External dimensions  Connections  ■ Measures to protect motors against surge voltages In a system in which a 400V-class general-purpose motor is operated with a voltage PMW inverter that uses an ultra high-speed switching device (such as an IGBT), surge voltages may be produced and deteriorate the insulation of motor coils, depending on the cable length, wiring method, cable constant, and so on. Here are some examples of measures against surge voltages. (1) Use motors with a high dielectric strength. (2) To suppress surge voltages, install an AC reactor (an input reactor may be used instead. For the application, contact your Toshiba dealer) or a surge suppression filter on the output side of the inverter.

		Dimensions (mm)									
		A	B	C	D	E	F	G			
MSF-4015Z	0.4, 0.75, 1.5	310	255	300	200	270	55	189	M4	M4	12
MSF-4037Z	2.2, 4.0	310	255	300	200	270	55	209	M4	M4	20
MSF-4075Z	5.5, 7.5	310	315	350	200	320	55	249	M5	M5	30
MSF-4150Z	11, 15	330	350	400	200	370	65	289	M5	M5	40

DIN rail kit	DIN003Z  DIN005Z 

Model	Inverter type	Approx. weight (kg)
DIN003Z	VFS11S-2002PL~2007PL VFS11-2002PM~2007PM	0.2
DIN005Z	VFS11S-2015PL, VFS11-2015PM, 2022PM VFS11-4004PL~4015PL, VFS11-6007P, 6015P	0.3

Devices	External dimensions and connections
Parameter writer	Parameter writer type: PWU001Z Cable type (1m): CAB0011 (3m): CAB0013 (5m): CAB0015 
Extension panel	Extension panel type: RKP001Z Cable type (1m): CAB0011 (3m): CAB0013 (5m): CAB0015 
RS485 communication converter unit	• 2-port type: RS4001Z  • 8-port type: RS4002Z  Cable type (1m): CAB0011, (3m): CAB0013, (5m): CAB0015

Devices	External dimensions and connections
RS232C communication converter cable	RS232C cable type: RS20035 
Remote panel CBVR-7B1	Panel hole 

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12.2.5

11. Table of parameters and data

11.1 User parameters

Title	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
FC	Operation frequency of operation panel	Hz	0.1/0.01	LL-UL	0.0		3.2

11.2 Basic parameters

- Four navigation functions

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
AUH	-	History function	-	-	Displays parameters in groups of five in the reverse order to that in which their settings were changed. * (Possible to edit)	-		4.1.4
AU1	0000	Automatic acceleration/ deceleration	-	-	0: Disabled (manual) 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		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		5.4 6.5.1 7.1

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Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
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		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)		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
uLu	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)

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
Pt	0015	V/F control mode selection	-	-	0: V/F constant 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: ○ / × 1 Standard motor: ○ / ○ 2 Standard motor: × / × 3 Standard motor: × / ○ 4 VF motor: ○ / × 5 VF motor: ○ / ○ 6 VF motor: × / × 7 VF motor: × / ○	0		5.13
Sr1	0018	Preset-speed operation frequency 1	Hz	0.1/0.01	LL-UL	0.0		5.14
Sr2	0019	Preset-speed operation frequency 2	Hz	0.1/0.01	LL-UL	0.0		
Sr3	0020	Preset-speed operation frequency 3	Hz	0.1/0.01	LL-UL	0.0		
Sr4	0021	Preset-speed operation frequency 4	Hz	0.1/0.01	LL-UL	0.0		
Sr5	0022	Preset-speed operation frequency 5	Hz	0.1/0.01	LL-UL	0.0		
Sr6	0023	Preset-speed operation frequency 6	Hz	0.1/0.01	LL-UL	0.0		
Sr7	0024	Preset-speed operation frequency 7	Hz	0.1/0.01	LL-UL	0.0		
F---	-	Extended parameters	-	-	-	-	-	4.1.2
Gr.U	-	Automatic edit function	-	-	-	-	-	4.1.3

*1 : Default values vary depending on the capacity. See the table of the page K-15.

*2 : ○ : valid, × : invalid

11.3 Extended parameters

- Input/output parameters 1

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F100	0100	Low-speed signal output frequency	Hz	0.1/0.01	0.0-FH	0.0		6.1.1
F101	0101	Speed reach setting frequency	Hz	0.1/0.01	0.0-FH	0.0		6.1.3
F102	0102	Speed reach detection band	Hz	0.1/0.01	0.0-FH	2.5		6.1.2
F105	0105	Priority selection (Both F-CC and R-CC are ON)	-	-	0: Reverse 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		
F132	0132	Output terminal selection 3 (FL)	-	-	0-255 (FL)	10		
F137	0137	Output terminal selection 1B (RY-RC)	-	-	0-255 (always ON)	255		6.3.4
F138	0138	Output terminal selection 2B (OUT-NO)	-	-	0-255 (always ON)	255		

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F139	0139	Output terminal logic selection (RY-RC, OUT-NO)	-	-	0: F130 and F137 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 F201 by terminal input) 1: Fnod (Switchable to F201 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

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		6.10
F271	0271	Jumping width 1	Hz	0.1/0.01	0.0-30.0	0.0		
F272	0272	Jump frequency 2	Hz	0.1/0.01	0.0-FH	0.0		

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F273	0273	Jumping width 2	Hz	0.1/0.01	0.0-30.0	0.0		6.10
F274	0274	Jump frequency 3	Hz	0.1/0.01	0.0-FH	0.0		
F275	0275	Jumping width 3	Hz	0.1/0.01	0.0-30.0	0.0		
F287	0287	Preset-speed operation frequency 8	Hz	0.1/0.01	LL-UL	0.0		5.14
F288	0288	Preset-speed operation frequency 9	Hz	0.1/0.01	LL-UL	0.0		
F289	0289	Preset-speed operation frequency 10	Hz	0.1/0.01	LL-UL	0.0		
F290	0290	Preset-speed operation frequency 11	Hz	0.1/0.01	LL-UL	0.0		
F291	0291	Preset-speed operation frequency 12	Hz	0.1/0.01	LL-UL	0.0		
F292	0292	Preset-speed operation frequency 13	Hz	0.1/0.01	LL-UL	0.0		
F293	0293	Preset-speed operation frequency 14	Hz	0.1/0.01	LL-UL	0.0		
F294	0294	Preset-speed operation frequency 15 (Fire-speed)	Hz	0.1/0.01	LL-UL	0.0		5.14 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

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)		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.

- Torque boost parameters 1

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F400	0400	Auto-tuning	-	-	0: Auto-tuning disabled 1: Initialization of F402 (reset to 0) 2: Auto-tuning enabled (after execution: 0)	0		5.11 6.17.1
F401	0401	Slip frequency gain	%	1/1	0-150	50		
F402	0402	Automatic torque boost value	%	0.1/0.1	0.0-30.0	*1		
F415	0415	Motor rated current	A	0.1/0.1	0.1-100.0	*1		
F416	0416	Motor no-load current	%	1/1	10-90	*1		
F417	0417	Motor rated speed	min-1	1/1	100-32000	1410(WP) 1710 (WN, AN)		
F418	0418	Speed control response coefficient	-	1/1	1-150	40		
F419	0419	Speed control stability coefficient	-	1/1	1-100	20		

*1 : Default values vary depending on the capacity. See the table of page K-15.

- Input/output parameters 2

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F470	0470	VIA input bias	-	-	-	-		6.5.4
F471	0471	VIA input gain	-	-	-	-		
F472	0472	VIB input bias	-	-	-	-		
F473	0473	VIB input gain	-	-	-	-		

- Torque boost parameters 2

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F480	0480	Exciting current coefficient	%	1/1	100-130	100		5.11 6.17.2
F485	0485	Stall prevention control coefficient 1	-	1/1	10-250	100		
F492	0492	Stall prevention control coefficient 2	-	1/1	50-150	100		
F494	0494	Motor adjustment coefficient	-	1/1	0-200	*1		
F495	0495	Maximum voltage adjustment coefficient	%	1/1	90-110	104		
F496	0496	Waveform switching adjustment coefficient	kHz	0.1/0.01	0.1-14.0	0.2		

*1 : Default values vary depending on the capacity. See the table of page K-15.

- Acceleration/deceleration time parameters

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F500	0500	Acceleration time 2	s	0.1/0.1	0.0-3200	10.0		6.18
F501	0501	Deceleration time 2	s	0.1/0.1	0.0-3200	10.0		
F502	0502	Acceleration/deceleration 1 pattern	-	-	0: Linear 1: S-pattern 1 2: S-pattern 2	0		
F503	0503	Acceleration/deceleration 2 pattern	-	-		0		
F504	0504	Acceleration/deceleration selection (1, 2, 3)	-	-	1: Acceleration/deceleration 1 2: Acceleration/deceleration 2 3: Acceleration/deceleration 3	1		
F505	0505	Acceleration/deceleration 1 and 2 switching frequency	Hz	0.1/0.01	0.0-UL	0.0		
F506	0506	S-pattern lower-limit adjustment amount	%	1/1	0-50	10		
F507	0507	S-pattern upper-limit adjustment amount	%	1/1	0-50	10		6.18
F510	0510	Acceleration time 3	s	0.1/0.1	0.0-3200	10.0		
F511	0511	Deceleration time 3	s	0.1/0.1	0.0-3200	10.0		
F512	0512	Acceleration/deceleration 3 pattern	-	-	0: Linear 1: S-pattern 1 2: S-pattern 2	0		
F513	0513	Acceleration/deceleration 2 and 3 switching frequency	Hz	0.1/0.01	0.0-UL	0.0		

- Protection parameters

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F601	0601	Stall prevention level 1	% (A)	1/1	10-199, 200 (disabled)	150		6.19.2
F602	0602	Inverter trip retention selection	-	-	0: Canceled with the power off 1: Still retained with the power off	0		6.19.3
F603	0603	Emergency stop selection	-	-	0: Coast stop 1: Slowdown stop 2: Emergency DC braking	0		6.19.4
F604	0604	Emergency DC braking time	s	0.1/0.1	0.0-20.0	1.0		6.19.4
F605	0605	Output phase failure detection mode selection	-	-	0: Disabled 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		6.19.5
F607	0607	Motor 150%-overload time limit	s	1/1	10-2400	300		6.19.1
F608	0608	Input phase failure detection mode selection	-	-	0: Disabled, 1: Enabled	1		6.19.6

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F609	0609	Small current detection current hysteresis	%	1/1	1-20	10		6.19.7
F610	0610	Small current trip/alarm selection	-	-	0: Alarm only 1: Tripping	0		
F611	0611	Small current detection current	% (A)	1/1	0-100	0		
F612	0612	Small current detection time	s	1/1	0-255	0		
F613	0613	Detection of output short-circuit during start-up	-	-	0: Each time (standard pulse) 1: At start-up (only one time after power is turned on) (standard pulse) 2: Each time (short-time pulse) 3: At start-up (only one time after power is turned on) (short-time pulse)	0		6.19.8
F615	0615	Over-torque trip/alarm selection	-	-	0: Alarm only 1: Tripping	0		6.19.9
F616	0616	Over-torque detection level	%	1/1	0-250	150		
F618	0618	Over-torque detection time	s	0.1/0.1	0.0-10.0	0.5		
F619	0619	Over-torque detection level hysteresis	%	1/1	0-100	10		6.19.9
F621	0621	Cumulative operation time alarm setting	100 Time	0.1/0.1 (=10 hours)	0.0-999.9	610		6.19.10
F626	0626	Over-voltage stall protection level	%	1/1	100-150	*1		6.13.5
F627	0627	Undervoltage trip/alarm selection	-	-	0: Alarm only (detection level below 60%) 1: Tripping (detection level below 60%) 2: Alarm only (detection level below 50%, DC reactor necessary)	0		6.19.12
F633	0633	Trip at VIA low level input mode	%	1/1	0: Disabled, 1-100	0		6.19.13
F634	0634	Annual average ambient temperature (parts replacement alarms)	-	-	1: -10 to +10°C 2: 11-20°C 3: 21-30°C 4: 31-40°C 5: 41-50°C 6: 51-60°C	3		6.19.14

*1 : Default values vary depending on the capacity. See the table of K-15.

- Output parameters

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F669	0669	Logic output/pulse train output selection (OUT-NO)	-	-	0: Logic output 1: Pulse train output	0		6.20.1
F676	0676	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/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%)	0		6.20.1
F677	0677	Maximum numbers of pulse train	pps	1/1	500-1600	800		6.20.1
F691	0691	Inclination characteristic of analog output	-	-	0: Negative inclination (downward slope) 1: Positive inclination (upward slope)	1		6.20.2
F692	0692	Meter bias	%	1/1	0 – 100	0		6.20.2

- Operation panel parameters

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F700	0700	Prohibition of change of parameter settings	-	-	0: Permitted 1: Prohibited	0		6.21.1
F701	0701	Unit selection	-	-	0: % 1: A (ampere)/V (volt)	0		6.21.2
F702	0702	Free unit selection	Times	0.01/0.01	0.00: Free unit display disabled (display of frequency) 0.01-200.0	0.00		6.21.3
F705	0705	Inclination characteristic of free unit display	-	-	0: Negative inclination (downward slope) 1: Positive inclination (upward slope)	1		
F706	0706	Free unit display bias	Hz	0.01/0.01	0.00-FH	0.00		
F707	0707	Free step 1 (pressing a panel key once)	Hz	0.01/0.01	0.00: Disabled 0.01-FH	0.00		6.21.4
F708	0708	Free step 2 (panel display)	-	1/1	0: Disabled 1-255	0		

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F710	0710	Standard monitor display selection	-	-	0: Operation frequency (Hz/free unit) 1: Frequency command (Hz/free unit) 2: Output current (%/A) 3: Inverter rated current (A) 4: Inverter load factor (%) 5: Output power (%) 6: Frequency command after PID control (Hz/free unit) 7: Optional item specified from an external control unit	0		6.21.5
F719	0719	Canceling of operation command when standby terminal (ST) is turned off	-	-	0: Operation command canceled (cleared) 1: Operation command retained	1		6.21.6
F721	0721	Panel stop pattern	-	-	0: Slowdown stop 1: Coast stop	0		6.21.7
F730	0730	Prohibition of frequency setting on the operation panel (FC)	-	-	0: Permitted 1: Prohibited	0		6.21.1
F733	0733	Panel operation prohibition (RUN/STOP keys)	-	-	0: Permitted 1: Prohibited	0		
F734	0734	Prohibition of panel emergency stop operation	-	-	0: Permitted 1: Prohibited	0		
F735	0735	Prohibition of panel reset operation	-	-	0: Permitted 1: Prohibited	0		
F736	0736	Prohibition of change of CMOd / FMOd during operation	-	-	0: Permitted 1: Prohibited	1		

- Communication parameters

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F800	0800	Communication rate	-	-	0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps	3		6.22
F801	0801	Parity	-	-	0: NON (No parity) 1: EVEN (Even parity) 2: ODD (Odd parity)	1		
F802	0802	Inverter number	-	1/1	0-255	0		
F803	0803	Communication error trip time	s	1/1	0: (disabled) 1-100	0		
F805	0805	Communication waiting time	s	0.01/0.01	0.00-2.00	0.00		
F806	0806	Setting of master and slave for communication between inverters	-	-	0: Slave (0 Hz command issued in case the master inverter fails) 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		

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F811	0811	Communication command point 1 setting	%	1/1	0-100	0		6.5.2 6.22.1
F812	0812	Communication command point 1 frequency	Hz	0.1/0.01	0.0-500.0	0.0		
F813	0813	Communication command point 2 setting	%	1/1	0-100	100		
F814	0814	Communication command point 2 frequency	Hz	0.1/0.01	0.0-500.0	50.0 (WP) 60.0 (WN, AN)		
F829	0829	Selection of communication protocol	-	-	0: Toshiba inverter protocol 1: Modbus RTU protocol	0		6.22
F870	0870	Block write data 1	-	-	0: No selection 1: Command information 1 2: Command information 2 3: Frequency command 4: Output data on the terminal board 5: Analog output for communications	0		
F871	0871	Block write data 2	-	-		0		
F875	0875	Block read data 1	-	-	0: No selection 1: Status information 2: Output frequency 3: Output current 4: Output voltage 5: Alarm information 6: PID feedback value 7: Input terminal board monitor 8: Output terminal board monitor 9: VIA terminal board monitor 10: VIB terminal board monitor	0		
F876	0876	Block read data 2	-	-		0		
F877	0877	Block read data 3	-	-		0		
F878	0878	Block read data 4	-	-		0		
F879	0879	Block read data 5	-	-		0		
F880	0880	Free notes	-	1/1	0-65535	0		
F890	0890	Parameter for option 1	-	1/1	0-65535	0		6.23
F891	0891	Parameter for option 2	-	1/1	0-65535	0		
F892	0892	Parameter for option 3	-	1/1	0-65535	0		6.23
F893	0893	Parameter for option 4	-	1/1	0-65535	0		
F894	0894	Parameter for option 5	-	1/1	0-65535	0		

- PM motor parameters

Title	Communication No.	Function	Unit	Minimum setting unit Panel/Communication	Adjustment range	Default setting	User setting	Reference
F910	0910	Step-out detection current level	% (A)	1/1	10-150	100		6.24
F911	0911	Step-out detection time	s	1/1	0.0: No detection 0.1-25.0	0.0		
F912	0912	High-speed torque adjustment coefficient	-	0.01/0.01	0.00-650.0	0.00		

■ Default settings by inverter rating

Inverter type	Torque boost value 1/2	Dynamic braking resistance	Dynamic braking resistor capacity	Automatic torque boost value	Motor rated current	Motor no-load current	Motor adjustment coefficient	Over-voltage stall protection level
	ub/F172 (%)	F308 (Ω)(Note)	F309 (kW)	F402 (%)	F415 (A)	F416 (%)	F494	F626 (%)
VFS11S-2002PL	6.0	200.0	0.12	8.3	1.2	70	90	134
VFS11S-2004PL	6.0	200.0	0.12	6.2	2.0	65	90	134
VFS11S-2007PL	6.0	200.0	0.12	5.8	3.4	60	80	134
VFS11S-2015PL	6.0	75.0	0.12	4.3	6.2	55	70	134
VFS11S-2022PL	5.0	75.0	0.12	4.1	8.9	52	70	134
VFS11-2002PM	6.0	200.0	0.12	8.3	1.2	70	90	134
VFS11-2004PM	6.0	200.0	0.12	6.2	2.0	65	90	134
VFS11-2005PM	6.0	200.0	0.12	6.0	2.7	62	80	134
VFS11-2007PM	6.0	200.0	0.12	5.8	3.4	60	80	134
VFS11-2015PM	6.0	75.0	0.12	4.3	6.2	55	70	134
VFS11-2022PM	5.0	75.0	0.12	4.1	8.9	52	70	134
VFS11-2037PM	5.0	40.0	0.12	3.4	14.8	48	70	134
VFS11-2055PM	4.0	20.0	0.24	3.0	21.0	46	70	134
VFS11-2075PM	3.0	15.0	0.44	2.5	28.2	43	70	134
VFS11-2110PM	2.0	10.0	0.66	2.3	40.6	41	60	134
VFS11-2150PM	2.0	7.5	0.88	2.0	54.6	38	50	134
VFS11-4004PL	6.0	200.0	0.12	6.2	1.0	65	90	140
VFS11-4007PL	6.0	200.0	0.12	5.8	1.7	60	80	140
VFS11-4015PL	6.0	200.0	0.12	4.3	3.1	55	70	140
VFS11-4022PL	5.0	200.0	0.12	4.1	4.5	52	70	140
VFS11-4037PL	5.0	160.0	0.12	3.4	7.4	48	70	140
VFS11-4055PL	4.0	80.0	0.24	2.6	10.5	46	70	140
VFS11-4075PL	3.0	60.0	0.44	2.3	14.1	43	70	140
VFS11-4110PL	2.0	40.0	0.66	2.2	20.3	41	60	140
VFS11-4150PL	2.0	30.0	0.88	1.9	27.3	38	50	140
VFS11-6007P	3.0	285.0	0.06	3.8	1.1	61	80	134
VFS11-6015P	3.0	145.0	0.12	3.8	2.1	59	70	134
VFS11-6022P	3.0	95.0	0.18	3.2	3.0	54	70	134
VFS11-6037P	3.0	48.0	0.37	3.5	4.9	50	70	134
VFS11-6055P	2.0	29.0	0.61	2.0	7.3	55	70	134
VFS11-6075P	2.0	29.0	0.61	1.5	9.5	51	70	134
VFS11-6110P	2.0	19.0	0.92	1.9	14.5	55	60	134
VFS11-6150P	1.0	14.0	1.23	1.7	19.3	53	50	134

Note: Be sure to set F308 (Dynamic braking resistance) at the resistance of the dynamic braking resistor connected.

12.2.5

■ Table of input terminal functions 1

Function No.	Code	Function	Action
0	-	No function is assigned	Disabled
1	ST	Standby terminal	ON: Ready for operation OFF: Coast stop (gate off)
2	F	Forward run command	ON: Forward run OFF: Slowdown stop
3	R	Reverse run command	ON: Reverse run OFF: Slowdown stop
4	JOG	Jog run mode	ON: Jog run, OFF: Jog run canceled
5	AD2	Acceleration/deceleration 2 pattern selection	ON: Acceleration/deceleration 2 OFF: Acceleration/deceleration 1 or 3
6	SS1	Preset-speed command 1	Selection of 15-speed with SS1 to SS4 (4 bits)
7	SS2	Preset-speed command 2	
8	SS3	Preset-speed command 3	
9	SS4	Preset-speed command 4	
10	RES	Reset command	ON: Acceptance of reset command ON → OFF: Trip reset
11	EXT	Trip stop command from external input device	ON: E Trip stop
12	CFMOD	Switching of command mode and frequency setting mode	ON: Forced switching from command mode to terminal input mode, forced switching from frequency setting mode to the mode commanded between FMOd and F207. (If F200 = 0)
13	DB	DC braking command	ON: DC braking
14	PID	PID control prohibited	ON: PID control prohibited OFF: PID control permitted
15	PWENE	Permission of parameter editing	ON: Parameter editing permitted OFF: Parameter editing prohibited (If F700 = 1)
16	ST+RES	Combination of standby and reset commands	ON: Simultaneous input from ST and RES
17	ST+CFMOD	Combination of standby and command/frequency setting mode switching	ON: Simultaneous input from ST and CFMOD
18	F+JOG	Combination of forward run and jog run	ON: Simultaneous input from F and JOG
19	R+JOG	Combination of reverse run and jog run	ON: Simultaneous input from R and JOG
20	F+AD2	Combination of forward run and acceleration/deceleration 2	ON: Simultaneous input from F and AD2
21	R+AD2	Combination of reverse run and acceleration/deceleration 2	ON: Simultaneous input from R and AD2
22	F+SS1	Combination of forward run and preset-speed command 1	ON: Simultaneous input from F and SS1
23	R+SS1	Combination of reverse run and preset-speed command 1	ON: Simultaneous input from R and SS1
24	F+SS2	Combination of forward run and preset-speed command 2	ON: Simultaneous input from F and SS2
25	R+SS2	Combination of reverse run and preset-speed command 2	ON: Simultaneous input from R and SS2
26	F+SS3	Combination of forward run and preset-speed command 3	ON: Simultaneous input from F and SS3
27	R+SS3	Combination of reverse run and preset-speed command 3	ON: Simultaneous input from R and SS3
28	F+SS4	Combination of forward run and preset-speed command 4	ON: Simultaneous input from F and SS4
29	R+SS4	Combination of reverse run and preset-speed command 4	ON: Simultaneous input from R and SS4
30	F+SS1+AD2	Combination of forward run, preset-speed command 1 and acceleration/deceleration 2	ON: Simultaneous input from F, SS1 and AD2
31	R+SS1+AD2	Combination of reverse run, preset-speed command 1 and acceleration/deceleration 2	ON: Simultaneous input from R, SS1 and AD2
32	F+SS2+AD2	Combination of forward run, preset-speed command 2 and acceleration/deceleration 2	ON: Simultaneous input from F, SS2 and AD2
33	R+SS2+AD2	Combination of reverse run, preset-speed command 2 and acceleration/deceleration 2	ON: Simultaneous input from R, SS2 and AD2

■ Table of input terminal functions 2

Function No.	Code	Function	Action
34	F+SS3+AD2	Combination of forward run, preset-speed command 3 and acceleration/deceleration 2	ON: Simultaneous input from F, SS3 and AD2
35	R+SS3+AD2	Combination of reverse run, preset-speed command 3 and acceleration/deceleration 2	ON: Simultaneous input from R, SS3 and AD2
36	F+SS4+AD2	Combination of forward run, preset-speed command 4 and acceleration/deceleration 2	ON: Simultaneous input from F, SS4 and AD2
37	R+SS4+AD2	Combination of reverse run, preset-speed command 4 and acceleration/deceleration 2	ON: Simultaneous input from R, SS4 and AD2
38	FCHG	Frequency command forced switching	ON: F207 (If F200 = 0) OFF: FMOd
39	VF2	No.2 Switching of V/F setting	ON: No.2 V/F setting (Pt = 0, F170, F171, F172, F173) OFF: No.1 V/F setting (Set value of Pt, vL, vLv, vb, tHr)
40	MOT2	No.2 motor switching (VF2 + AD2 + OCS2)	ON: No.2 motor (Pt = 0, F170, F171, F172, F173, F185, F500, F501, F503) OFF: No.1 motor (Set value of Pt, vL, vLv, vb, tHr, ACC, dEC, F502, F601)
41	UP	Frequency UP signal input from external contacts	ON: Increase in frequency
42	DOWN	Frequency DOWN signal input from external contacts	ON: Reduction in frequency
43	CLR	Frequency UP/DOWN cancellation signal input from external contacts	OFF→ON: Resetting of UP/DOWN frequency by means of external contacts
44	CLR+RES	Combination of frequency UP/DOWN cancellation and reset by means of external contacts	ON: Simultaneous input from CLR and RES
45	EXTN	Inversion of trip stop command from external device	OFF: E Trip stop
46	OH	Thermal trip stop signal input from external device	ON: OH2 Trip stop
47	OHN	Inversion of thermal trip stop command from external device	OFF: OH2 Trip stop
48	SC/LC	Forced switching from remote to local control	Enabled when remote control is exercised ON: Local control (setting of CMOd, FMOd and F207) OFF: Remote control
49	HD	Operation holding (stop of 3-wire operation)	ON: F (forward run)/R: (reverse run) held, 3-wire operation OFF: Slowdown stop
50	CMTP	Forced switching of command mode and terminal board command	ON: Terminal board operation OFF: Setting of CMOd
51	CKWH	Display cancellation of the cumulative power amount (kWh)	ON: Monitor display cancellation of the cumulative power amount (kWh)
52	FORCE	Forced operation (factory configuration required)	ON: Forced operation mode in which operation is not stopped in the event of the occurrence of a soft fault (preset speed operation frequency 15) To use this function, the inverter needs to be so configured at the factory. OFF: Normal operation
53	FIRE	Fire-speed control	ON: Fire-speed operation (preset speed operation frequency 15) OFF: Normal operation

Note. When function 1, 10-12, 15-17, 38, 41-45 or 48 is assigned to an input terminal board, the input terminal board is enabled even if the parameter command mode selection CMOd is set at 1 (panel).

■ Table of input terminal functions 3

Function No.	Code	Function	Action
54	STN	Coast stop (gate off)	ON: Coast stop (gate off)
55	RESN	Inversion of RES	ON: Acceptance of reset command OFF→ ON: Trip reset
56	F+ST	Combination of forward run and standby	ON: Simultaneous input from F and ST
57	R+ST	Combination of reverse run and standby	ON: Simultaneous input from R and ST
58	AD3	Acceleration/deceleration 3 selection	ON: Acceleration/deceleration 3 OFF: Acceleration/deceleration 1 or 2
59	F+AD3	Combination of forward run and acceleration/deceleration 3	ON: Simultaneous input from F and AD3
60	R+AD3	Combination of reverse run and acceleration/deceleration 3	ON: Simultaneous input from R and AD3
61	OCS2	Forced switching of stall prevention level 2	ON: Enabled at the value of F185 OFF: Enabled at the value of F601
62	HDRY	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.
64	PRUN	Cancellation (clearing) of operation command from panel	0: Operation command canceled (cleared) 1: Operation command retained
65	ICLR	PID control integral value clear	ON: PID control integral value always zero OFF: PID control permitted

■ Table of output terminal functions 1

Function No.	Code	Function	Action
0	LL	Frequency lower limit	ON: The output frequency is above the LL set value. OFF: The output frequency is equal to or less than the LL set value.
1	LLN	Inversion of frequency lower limit	Inversion of LL setting
2	UL	Frequency upper limit	ON: Output frequency is equal to or higher than UL value. OFF: Output frequency is lower than UL value.
3	ULN	Inversion of frequency upper limit	Inversion of UL setting
4	LOW	Low-speed detection signal	ON: Output frequency is equal to or higher than F100 value. OFF: Output frequency is lower than F100 value.
5	LOWN	Inversion of low-speed detection signal	Inversion of LOW setting
6	RCH	Designated frequency attainment signal (completion of acceleration/deceleration)	ON: The output frequency is equal to or less than the specified frequency ± frequency set with F102. OFF: The output frequency is above the specified frequency ± frequency set with F102.
7	RCHN	Inversion of designated frequency attainment signal (inversion of completion of acceleration/deceleration)	Inversion of RCH setting
8	RCHF	Set frequency attainment signal	ON: The output frequency is equal to or less than the frequency set with F101 ± F102. OFF: The output frequency is above the frequency set with F101 ± F102.
9	RCHFN	Inversion of set frequency attainment signal	Inversion of RCHF setting
10	FL	Failure signal (trip output)	ON: When inverter is tripped OFF: When inverter is not tripped
11	FLN	Inversion of failure signal (inversion of trip output)	Inversion of FL setting

■ Table of output terminal functions 2

Function No.	Code	Function	Action
12	OT	Over-torque detection	ON: Torque current is equal to or larger than F615 set value and longer than F618 set time. OFF: The torque current is equal to or less than (F615 set value - F619 set value).
13	OTN	Inversion of over-torque detection	Inversion of OT
14	RUN	Start/Stop	ON: When operation frequency is output or during (db) OFF: Operation stopped
15	RUNN	Inversion of RUN/STOP	Inversion of RUN setting
16	POL	OL pre-alarm	ON: 50% or more of calculated value of overload protection level OFF: Less than 50% of calculated value of overload protection level
17	POLN	Inversion of OL pre-alarm	Inversion of POL setting
18	POHR	Braking resistor overload pre-alarm	ON: 50% or more of calculated value of F308 set overload protection level OFF: Less than 50% of calculated value of F308 set overload protection level
19	POHRN	Inversion of braking resistor overload pre-alarm	Inversion of RCHR setting
20	POT	Over-torque detection pre-alarm	ON: Torque current is equal to or larger than 70% of F615 set value. OFF: The torque current is below (F615 set value x 70% - F619 set value)
21	POTN	Inversion of over-torque detection pre-alarm	Inversion of POT setting
22	PAL	Pre-alarm	One of the following is turned on: ON POL, POHR, POT, MOFF, UC, OT, LL stop, COT, and momentary power failure slowdown stop. or C. P. Or H issues an alarm All the following are turned off: OFF POL, POHR, POT, MOFF, UC, OT, LL stop, COT, and momentary power failure slowdown stop. or C. P. Or H issues no alarm
23	PALN	Inversion of pre-alarm	Inversion of PAL setting
24	UC	Small-current detection	ON: The output current is equal to or less than F611 set value for F612 set time. OFF: The output current is equal to or larger than F611 set value + 10%.
25	UCN	Inversion of small-current detection	Inversion of UC setting
26	HFL	Significant failure	ON: OCA. OCL. Ot. E. EEP1. Etn. EPH0. Err2. S. OH2. UP1. EF2. UC. EtYP. Or EPH1) OFF: Failure other than the above
27	HFLN	Inversion of significant failure	Inversion of HFL setting
28	LFL	Insignificant failure	ON: (OC1-3. OP1-3. OH. OL1-2. OLr) OFF: Failure other than the above
29	LFLN	Inversion of insignificant failure	Inversion of LFL setting
30	RDY1	Ready for operation (including ST/RUN)	ON: Ready for operation (ST and RUN are also ON) OFF: Others
31	RDY1N	Inversion of ready for operation (including ST/RUN)	Inversion of RDY1 setting
32	RDY2	Ready for operation (excluding ST/RUN)	ON: Ready for operation (ST and RUN are not ON) OFF: Others
33	RDY2N	Inversion of ready for operation (excluding ST/RUN)	Inversion of RDY2
34	FCVIB	Frequency VIB selection	ON: VIB selected as frequency command OFF: Terminal other than VIB selected as frequency command

■ Table of output terminal functions 3

Function No.	Code	Function	Action
35	FCVIBN	Inversion of frequency VIB selection	Inversion of FCVIB
36	FLR	Fault signal (put out also at the time of a retry)	ON: When inverter trips or retries OFF: When inverter does not trip or retry
37	FLRN	Inversion of failure signal (put out also at the time of a retry)	Inversion of FLR
38	OUT0	Specified data output 1	ON: Specified data from remote control FA50: BIT0= 1 OFF: Specified data from remote control FA50: BIT0= 0
39	OUT0N	Inversion of specified data output 1	Inversion of OUT0 setting
40	OUT1	Specified data output 2	ON: Specified data from remote control FA50: BIT1= 1 OFF: Specified data from remote control FA50: BIT1= 0
41	OUT1N	Inversion of specified data output 2	Inversion of OUT1 setting
42	COT	Cumulative operation time alarm	ON: Cumulative operation time is equal to or longer than F621 OFF: Cumulative operation time is shorter than F621
43	COTN	Inversion of cumulative operation time alarm	Inversion of COT
44	LTA	Parts replacement alarm	ON: Calculation for parts replacement time is equal to or longer than the preset time ON: Calculation for parts replancement time is shorter than the preset time
45	LTAN	Inversion of replacement alarm	Inversion of LTA
46	BR	Braking sequence output	ON: Braking retention signal OFF: Braking release signal
47	BRN	Inversion of braking sequence output	Inversion of BR
48	LI1	F terminal input signal	ON: The signal input to F terminal is ON OFF: The signal input to F terminal is OFF
49	LI1N	Inversion of F terminal input signal	Inversion of LI1
50	LI2	R terminal input signal	ON: The signal input to R terminal is ON OFF: The signal input to R terminal is OFF
51	LI2N	Inversion of R terminal input signal	Inversion of LI2
52	PIDF	Signal in accordance of frequency command	ON: Frequency commanded by Fn0d or F207 and that by VIA show the same value. OFF: Frequency commanded by Fn0d or F207 and that by VIA show different values.
53	PIDFN	Inversion of signal in accordance of frequency command	Inversion of PIDF setting
54	MOFF	Undervoltage detection	ON: Undervoltage detected OFF: Other than undervoltage
55	MOFFN	Inversion of undervoltage detection	Inversion of MOFF
56-253	Disabled	Invalid settings, always OFF (ignored)	Invalid settings, always OFF (ignored)
254	AOFF	Always OFF	Always OFF
255	AON	Always ON	Always ON

■ Order of precedence of combined functions

XX: Impossible combination, X: Invalid, + : Valid under some conditions, O: Valid, @: Priority

Function No. / Function		1	2	3	4	5/58	6/9	10	11	50	13	14	15	46	48	41/42	43	49	38	39	40	52	53
1	Standby		@	@	@	@	@	O	O	O	@	O	O	O	O	O	O	@	O	O	O	O	X
2	Forward run command	+		X	+	O	O	O	X	O	X	O	O	X	O	O	O	O	O	O	O	O	X
3	Reverse run command	+	@		+	O	O	O	X	O	X	O	O	X	O	O	O	O	O	O	O	O	X
4	Jug run command	+	+	+		@	÷	O	X	O	X	@	O	X	O	O	O	XX	O	O	O	O	X
5/58	Acceleration/deceleration 2 or 3 selection	+	O	O	X		O	O	X	O	X	O	O	X	O	O	O	O	O	O	X	O	O
6~9	Preset-speed run commands 1 to 4	+	O	O	X	O		O	X	O	X	O	O	X	O	O	O	O	O	O	O	O	X
10	Reset command	O	O	O	O	O	O		X	O	O	O	O	X	O	O	O	O	O	O	O	O	O
11	Trip stop command from external input device	+	@	@	@	@	@	@		O	@	@	O	X	O	@	O	@	O	O	O	@	@
50	Forced switching of command mode and	O	O	O	O	O	O	O	O		O	O	O	O	O	O	O	O	O	O	O	O	O
13	DC braking command	+	@	@	@	@	@	O	X	O		@	O	X	O	@	O	@	O	O	O	O	X
14	PID control prohibited	O	O	O	X	O	O	O	X	O	X		O	X	O	O	O	O	O	O	O	O	X
15	Permission of parameter editing	O	O	O	O	O	O	O	O	O	O	O		O	O	O	O	O	O	O	O	O	O
46	Thermal trip stop command from external	O	@	@	@	@	@	@	@	O	@	@	O		O	@	O	@	O	O	O	X	O
48	Remote/local control forced switching	O	O	O	O	O	O	O	O	O	O	O	O	O		O	O	O	O	O	O	O	O
41/42	Frequency UP/DOWN signal input from	O	O	O	O	O	O	O	X	O	X	O	O	X	O		O	O	O	O	O	O	X
43	Clearing of UP/DOWN frequency with external	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O		O	O	O	O	O	X
49	Operation holding (cancellation of 3-wire	+	O	O	XX	O	O	O	X	O	X	O	O	X	O	O	O		O	O	O	O	X
38	Frequency commands forced switching	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O		O	O	O	X
39	No.2 Switching of V/F setting	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O		X	O	O
40	No.2 motor switching	O	O	O	O	@	O	O	O	O	O	O	O	O	O	O	O	O	O	@		O	O
52	Forced operation	O	O	O	O	O	O	O	X	O	O	O	O	@	O	O	O	O	O	O	O		O
53	Fire-speed control	@	@	@	@	O	@	O	X	O	@	@	O	O	O	@	@	@	@	O	O	O	

* For the functions of combined terminals (combined functions), refer to the table of their respective functions.

12. Specifications

12.1 Models and their standard specifications

■ Standard specifications

Item		Specification									
Input voltage		3-phase 240V									
Applicable motor (kW)		0.2	0.4	0.55	0.75	1.5	2.2	4.0	5.5	7.5	11	15
Rating	Type	VFS11										
	Form	2002PM	2004PM	2005PM	2007PM	2015PM	2022PM	2037PM	2055PM	2075PM	2110PM	2150PM
	Capacity (kVA) Note 1)	0.6	1.3	1.4	1.8	3.0	4.2	6.7	10	13	21	25
	Rated output/current (A) Note 2)	1.5 (1.5)	3.3 (3.3)	3.7 (3.3)	4.8 (4.4)	8.0 (7.9)	11.0 (10.0)	17.5 (16.4)	27.5 (25.0)	33 (33)	54 (49)	66 (60)
	Output voltage Note 3)	3-phase 200V to 240V										
	Overload current rating	150%-60 seconds, 200%-0.5 second										
Power supply	Voltage-frequency	3-phase 200V to 240V - 50/60Hz										
	Allowable fluctuation	Voltage + 10%, -15% Note 4), frequency ±5%										
Protective method		IP20 Enclosed type (JEM1030)										
Cooling method		Self-cooling				Forced air-cooled						
Color		Munsel 5Y-8/0.5										
Built-in filter		Basic filter										

Item		Specification													
Input voltage		1-phase 240V					3-phase 500V								
Applicable motor (kW)		0.2	0.4	0.75	1.5	2.2	0.4	0.75	1.5	2.2	4.0	5.5	7.5	11	15
Rating	Type	VFS11S					VFS11								
	Form	2002PL	2004PL	2007PL	2015PL	2022PL	4004PL	4007PL	4015PL	4022PL	4037PL	4055PL	4075PL	4110PL	4150PL
	Capacity (kVA) Note 1)	0.6	1.3	1.8	3.0	4.2	1.1	1.8	3.1	4.2	7.2	11	13	21	25
	Rated output current (A) Note 2)	1.5 (1.5)	3.3 (3.3)	4.8 (4.4)	8.0 (7.9)	11.0 (10.0)	1.5 (1.5)	2.3 (2.1)	4.1 (3.7)	5.5 (5.0)	9.5 (8.6)	14.3 (13.0)	17.0 (17.0)	27.7 (25.0)	33 (30)
	Rated output voltage Note 3)	3-phase 200V to 240V					3-phase 380V to 500V								
	Overload current rating	150%-60 seconds, 200%-0.5 second					150%-60 seconds, 200% -0.5 second								
Power supply	Voltage-current	1-phase 200V to 240V – 50/60Hz					3-phase 380V to 500V - 50/60Hz								
	Allowable fluctuation	Voltage + 10%, -15% Note 4), frequency±5%					Voltage + 10%, -15% Note 4), frequency ±5%								
Protective method		IP20 Enclosed type (JEM1030)					IP20 Enclosed type (JEM1030)								
Cooling method		Self-cooling			Forced air-cooled		Forced air-cooled								
Color		Munsel 5Y-8/0.5					Munsel 5Y-8/0.5								
Built-in filter		EMI filter					EMI filter								

Item		Specification							
Input voltage		3-phase 600V							
Applicable motor (kW)		0.75	1.5	2.2	4.0	5.5	7.5	11	15
Rating	Type	VFS11-							
	Form	6007P	6015P	6022P	6037P	6055P	6075P	6110P	6150P
	Capacity (kVA) Note 1)	1.7	2.7	3.9	6.1	9	11	17	22
	Rated output/current (A) Note 2)	1.7 (1.5)	2.7 (2.4)	3.9 (3.5)	6.1 (5.5)	9.0 (8.1)	11.0 (9.9)	17.0 (15.3)	22.0 (19.8)
	Output voltage Note 3)	3-phase 525V to 600V							
	Overload current rating	150%-60 seconds, 200%-0.5 second							
Power supply	Voltage-frequency	3-phase 525V to 600V - 50/60Hz							
	Allowable fluctuation	Voltage + 10%, -15% Note 4), frequency ±5%							
Protective method		IP20 Enclosed type (JEM1030)							
Cooling method		Forced air-cooled							
Color		Munsel 5Y-8/0.5							
Built-in filter		No filter							

Note 1. Capacity is calculated at 220V for the 240V models, at 440V for the 500V models and at 575V for the 600V models.
Note 2. Indicates rated output current setting when the PWM carrier frequency (parameter F300) is 4kHz or less. When exceeding 4kHz, the rated output current setting is indicated in the parentheses. It needs to be further reduced for PWM carrier frequencies above 12 kHz.
The rated output current is reduced even further for 500V models with a supply voltage of 480V or more.
The default setting of the PWM carrier frequency is 12kHz.
Note 3. Maximum output voltage is the same as the input voltage.
Note 4. ±10% when the inverter is used continuously (load of 100%).
Note 5. If you are using 600V model, be sure to connect an input reactor (ACL).

■ Common specification

Item		Specification
Principal control functions	Control system	Sinusoidal PWM control
	Rated output voltage	Adjustable within the range of 50 to 600V by correcting the supply voltage (not adjustable above the input voltage)
	Output frequency range	0.5 to 500.0Hz, default setting: 0.5 to 80Hz, maximum frequency: 30 to 500Hz
	Minimum setting steps of frequency	0.1Hz: analog input (when the max. frequency is 100Hz), 0.01Hz: Operation panel setting and communication setting
	Frequency accuracy	Digital setting: within ±0.01% of the max. frequency (-10 to +60°C) Analog setting: within ±0.5% of the max. frequency (25°C ±10°C)
	Voltage/frequency characteristics	V/f constant, variable torque, automatic torque boost, vector control, automatic energy-saving, dynamic automatic energy-saving control, PM motor control. Auto-tuning. Base frequency (25 - 500Hz) adjusting to 1 or 2, torque boost (0 - 30%) adjusting to 1 or 2, adjusting frequency at start (0.5 - 10Hz)
	Frequency setting signal	Potentiometer on the front panel, external frequency potentiometer (connectable to a potentiometer with a rated impedance of 1 - 10kΩ), 0 - 10Vdc (input impedance: VIA/VIB=30kΩ, 4 - 20mAdc (Input impedance: 250Ω).
	Terminal board base frequency	The characteristic can be set arbitrarily by two-point setting. Possible to set individually for three functions: analog input (VIA and VIB) and communication command.
	Frequency jump	Three frequencies can be set. Setting of the jump frequency and the range.
	Upper- and lower-limit frequencies	Upper-limit frequency: 0 to max. frequency, lower-limit frequency: 0 to upper-limit frequency
	PWM carrier frequency	Adjustable within a range of 2.0 to 16.0Hz (default: 12kHz).
	PID control	Setting of proportional gain, integral gain, differential gain and control wait time. Checking whether the amount of processing amount and the amount of feedback agree.
Operation specifications	Acceleration/deceleration time	Selectable from among acceleration/deceleration times 1, 2 and 3 (0.0 to 3200 sec.). Automatic acceleration/deceleration function. S-pattern acceleration/deceleration 1 and 2 and S-pattern adjustable. Control of forced rapid deceleration and dynamic rapid deceleration
	DC braking	Braking start-up frequency: 0 to maximum frequency, braking rate: 0 to 100%, braking time: 0 to 20 seconds, emergency DC braking, motor shaft fixing control
	Dynamic braking	Control and drive circuit is built in the inverter with the braking resistor outside (optional).
	Input terminal function (programmable)	Possible to select from among 66 functions, such as forward/reverse run signal input, jog run signal input, operation base signal input and reset signal input, to assign to 8 input terminals. Logic selectable between sink and source.
	Output terminal functions (programmable)	Possible to select from among 58 functions, such as upper/lower limit frequency signal output, low speed detection signal output, specified speed reach signal output and failure signal output, to assign to FL relay output, open collector output and RY output terminals.
	Forward/reverse run	The RUN and STOP keys on the operation panel are used to start and stop operation, respectively. The switching between forward run and reverse run can be done from one of the three control units: operation panel, terminal board and external control unit.
	Jog run	Jog mode, if selected, allows jog operation from the operation panel or the terminal board.
	Preset speed operation	Base frequency + 15-speed operation possible by changing the combination of 4 contacts on the terminal board.
	Retry operation	Capable of restarting automatically after a check of the main circuit elements in case the protective function is activated. 10 times (Max.) (selectable with a parameter)
	Various prohibition settings	Possible to write-protect parameters and to prohibit the change of panel frequency settings and the use of operation panel for operation, emergency stop or resetting.
	Regenerative power ride-through control	Possible to keep the motor running using its regenerative energy in case of a momentary power failure (default: OFF).
	Auto-restart operation	In the event of a momentary power failure, the inverter reads the rotational speed of the coasting motor and outputs a frequency appropriate to the rotational speed in order to restart the motor smoothly. This function can also be used when switching to commercial power.
	Drooping function	When two or more inverters are used to operate a single load, this function prevents load from concentrating on one inverter due to unbalance.
	Override function	The sum of two analog signals (VIA/VIB) can be used as a frequency command value.
	Failure detection signal	1c-contact output (250Vac-0.5A-cosφ=0.4)

<Continued overleaf>

12.2.5

<Continued>

	Item	Specification
Protective function	Protective function	Stall prevention, current limitation, over-current, output short circuit, over-voltage, over-voltage limitation, undervoltage, ground fault, power supply phase failure, output phase failure, overload protection by electronic thermal function, armature over-current at start-up, load side over-current at start-up, over-torque, undercurrent, overheating, cumulative operation time, life alarm, emergency stop, braking resistor over-current/overload, various pre-alarms
	Electronic thermal characteristic	Switching between standard motor and constant-torque VF motor, switching between motors 1 and 2, setting of overload trip time, adjustment of stall prevention levels 1 and 2, selection of overload stall
	Reset function	Function of resetting by closing contact 1a or by turning off power or the operation panel. This function is also used to save and clear trip records.
Display function	Alarms	Stall prevention, overvoltage, overload, under-voltage, setting error, retry in process, upper/lower limits
	Causes of failures	Over-current, overvoltage, overheating, short-circuit in load, ground fault, overload on inverter, over-current through arm at start-up, over-current through load at start-up, CPU fault, EEPROM fault, RAM fault, ROM fault, communication error. (Selectable: Overload of braking resistor, emergency stop, under-voltage, low voltage, over-torque, motor overload, output open-phase)
	Monitoring function	Operation frequency, operation frequency command, forward/reverse run, output current, voltage in DC section, output voltage, torque, torque current, load factor of inverter, integral load factor of PBR, input power, output power, information on input terminals, information on output terminals, version of CPU1, version of CPU2, version of memory, PID feedback amount, frequency command (after PID), integral input power, integral output power, rated current, causes of past trips 1 through 4, parts replacement alarm, cumulative operation time
	Past trip monitoring function	Stores data on the past four trips: number of trips that occurred in succession, operation frequency, direction of rotation, load current, input voltage, output voltage, information on input terminals, information on output terminals, and cumulative operation time when each trip occurred.
	Output for frequency meter	Analog output: (1mAdc full-scale DC ammeter or 7.5Vdc full-scale DC ammeter / Rectifier-type AC voltmeter, 225% current Max. 1mAdc, 7.5Vdc full-scale), 4 to 20mA/0 to 20mA output
	4-digit 7-segments LED	Frequency: inverter output frequency. Alarm: stall alarm "C", overvoltage alarm "P", overload alarm "L", overheat alarm "H". Status: inverter status (frequency, cause of activation of protective function, input/output voltage, output current, etc.) and parameter settings. Free-unit display: arbitrary unit (e.g. rotating speed) corresponding to output frequency.
	Indicator	Lamps indicating the inverter status by lighting, such as RUN lamp, MON lamp, PRG lamp, % lamp, Hz lamp, frequency setting potentiometer lamp, UP/DOWN key lamp and RUN key lamp. The charge lamp indicates that the main circuit capacitors are electrically charged.
Environments	Use environments	Indoor, altitude: 1000m (Max.), not exposed to direct sunlight, corrosive gas, explosive gas or vibration (less than 5.9m/s^2) (10 to 55Hz)
	Ambient temperature	-10 to +60°C Note)1,2.
	Storage temperature	-20 to +65°C
	Relative humidity	20 to 93% (free from condensation and vapor).

Note 1. Above 40°C : Remove the protective seal from the top of VF-S11.
If the ambient temperature is above 50°C: Remove the seal from the top of the inverter and use the inverter with the rated output current reduced.

Note 2. If inverters are installed side by side (with no sufficient space left between them): Remove the seal from the top of each inverter.
When installing the inverter where the ambient temperature will rise above 40°C, remove the seal from the top of the inverter and use the inverter with the rated output current reduced.

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12.2 Outside dimensions and mass

■ Outside dimensions and mass

Voltage class	Applicable motor (kW)	Inverter type	Dimensions (mm) W	H	D	W1	H1	H2	D2	Drawing	Approx. weight (kg)
1-phase 240V	0.2	VFS11S-2002PL	72	130	130	60	121.5	15	8	A	1.0
	0.4	VFS11S-2004PL									1.0
	0.75	VFS11S-2007PL			140						1.2
	1.5	VFS11S-2015PL	105	130	150	93		13		B	1.4
	2.2	VFS11S-2022PL	140	170	150	126	157	14		C	2.2
3-phase 240V	0.2	VFS11-2002PM	72	130	120	60	121.5	15	8	A	0.9
	0.4	VFS11-2004PM									0.9
	0.55	VFS11-2005PM									1.1
	0.75	VFS11-2007PM			130						1.1
	1.5	VFS11-2015PM	105	130		93		13		B	1.2
	2.2	VFS11-2022PM			150						1.3
	4.0	VFS11-2037PM	140	170	150	126	157	14		C	2.2
	5.5	VFS11-2055PM	180	220	170	160	210	12		D	4.8
	7.5	VFS11-2075PM									4.9
	11	VFS11-2110PM	245	310	190	225	295	19.5		E	9.3
	15	VFS11-2150PM									9.6
3-phase 500V	0.4	VFS11-4004PL	105	130	150	93	121.5	13	8	B	1.4
	0.75	VFS11-4007PL									1.5
	1.5	VFS11-4015PL									1.5
	2.2	VFS11-4022PL	140	170	150	126	157	14		C	2.3
	4.0	VFS11-4037PL									2.5
	5.5	VFS11-4055PL	180	220	170	160	210	12		D	5.0
	7.5	VFS11-4075PL									5.1
	11	VFS11-4110PL	245	310	190	225	295	19.5		E	9.6
	15	VFS11-4150PL									9.6
3-phase 600V	0.75	VFS11-6007P	105	130	150	93	121.5	13	8	B	1.3
	1.5	VFS11-6015P									1.3
	2.2	VFS11-6022P	140	170	150	126	157	14		C	2.1
	4.0	VFS11-6037P									2.2
	5.5	VFS11-6055P	180	220	170	160	210	12		D	4.7
	7.5	VFS11-6075P									4.7
	11	VFS11-6110P	245	310	190	225	295	19.5		E	8.8
	15	VFS11-6150P									8.8

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■ Outline drawing

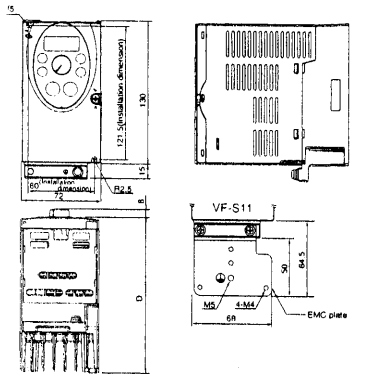


Fig.A

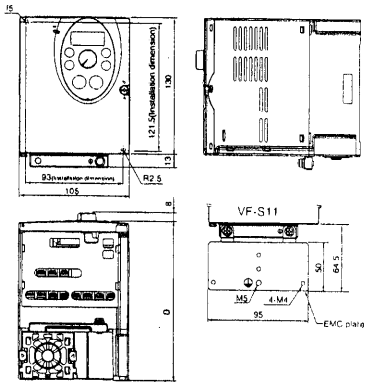


Fig.B

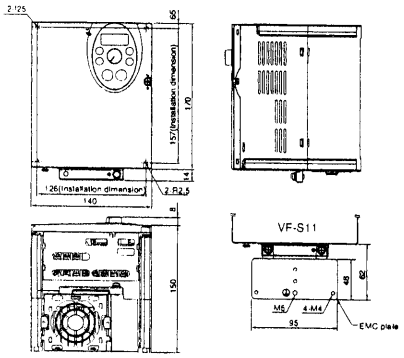


Fig.C

Note 1. To make it easier to grasp the dimensions of each inverter, dimensions common to all inverters in these figures are shown with numeric values but not with symbols.
Here are the meanings of the symbols used.

W: Width
H: Height
D: Depth
W1: Mounting dimension (horizontal)
H1: Mounting dimension (vertical)
H2: Height of EMC plate mounting area
D2: Depth of frequency setting knob

Note 2. Here are the avaiable EMC plate
Fig.A : EMP003Z (Approx. weight : 0.1kg)
Fig.B, Fig.C : EMP004Z (Approx. weight : 0.1kg)
Fig.D : EMP005Z (Approx. weight : 0.3kg)
Fig.E : EMP006Z (Approx. weight : 0.3kg)

Note 3. The models shown in Fig. A and Fig. B are fixed at two points: in the upper left and lower right corners.

Note 4. The model shown in Fig. A is not equipped with a cooling fan.

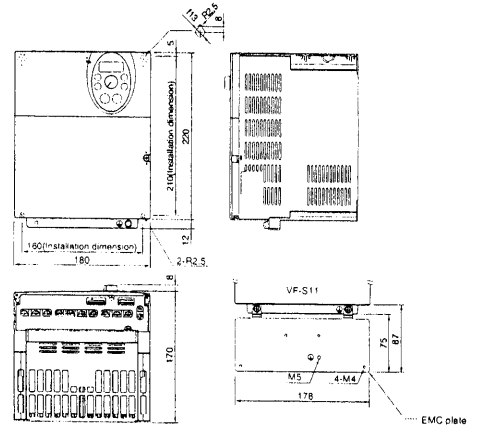


Fig.D

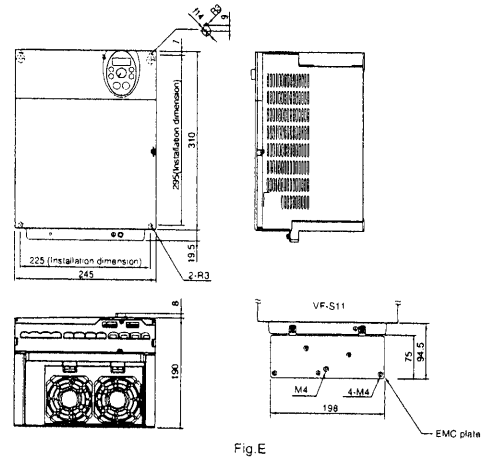


Fig.E

13. Before making a service call - Trip information and remedies

13.1 Trip causes/warnings and remedies

When a problem arises, diagnose it in accordance with the following table.
If it is found that replacement of parts is required or the problem cannot be solved by any remedy described in the table, contact your Toshiba dealer.

[Trip information]

Error code	Failure code	Problem	Possible causes	Remedies
OC 1 OC 1P	0001 0025	Overcurrent during acceleration Overcurrent flowing in element during acceleration	• The acceleration time ACC is too short. • The V/F setting is improper. • A restart signal is imput to the rotating motor after a momentary stop, etc. • A special motor (e.g. motor with a small impedance) is used.	• Increase the acceleration time ACC. • Check the V/F parameter. • Use F301 (auto-restart) and F302 (ride-through control). • Adjust the carrier frequency F300. • Set the carrier frequency control mode selection parameter F316 to 1 or 3 (carrier frequency decreased automatically).
OC2 OC2P	0002 0026	Overcurrent during deceleration Overcurrent flowing in element during decelearion	• The deceleration time dEC is too short.	• Increase the deceleration time dEC. • Set the carrier frequency control mode selection parameter F316 to 1 or 3 (carrier frequency decreased automatically).
OC3 OC3P	0003 0027	Overcurrent during constant speed operation Overcurrent flowing in element during operation	• The load fluctuates abruptly. • The load is in an abnormal condition.	• Reduce the load fluctuation. • Check the load (operated machine). • Set the carrier frequency control mode selection parameter F316 to 1 or 3 (carrier frequency decreased automatically).
OC 1P OC2P OC3P	0025 0026 0027	Ground fault trip Arm overcurrent at start-up (for 11 and 15 kW models only)	• A current leaked from an output cable or the motor to ground. • A main circuit elements is defective.	• Check cables, connectors, and so on for ground faults. • Make a service call.
OCL	0004	Overcurrent (An overcurrent on the load side at start-up)	• The insulation of the output main circuit or motor is defective. • The motor has too small impedance. • A 11 or 15 kW model was started, although a current is leaked from an output cable or the motor to ground.	• Check the cables and wires for defective insulation. • When using a 11 or 15 kW model, check cables, connectors, and so on for ground faults.
OCA	0005	Arm overcurrent at start-up	• A main circuit elements is defective.	• Make a service call.
* EPH1	0008	Input phase failure	• A phase failure occured in the input line of the main circuit. • The capacitor in the main circuit lacks capacitance.	• Check the main circuit input line for phase failure. • Enable F608 (input phase failure detection). • Check the capacitor in the main circuit for exhaustion.
* EPHO	0009	Output phase failure	• A phase failure occurred in the output line of the main circuit.	• Check the main circuit output line, motor, etc. for phase failure. • Enable F605 (Output phase failure detection).

* You can select a trip ON/OFF by parameters.

(Continued overleaf)

(Continued)

Error code	Failure code	Problem	Possible causes	Remedies
OP1	000A	Overvoltage during acceleration	• The imput voltage fluctuates abnormally. (1) The power supply has a capacity of 200kVA or more. (2) A power factor improvement capacitor is opened or closed. (3) A system using a thyrister is connected to the same power distribution line. • A restart signal is input to the rotating motor after a momentary stop, etc.	• Insert a suitable input reactor. • Use F301 (auto-restart) and F302 (ride-through control).
OP2	000B	Overvoltage during deceleration	• The deceleration time dEC is too short. (Regenerative energy is too large.) • F304 (dynamic braking resistor) is off. • F305 (overvoltage limit operation) is off. • The input voltage fluctuates abnormally. (1) The power supply has a capacity of 200kVA or more. (2) A power factor improvement capacitor is opened and closed. (3) A system using a thyrister is connected to the same power distribution line.	• Increase the deceleration time dEC. • Install a dynamic braking resistor. • Enable F304 (dynamic braking resistor). • Enable F305 (overvoltage limit operation). • Insert a suitable input reactor.
OP3	000C	Overvoltage during constant-speed operation	• The input voltage fluctuates abnormally. (1) The power supply has a capacity of 200kVA or more. (2) A power factor improvement capacitor is opened or closed. (3) A system using a thyrister is connected to the same power distribution line. • The motor is in a regenerative state because the load causes the motor to run at a frequency higher than the inverter output frequency.	• Insert a suitable input reactor. • Install a dynamic braking resistor.
OL 1	000D	Inverter overload	• The acceleration time ACC is too short. • The DC braking amout is too large. • The V/F setting is improper. • A restart signal is input to the rotating motor after a momentary stop, etc. • The load is too large.	• Increase the acceleration time ACC. • Reduce the DC braking amount F251 and the DC braking time F252. • Check the V/F parameter setting. • Use F301 (auto-restart) and F302 (ride-through control). • Use an inverter with a larger rating.
OL2	000E	Motor overload	• The V/F setting is improper. • The motor is locked up. • Low-speed operation is performed continuously. • An excessive load is applied to the motor during operation.	• Check the V/F parameter setting. • Check the load (operated machine). • Adjust OLN to the overload that the motor can withstand during operation in a low speed range.
OLr	000F	Dynamic braking resistor overload trip	• The deceleration time is too short. • Dynamic braking is too large.	• Increase the deceleration time dEC. • Increase the capacity of dynamic braking resistor (wattage) and adjust PBR capacity parameter F308.
* Ot	0020	Over-torque trip	• Over-torque reaches to a detection level during operation.	• Enable F615 (over-torque trip selection). • Check system error.
OH	0010	Overheat	• The cooling fan does not rotate. • The ambient temperature is too high. • The vent is blocked up. • A heat generating device is installed close to the inverter. • The thermistor in the unit is broken.	• Restart the operation by resetting the inverter after it has cooled down enough. • The fan requires replacement if it does not rotate during operation. • Secure sufficient space around the inverter. • Do not place any heat generating device near the inverter. • Make a service call.

* You can select a trip ON/OFF by parameters.

(Continued overleaf)

(Continued)

Error code	Failure code	Problem	Possible causes	Remedies
OH2	002E	External thermal trip	• An external thermal trip is input.	• Check the external thermal input.
E	0011	Emergency stop	• During automatic operation or remote operation, a stop command is entered from the operation panel or a remote input device.	• Reset the inverter.
EEP1	0012	EEPROM fault 1	• A data writing error occurs.	• Turn off the inverter, then turn it again. If it does not recover from the error, make a service call.
EEP2	0013	EEPROM fault 2	• Power supply is cut off during tYP operation and data writing is aborted.	• Turn the power off temporarily and turn it back on, and then try tYP operation again.
EEP3	0014	EEPROM fault 3	• A data reading error occurred.	• Turn off the inverter, then turn it again. If it does not recover from the error, make a service call.
Err2	0015	Main unit RAM fault	• The control RAM is defective.	• Make a service call.
Err3	0016	Main unit ROM fault	• The control ROM is defective.	• Make a service call.
Err4	0017	CPU fault 1	• The control CPU is defective.	• Make a service call.
Err5	0018	Remote control error	• An error arises during remote operation.	• Check the remote control device, cables, etc.
Err7	001A	Current detector fault	• The current detector is defective.	• Make a service call.
Err8	001B	Optional circuit board format error	• An optional circuit board in a different format is installed.	• Check again to be sure that the circuit board is connected correctly, and then reset the power supply. • Replace the circuit board with a correctly formatted one.
* UC	001D	Low-current operation Trip	• The output current decreased to a low-current detection level during operation.	• Enable F610 (low-current detection). • Check the suitable detection level for the system (F611, F612). • Make a service call if the setting is correct.
* UP1	001E	Undervoltage trip (main circuit)	• The input voltage (in the main circuit) is too low.	• Check the input voltage. • Enable F627 (undervoltage trip selection). • To cope with a momentary stop due to undervoltage, enable F302 (ride-through control) and F301 (auto-restart).
EF2	0022	Ground fault trip	• A ground fault occurs in the output cable or the motor.	• Check the cable and the motor for ground faults.
Etn1	0064	Auto-tuning error	• Check the motor parameter F401 to F494. • The motor with the capacity of 2 classes or less than the inverter is used. • The output cable is too thin. • The motor is rotating. • The inverter is used for loads other than those of three-phase induction motors.	
EtYP	0029	Inverter type error	• Circuit board is changed. (Or main circuit/drive circuit board)	• Make a service call.
* E-18	0032	Brea in analog signal cable	• The signal input via VIA is below the analog sinal detectio level set with F633.	• Check the cables for breaks. And check the setting of input signal or setting value of F633.
E-19	0033	CPU communications error	• A communications error occurs between control CPUs.	• Make a service call.
E-20	0034	Excessive torque boosted	• The torque boost parameter F402 is set too high. • The motor has too small impedance.	• Decrease the setting of the torque boost parameter F402.
E-21	0035	CPU fault 2	• The control CPU is defective.	• Make a service call.
SOUt	002F	Step-out (For PM motor only)	• The motor shaft is locked. • One output phase is open. • An impact load is applied.	• Unlock the motor shaft. • Check the interconnect cables between the Inverter and the motor.

* You can select a trip ON/OFF by parameters.

[Alarm information] Each message in the table is displayed to give a warning but does not cause the inverter to trip

Error code	Problem	Possible causes	Remedies
OFF	ST terminal OFF	• The ST-CC circuit is opened.	• Close the ST-CC circuit.
nOFF	Undervoltage in main circuit	• The supply voltage between R, S and T is under voltage.	• Measure the main circuit supply voltage. If the voltage is at a normal level, the inverter requires repairing.
rtry	Retry in process	• The inverter is in the process of retry. • A momentary stop occurred.	• The inverter is normal if it restarts after several tens of senconds. The inverter restarts automatically. Be careful of the machine because it may suddenly restart.
Err1	Frequency point setting error alarm	• The frequency setting signals at points 1 and 2 are set too close to each other.	• Set the frequency setting signals at points 1 and 2 apart from each other.
CLr	Clear command acceptable	• This message is displayed when pressing the STOP key while an error code is displayed.	• Press the STOP key again to clear the trip.
EOFF	Emergency stop command acceptable	• The operation panel is used to stop the operation in automatic control or remote control mode.	• Press the STOP key for an emergency stop. To cancel the emergency stop, press any other key.
H !! LO	Setting error alarm / An error code and data are displayed alternately twice each.	• An error is found in a setting when data is reading or writing.	• Check whether the setting is made correctly.
HEAd/ End	Display of first/last data items	• The first and last data item in the RUN data group is displayed.	• Press MODE key to exit the data group.
db	DC braking	• DC braking in process	• The message goes off in several tens of seconds if no problem occurs. Note)
dbon	Shaft fixing control	• Motor shaft fixing control is in process.	• Normal if the message disappears when a stop command is entered (or the operation command is canceled).
E1 E2 E3	Flowing out of excess number of digits	• The number of digits such as frequencies is more than 4. (The upper digits have a priority.)	• Lower the fequency free unit magnification F702.
StOP	Momentary power failure slowdown stop prohibition function activated.	• The slowdown stop prohibition function set with F302 (momentary power failure ride-through operation) is activated.	• To restart operation, reset the inverter or input an operation signal again.
LStP	Auto-stop because of continuous operation at the lower-limit frequency	• The automatic stop function selected with F256 was activated.	• To deactivate the automatic stop function, increase the frequency command above the lower-limit frequency (LL) + 0.2 Hz or turn off the operation command.
In It	Parameters in the process of initialization	• Parameters are being initialized to default values.	• Normal if the message disappears after a while (several seconds to several tens of seconds).
E-17	Operation panel key fault	• The RUN or STOP key is held down for more than 20 seconds. • The RUN or STOP key is faulty.	• Check the operation panel.
Atn1	Auto-tuning	• Auto-tuning in process	• Normal if it the message disappears after a few seconds.

Note) When the ON/OFF function is selected for DC braking (DB), using the input terminal selection parameter, you can judge the inverter to be normal if "db" disappears when opening the circuit between the terminal and CC.

[Prealarm display]

C	Overcurrent alarm	Same as OC (overcurrent)
P	Overvoltage alarm	Same as OP (overvoltage)
L	Overload alarm	Same as OL1 and OL2 (overload)
H	Overheat alarm	Same as OH (overheat)

If two or more problems arise simultaneously, one of the following alarms appears and blinks.
[P. PL . [PL
The blinking alarms [. P. L . H are displayed in this order from left to right.

13.2 Restoring the inverter from a trip

Do not reset the inverter when tripped because of a failure or error before eliminating the cause. Resetting the tripped inverter before eliminating the problem causes it to trip again.

The inverter can be restored from a trip by any of the following operations:

(1) By turning off the power (Keep the inverter off until the LED turns off.)
Note) Refer to 6.15.3 (inverter trip retention selection F602) for details.
(2) By means of an external signal (Short circuit between RES and CC on terminal board → Open)
(3) By operation panel operation
(4) By inputting a trip clear signal from a remote input device
(Refer to the remote input device operating manual for details.)

To reset the inverter by operation panel operation, follow these steps.

1. Press the STOP key and make sure that [Lr is displayed.
2. Pressing the STOP key again will reset the inverter if the cause of the trip has already been eliminated.

☆ When any overload function [OL 1: inverter overload, OL 2: motor overload, OLr: braking resistor overload] is active, the inverter cannot be reset by inputting a reset signal from an external device or by operation panel operation before the virtual cooling time has passed.

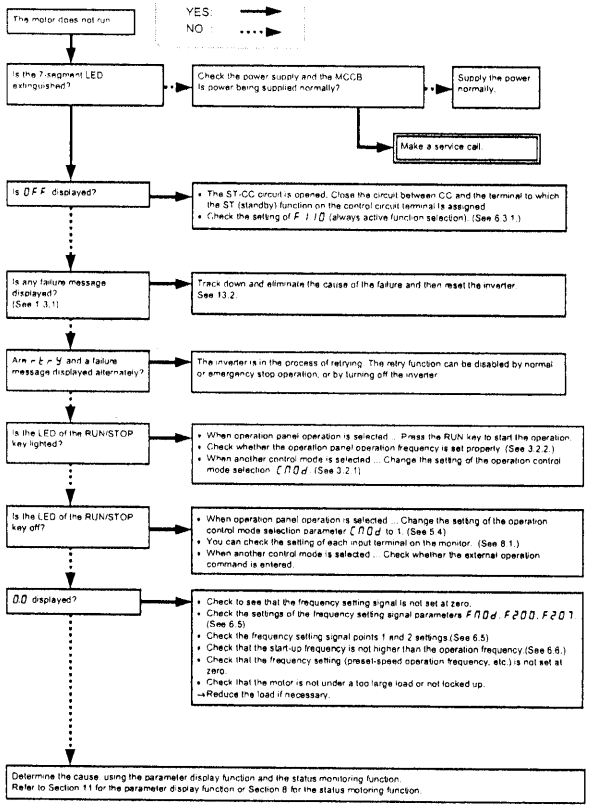
Virtual cooling time ... OL 1 : about 30 seconds after the occurrence of a trip
OL 2 : about 120 seconds after a occurrence of a trip
OLr : about 20 seconds after a occurrence of a trip

☆ In case of a trip due to overheating (OH), the inverter checks the temperature within. Wait until the temperature in the inverter falls sufficiently before resetting the inverter.

[Caution]
Turning the inverter off then turning it on again resets the inverter immediately. You can use this mode of resetting if there is a need to reset the inverter immediately. Note, however, that this operation may damage the system or the motor if it is repeated frequently.

13.3 If the motor does not run while no trip message is displayed ...

If the motor does not run while no trip message is displayed, follow these steps to track down the cause.



13.4 How to determine the causes of other problems

The following table provides a listing of other problems, their possible causes and remedies.

Problems	Causes and remedies
The motor runs in the wrong direction.	• Invert the phases of the output terminals U, V and W. • Invert the forward/reverse run-signal terminals of the external input device. (See 6.3 "Assignment of functions to control terminals".) • Change the setting of the parameter Fr in the case of panel operation.
The motor runs but its speed does not change normally.	• The load is too heavy. Reduce the load. • The soft stall function is activated. Disable the soft stall function. (See 5.14.) • The maximum frequency FH and the upper limit frequency UL are set too low. Increase the maximum frequency FH and the upper limit frequency UL. • The frequency setting signal is too low. Check the signal set value, circuit, cables, etc. • Check the setting characteristics (point 1 and point 2 settings) of the frequency setting signal parameters. (See 6.5.) • If the motor runs at a low speed, check to see that the stall prevention function is activated because the torque boost amount is too large. Adjust the torque boost amount (Ub) and the acceleration time (ACC). (See 5.12 and 5.1.)
The motor does not ac-celerate or decelerate smoothly.	• The acceleration time (ACC) or the deceleration time (dEC) is set too short. Increase the acceleration time (ACC) or the deceleration time (dEC).
A too large current flows into the motor.	• The load is too heavy. Reduce the load. • If the motor runs at a low speed, check whether the torque boost amount is too large. (See 5.12.)
The motor runs at a higher or lower speed than the specified one.	• The motor has an improper voltage rating. Use a motor with a proper voltage rating. • The motor terminal voltage is too low. Check the setting of the base frequency voltage parameter (ULu). (See 6.13.6.) Replace the cable with a cable larger in diameter. • The reduction gear ratio, etc., are not set properly. Adjust the reduction gear ratio, etc. • The output frequency is not set correctly. Check the output frequency range. • Adjust the base frequency. (See 5.10.)
The motor speed fluctu-ates during operation.	• The load is too heavy or too light. Reduce the load fluctuation. • The inverter or motor used does not have a rating large enough to drive the load. Use an inverter or motor with a rating large enough. • Check whether the frequency setting signal changes. • If the V/F control selection parameter Pt is set at 3, check the vector control setting, operation conditions, etc. (See 5.11.)
Parameter settings cannot be changed.	Change the setting of the parameter F700 (prohibition of change of parameter setting) to 0 (permitted) if it is set at 1 (prohibited). * For reasons of safety, some parameters cannot be reprogrammed while the inverter is running. (see 4.1.5)

How to cope with parameter setting-related problems

If you forget parameters which have been reset	• You can search for all reset parameters and change their settings. * Refer to 4.1.3 for details.
If you want to return all reset parameters to their respective default settings	• You can return all parameters which have been reset to their default settings. * Refer to 4.1.6 for details.

14. Inspection and maintenance

Danger	
Mandatory	• The equipment must be inspected every day. If the equipment is not inspected and maintained, errors and malfunctions may not be discovered which could lead to accidents. • Before inspection, perform the following steps. (1) Shut 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 (800V DC or more), and check that the voltage to the DC main circuits (across PA-PC) does not exceed 45V. Performing an inspection without carrying out these steps first could lead to electric shock.

Be sure to inspect the inverter regularly and periodically to prevent it from breaking down because of the environment of use, such as temperature, humidity, dust and vibration, or deterioration of its components with aging.

14.1 Regular inspection

Since electronic parts are susceptible to heat, install the inverter in a cool, well-ventilated and dust-free place. This is essential for increasing the service life.

The purpose of regular inspections is to maintain the correct environment of use and to find any sign of failure or malfunction by comparing current operation data with past operation records.

Subject of inspection	Inspection procedure			Critena for judgement
	Inspection item	Inspection cycle	Inspection method	
1. Indoor environment	1) Dust, temperature and gas	Occasionally	1) Visual check, check by means of a thermometer, smell check	1) Improve the environment if it is found to be unfavorable.
	2) Drop of water or other liquid	Occasionally	2) Visual check	2) Check for any trace of water condensation.
	3) Room temperature	Occasionally	3) Check by means of a thermometer	3) Max. temperature: 60°C
2. Units and components	1) Vibration and noise	Occasionally	Tactile check of the cabinet	Is something unusual is found, open the door and check the transformer, reactors, contactors, relays, cooling fan, etc., inside. If necessary, stop the operation.
3. Operation data (output side)	1) Load current	Occasionally	Moving-iron type AC ammeter	To be within the rated current, voltage and temperature. No significant difference from data collected in a normal state.
	2) Voltage (*)	Occasionally	Rectifier type AC voltmeter	
	3) Temperature	Occasionally	Thermometer	

*) The voltage measured may slightly vary from voltmeter to voltmeter. When measuring the voltage, always take readings from the same circuit tester or voltmeter.

■ Check points

1. Something unusual in the installation environment
2. Something unusual in the cooling system
3. Unusual vibration or noise
4. Overheating or discoloration
5. Unusual odor
6. Unusual motor vibration, noise or overheating
7. Adhesion or accumulation of foreign substances (conductive substances)

14.2 Periodical inspection

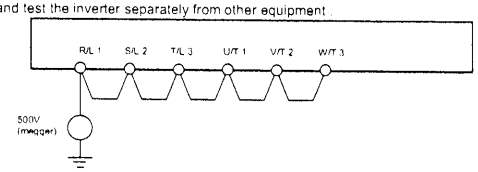
Make a periodical inspection at intervals of 3 or 6 months depending on the operating conditions.

Danger	
Mandatory	•Before inspection, perform the following steps. (1) Shut 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 (800V DC or more), and check that the voltage to the DC main circuits (across PA-PC) does not exceed 45V. Performing an inspection without carrying out these steps first could lead to electric shock.
Prohibited	• Never replace any part. This could be a cause of electric shock, fire and bodily injury. To replace parts, call the local sales agency.

■ Check items

1. Check to see if all screwed terminals are tightened firmly. If any screw is found loose, tighten it again with a screwdriver.
2. Check to see if all caulked terminals are fixed properly. Check them visually to see that there is no trace of overheating around any of them.
3. Check all cables and wires for damage. Check them visually.
4. Remove dirt and dust. With a vacuum cleaner, remove dirt and dust. When cleaning, clean the vents and the printed circuit boards. Always keep them clean to prevent an accident due to dirt or dust.
5. If no power is supplied to the inverter for a long time, the performance of its large-capacity electrolytic capacitor declines.
   When leaving the inverter unused for a long time, supply it with electricity once every two years, for 5 hours or more each, to recover the performance of the large-capacity electrolytic capacitor. And also check the function of the inverter. It is advisable not to supply the commercial power directly to the inverter but to gradually increase the power supply voltage with a transformer, etc.
6. If the need arises, conduct an insulation test on the main circuit terminal board only, using a 500V insulation tester. Never conduct an insulation test on control terminals other than terminals on the printed circuit board or on control terminals. When testing the motor for insulation performance, separate it from the inverter in advance by disconnecting the cables from the inverter output terminals U, V and W. When conducting an insulation test on peripheral circuits other than the motor circuit, disconnect all cables from the inverter so that no voltage is applied to the inverter during the test.

(Note) Before an insulation test, always disconnect all cables from the main circuit terminal board and test the inverter separately from other equipment.



7. Never test the inverter for pressure. A pressure test may cause damage to its components.
8. Voltage and temperature check

   Recommended voltmeter : Input side ... Moving-iron type voltmeter (⧑)

   Output side ... Rectifier type voltmeter (⧑)

   It will be very helpful for detecting a defect if you always measure and record the ambient temperature before, during and after the operation.

■ Replacement of expendable parts

The inverter is composed of a large number of electronic parts including semiconductor devices. The following parts deteriorate with the passage of time because of their composition or physical properties. The use of aged or deteriorated parts leads to degradation in the performance or a breakdown of the inverter. To avoid such trouble, the inverter should be checked periodically.

Note) Generally, the life of a part depends on the ambient temperature and the conditions of use. The life spans listed below are applicable to parts when used under normal environmental conditions.

1) Cooling fan
   The fan, which cools down heat-generating parts, has a service life of about 30,000 hours (about 2 or 3 years of continuous operation). The fan also needs to be replaced if it makes a noise or vibrates abnormally.
2) Smoothing capacitor
   The smoothing aluminum electrolytic capacitor in the main circuit DC section degrades in performance because of ripple currents, etc. It becomes necessary to replace the capacitor after it is used for about 5 years under normal conditions. Since the smoothing capacitor is mounted on a printed circuit board, it needs to be replaced together with the circuit board.
   <Criteria for appearance check>
   - Absence of liquid leak
   - Safety valve in the depressed position
   - Measurement of electrostatic capacitance and insulation resistance

Note: The operation time is helpful for roughly determining the time of replacement. For the replacement of parts, contact your nearest Toshiba inverter distributor. For safety's sake, never replace any part on your own. (Parts replacement alarms can be known by monitor and alarm output, if it is set. Refer to section 6.19.14)

■ Standard replacement cycles of principal parts

As guides, the table below lists part replacement cycles that were estimated based on the assumption that the inverter would be used in a normal use environment under normal conditions (ambient temperature, ventilation conditions, and energizing time). The replacement cycle of each part does not mean its service life but the number of years over which its failure rate does not increase significantly.

Part name	Standard replacement cycle	Replacement mode and others
Cooling fan	2 to 3 years	Replacement with a new one
Main circuit smoothing aluminum electrolytic capacitor	5 years	Replacement with a new one
Relay and contactor	-	Whether to replace or not depends on the check results
Aluminum electrolytic capacitor mounted on a printed circuit board	5 years	Replace with a new circuit board

Note) The life of a part greatly varies depending on the environment of use.

14.3 Making a call for servicing

For the Toshiba service network, refer to the back cover of this instruction manual. If defective conditions are encountered, please contact the Toshiba service section in charge via your Toshiba dealer.
When making a call for servicing, please inform us of the contents of the rating label on the right panel of the inverter, the presence or absence of optional devices, etc., in addition to the details of the failure.

14.4 Keeping the inverter in storage

Take the following precautions when keeping the inverter in storage temporarily or for a long period of time.

1. Store the inverter in a well-ventilated place away from heat, damp, dust and metal powder.
2. If the printed circuit board in your inverter has an anti-static cover (black cover), do not leave it detached from the circuit board during storage. The cover must be detached before turning on the inverter.
3. If no power is supplied to the inverter for a long time, the performance of its large-capacity electrolytic capacitor declines.
   When leaving the inverter unused for a long time, supply it with electricity once every two years, for 5 hours or more each, to recover the performance of the large-capacity electrolytic capacitor. And also check the function of the inverter. It is advisable not to supply the commercial power directly to the inverter but to gradually increase the power supply voltage with a transformer, etc.

15. Warranty

Any part of the inverter that proves defective will be repaired and adjusted free of charge under the following conditions:

1. This warranty applies only to the inverter main unit.
2. Any part of the inverter which fails or is damaged under normal use within twelve months from the date of delivery shall be repaired free of charge.
3. For the following kinds of failure or damage, the repair cost shall be borne by the customer even within the warranty period.
   - Failure or damage caused by improper or incorrect use or handling, or unauthorized repair or modification of the inverter
   - Failure or damage caused by the inverter falling or an accident during transportation after the purchase
   - Failure or damage caused by fire, salty water or wind, corrosive gas, earthquake, storm or flood, lightning, abnormal voltage supply, or other natural disasters
   - Failure or damage caused by the use of the inverter for any purpose or application other than the intended one
4. All expenses incurred by Toshiba for on-site services shall be charged to the customer, unless a service contract is signed beforehand between the customer and Toshiba, in which case the service contract has priority over this warranty.

16. Disposal of the inverter

⚠ Warning	
Mandatory	• If you throw away the inverter, have it done by a specialist in industry waste disposal(*). If you throw away the inverter by yourself, this can result in explosion of capacitor or produce noxious gases, resulting in injury. (*) Persons who specialize in the processing of waste and known as "industrial waste product collectors and transporters" or "industrial waste disposal persons. "If the collection, transport and disposal of industrial waste is done by someone who is not licensed for that job, it is a punishable violation of the law. (Laws in regard to cleaning and processing of waste materials)

For safety's sake, do not dispose of the disused inverter yourself but ask an industrial waste disposal agent.
Disposing of the inverter improperly could cause its capacitor to explode and emit toxic gas, causing injury to persons.

TOSHIBA
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INDUSTRIAL AND POWER SYSTEMS & SERVICES COMPANY

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● For further information, please contact your nearest Toshiba Liaison Representative or International Operations - Producer Goods.
● The data given in this manual are subject to change without notice.
2004-12

BOILER AND FEW CONTROL PANEL

LOCAL PUMPS CONTROL

1 2 3

HS1

LEAD P1 - LAG P2 - STOP P3
LEAD P2 - LAG P3 - STOP P1
LEAD P3 - LAG P1 - STOP P2

LOCAL - OFF - AUTO

HS2

LOCAL : MANUAL CONTROL VIA PUMP SELECTOR SW

AUTO : CONTROL VIA PROCESS PLC
- STOP ON LOW FEW WATER.
- ALTERNATE PUMP OPERATION

B1 DISABLE

BOILER & CIRCULATOR

B2 DISABLE

NORMAL - ECONOMY

HS3

~~NORMAL : NO INTERVENTION FROM PLC~~

~~ECONOMY: HWS DEPEND ON OUTSIDE AIR TEMPERATURE~~
~~-5C OR LESS : 80C~~
~~10C OR MORE : 60C~~
~~P3 AND P4 RUN WHEN OUTDOR TEMPERATURE DROP BELOW 18C~~

FUNCTION DISABLED DUE TO SALSNES FILTER HEATER REQUIREMENT

PART LIST
=========

1 ENCLOSURES EUROBEX 30"x20"x8" 5412 ESBU302008

1 LAMICOID

2 SELECTOR SWITCH 3 POSITION 800T-J2B

1 SELECTOR SWITCH 2 POSITION 800T-H2T

PART LIST
=========

3 TERMINAL RAIL 14" 1492-DR6

1 WIRING DUCT DUCT 2" TOTAL=112" T2X3HDG
1 WIRING DUCT COVER 2" TOTAL=112"

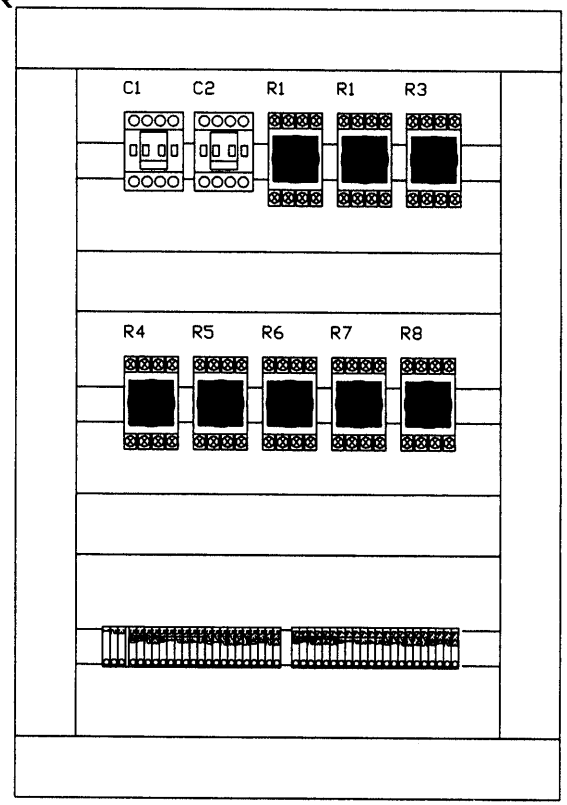
TERMINAL BLOCKS (TOTAL 45)
- n GRAY
- 1 WHITE
- 1 GREEN

2 STOP BLOCK 1492-EA35
1 END COVER
2 TERMINAL SEPARATOR

2 SELECTOR SWITCH 3 POSITION

1 SELECTOR SWITCH 2 POSITION

JEVCAR



REV.	DESCRIPTION	DATE	BY
A	PRE-APPROVAL	06/20/05	CF
B			
C			

REV.	DESCRIPTION	DATE	BY
D			
E			
F			

INSTRUMENTATION

PLC SHEMATIC DIAGRAM

SPEC - BUILD.
JEVCAR TECHNOLOGIES
CSA / ULC

CITY OF IQALUIT

WASTEWATER TREATMENT PLANT
PHASE 1

FILTERED EFLUENT AND BOILER CONTROL PANEL

DRAWN BY: CHECKED BY:	SCALE: NTS	DATE JUNE 20TH, 2005	SHEET NO 4/8
CADD SYSTEM AutoCAD	DWG NO. CADD SYSTEM	REV. 0	CONTRACT 0

REP: REPERTOIRE:

18.3.1

SEQUENCE OF OPERATION UNDER PROCESS PLC OPERATION (Few Pump)

1- pump/boiller control panel controls FEW pump operation on a run time base.

2- on pressur drop, lead pump start, on decond stage drop, second pump start

3- every 15 h of opperation of the lead pump, lowest time pump become lead pump.

3- in case of low pressur for more then 5 min. alarm on panel view.

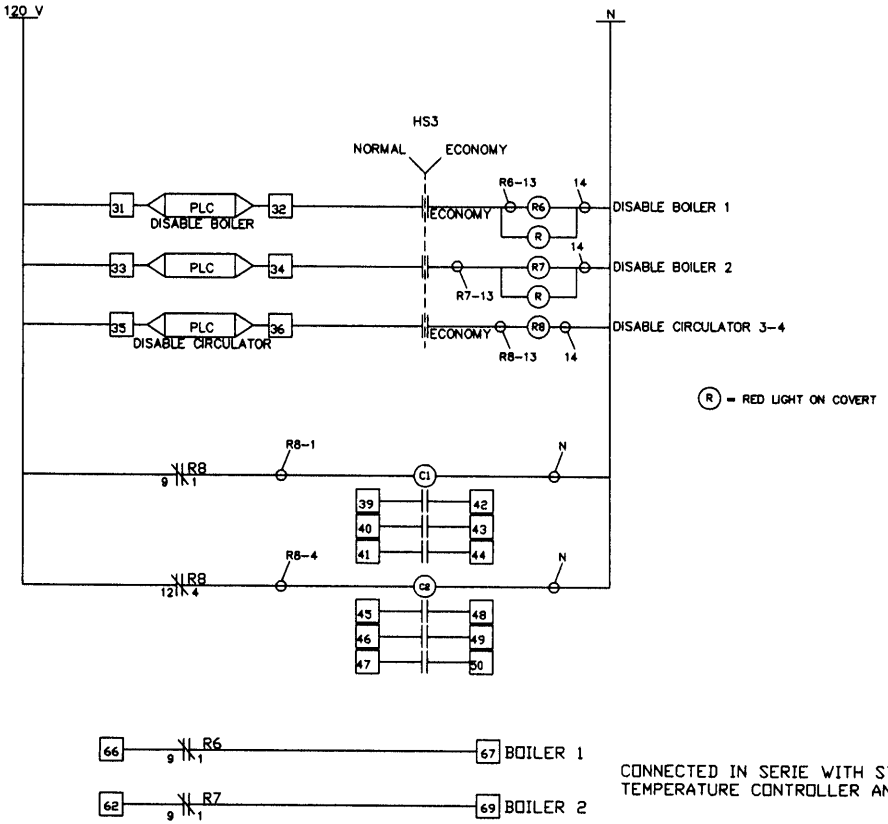
4- on high FEW level(90%), outside blue lamp active.

5- on low FEW water(30%), outside red lamp active.

6- on low low FEW water(20%), alarm on all MMI.

7- on very low FEW water(10%), alarm on all MMI, Few pump stop.

8 all status, level and alarm avialable on a specific page on all panel view.



CONNECTED IN SERIE WITH STANDARD BOILER TEMPERATURE CONTROLLER AND HIGH LIMIT

SYMBOL SCHEDULE

- CONTROL PANEL TERMINALS
- SEE LOOP DRAWING REFERENCE FOR FIELD WIRING LAYOUT
- FIELD WIRING
- PANEL WIRING

DESCRIPTION

REV.	DESCRIPTION	DATE	BY
A	PRE-APPROVAL	06/20/05	CF
B			
C			

REV.	DESCRIPTION	DATE	BY
D			
E			
F			

INSTRUMENTATION

PLC SHEMATIC DIAGRAM

SPEC - MUSLIM.

JEYCAR TECHNOLOGIES

CSA / ULC

CITY OF IQALUIT

WASTEWATER TREATMENT PLANT
PHASE 1

FILTERED EFLUENT AND BOILER CONTROL PANEL

DRAWN BY: / CHECKED BY:	SCALE: NTS	DATE: JUNE 20TH, 2006	SHEET NO: 4/8
CADD SYSTEM: AutoCAD	DWG NO.: CADD SYSTEM	REV.: 0	CONTRACT: 0

REP: REPERTOIRE:

1993

1 - LEAD P1 - LAG P2 - STOP P3
2 - LEAD P2 - LAG P3 - STOP P1
3 - LEAD P3 - LAG P1 - STOP P2

PS1 - PRESSURE SWITCH 1 FIRST STAGE
PS2 - PRESSURE SWITCH 2 SECOND STAGE

SEQUENCE OF OPERATION (boiler)

1- Boilers are 50% capacity each and oprate in a lead / lag configuration

2- Boiler / pump control panel controls boilers and pump operation

3- Existing pump P-03 and new pump P-04 shall be activated when the outdoor air temperature drops below 16C(via PLC)

4- Integral boiler controls are provided by the boiler manufacturer and connected to the boiler / pump control panel

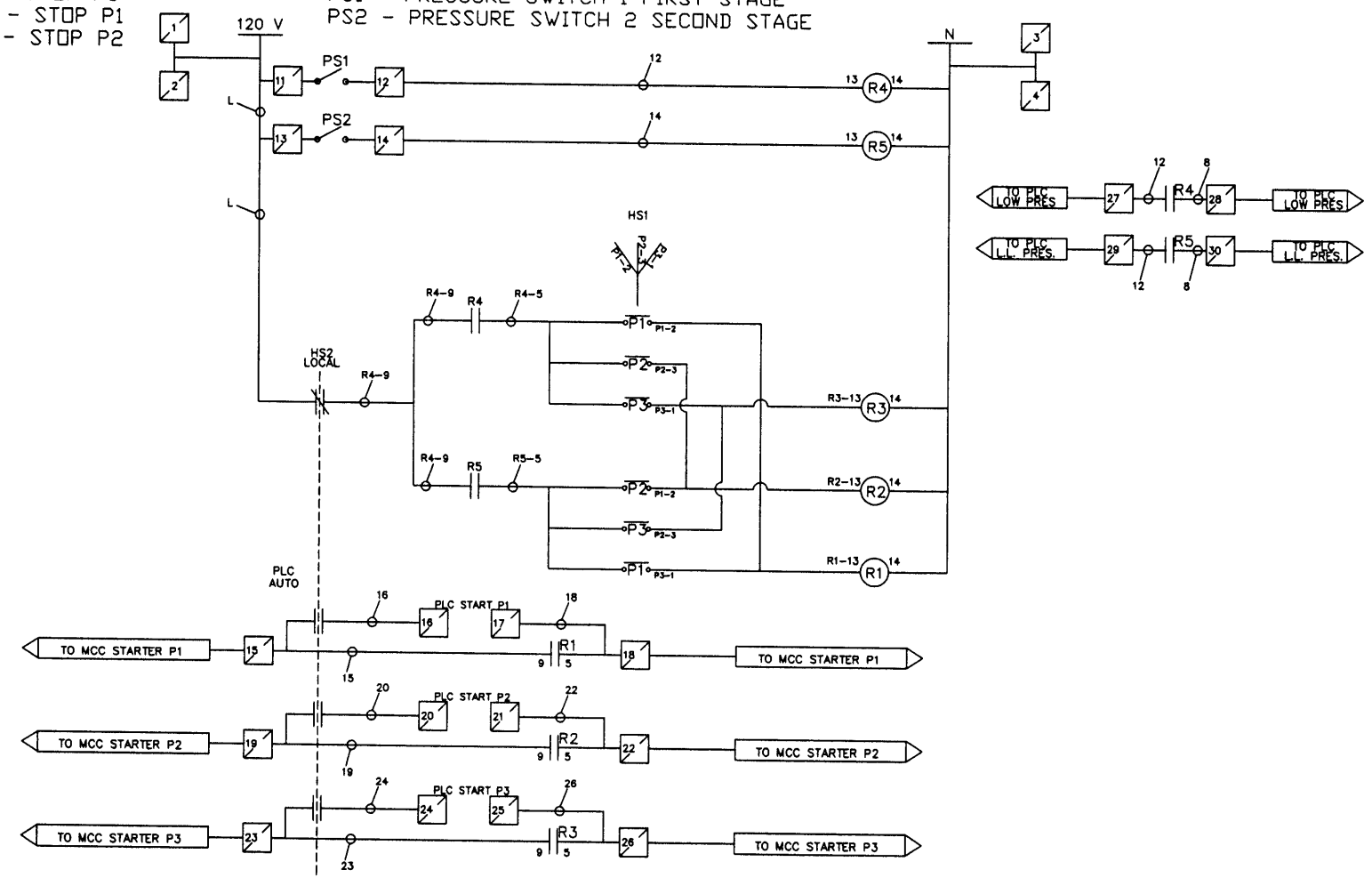
5- control panel enable/disable switch to permit return to mechanical operation.

6- Supply temperature to building heating loop is reset as follows:

O/A temps.	HWS
-5C or less	88C
10C	60C

7. when hws set to 60c p.l.c to cycle boiller a lower temperature.

8 all status, temperature and alarm avialable on a specific page on all panel view.



REV.	DESCRIPTION	DATE	BY
A	REVISION-A	DATE	NOM
B	REVISION-B	DATE	NOM
C	REVISION-C	DATE	NOM

REV.	DESCRIPTION	DATE	BY
D	REVISION-D	DATE	NOM
E	REVISION-E	DATE	NOM
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INSTRUMENTATION

PLC SHEMATIC DIAGRAM
I/O CARD 0000

JEVCAR TECHNOLOGIES

CITY OF IQALUIT

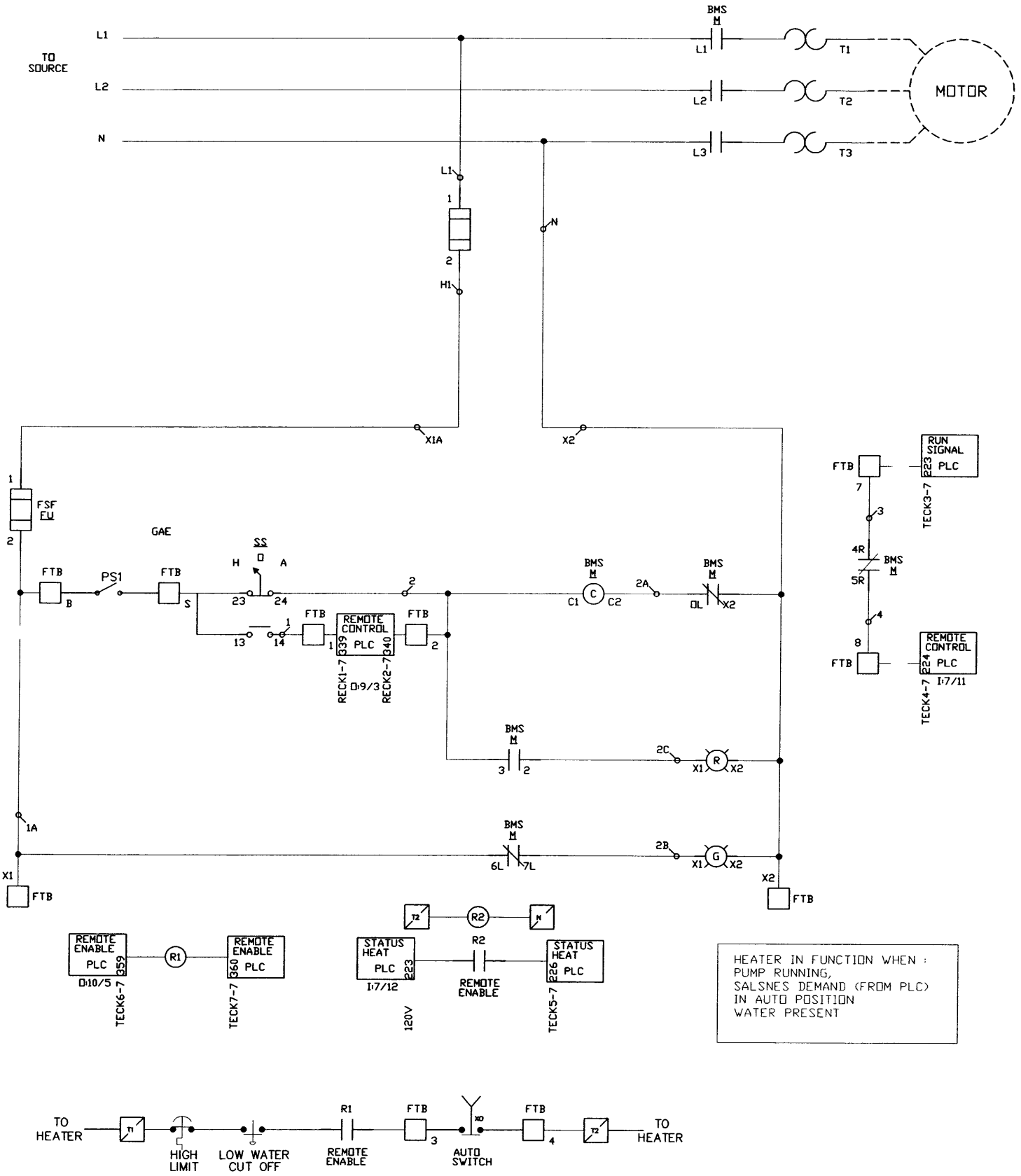
WASTEWATER TREATMENT PLANT
PHASE 1

FILTERED EFLUENT AND BOILER CONTROL PANEL

DRAWN BY: / CHECKED BY:	SCALE: NTS	DATE: JUNE 15TH, 2005	SHEET NO: 0
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REP: REPERTOIRE:

VERY HOT FEW WATER BOOSTER PUMP P20

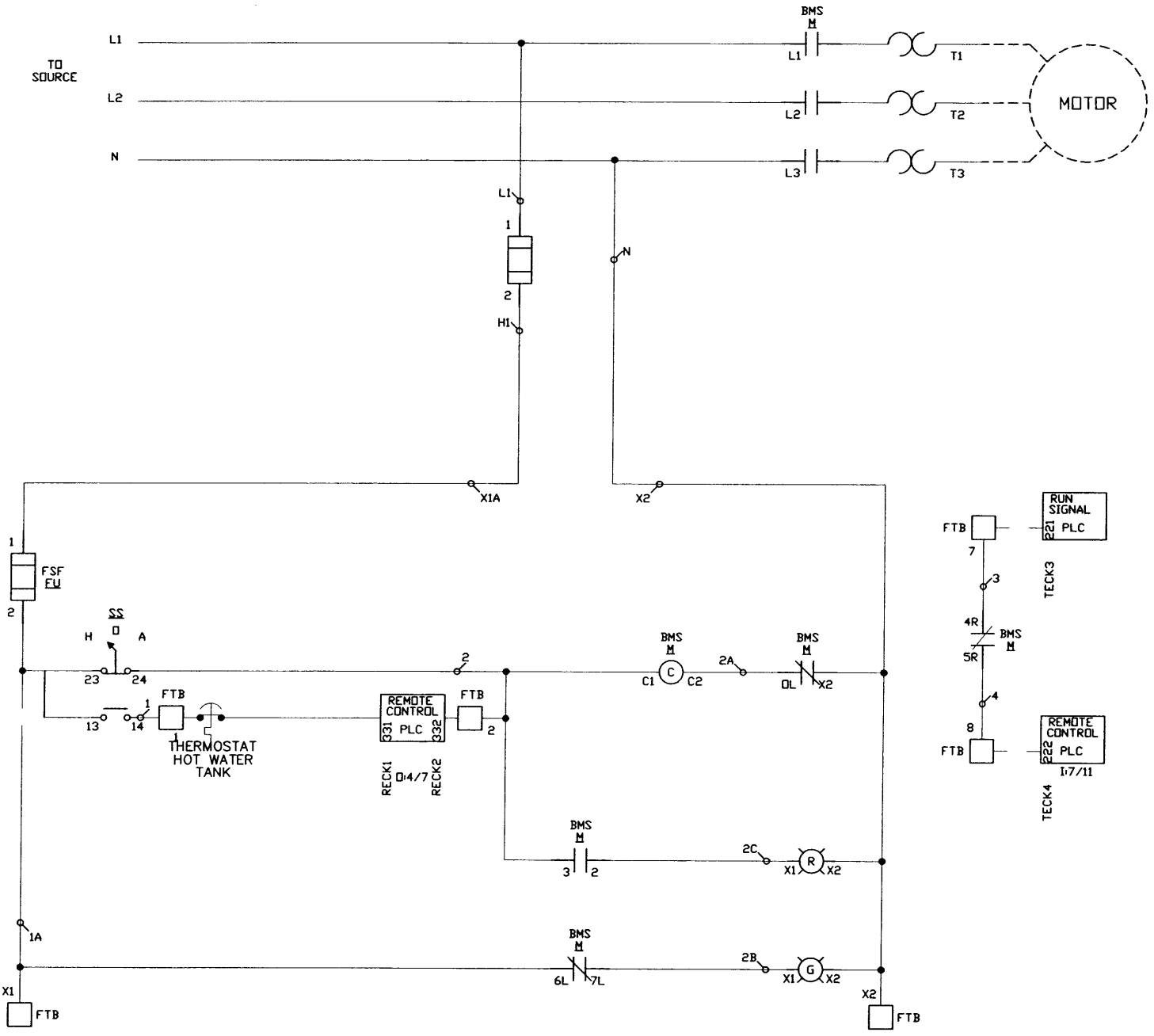


. UNITS INCLUDED

HL .RINK WIRE MARKERS

JOB NAME :	IQUALUIT SEWAGE WATER STATION	VERY HOT FEW WATER BOOSTER PUMP P20	EQUIPMENT DESIGNATION :	FEW P20
JOB LOCATION :	MIRABEL, QC.		EQUIPMENT TYPE :	MODIFIED MOTOR CONTROL CENTER
DRAWN BY :	CAD		DRAWING TYPE :	ELEMENTARY DIAGRAM
ENGR :	CARL,F		DRAWING # :	
DATE :	APRIL 15, 2006		REVISION :	AS BUILT MARCH 2006
DRAWING STATUS :	RECORD		PAGE :	- - -

FEW HOT WATER RECIRC PUMP P21



ECIRC PUMP IN FUNCTION WHEN:

IN AUTO POSITION
(DEPEND ON TEMPERATURE

IN HAND, ALWAYS

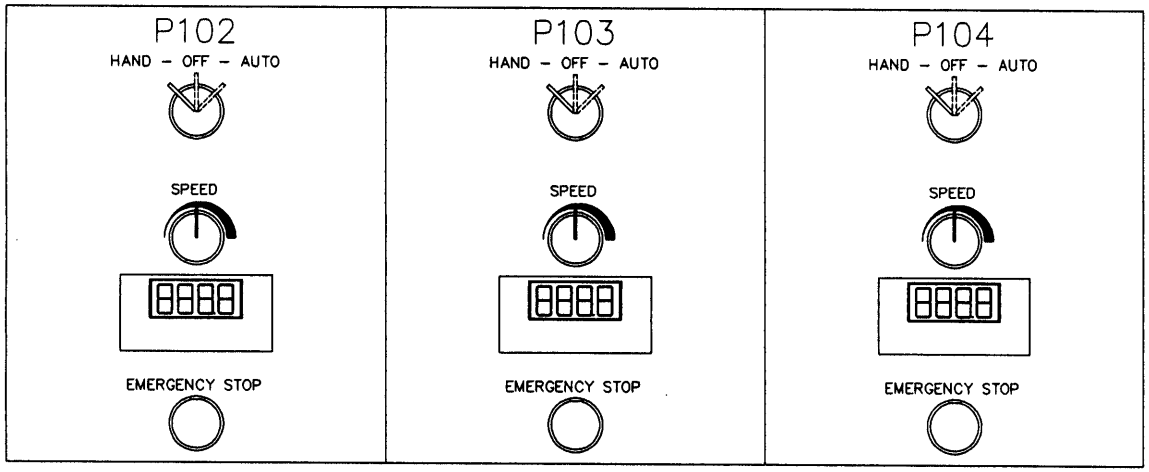
L UNITS INCLUDED
HL RINK WIRE MARKERS

JOB NAME :	IQUALUIT SEWAGE WATER STATION
JOB LOCATION :	MIRABEL, QC.
DRAWN BY :	CAD
ENGR :	CARL,F
DATE :	APRIL 15, 2006
DRAWING STATUS :	RECORD

FEW HOT WATER
RECIRC PUMP P21

EQUIPMENT DESIGNATION :	FEW P21
EQUIPMENT TYPE :	MODIFIED MOTOR CONTROL CENTER
DRAWING TYPE :	ELEMENTARY DIAGRAM
DRAWING # :	
REVISION :	AS BUILT MARCH 2006
PAGE :	- - -

RAW WASTE WATER PUMP CONTROL PANEL



PART LIST
=========

1 EUROBEX ENCLOSURE 5412 ESBU 30" X 12" X 8"

3 PANEL LAMICOID "P10x"

3 SELECTOR SWITCH 800T-J2B
3 PLATE "HAND-OFF-AUTO" 800T-X501

3 POTENTIOMETER 800H-UR35
3 SPEED PLATE W/GRADUATED MARKINGS 800T-X608
3 DIGITAL INDICATOR UM331 (YOKOGAWA)

3 TWO POSITION PUSH-PULL 800T-FX6A1
3 PUSH TO STOP PLATE 800T-618Y

REV.	DESCRIPTION	DATE	BY
A	REVISION-A	DATE	NOM
B	REVISION-B	DATE	NOM
C	REVISION-C	DATE	NOM

REV.	DESCRIPTION	DATE	BY
D	REVISION-D	DATE	NOM
E	REVISION-E	DATE	NOM
F	REVISION-F	DATE	NOM

INSTRUMENTATION

PLC SHEMATIC DIAGRAM
I/O CARD 0000

SPEC - KUDLIK.
DEVCAR TECHNOLOGIES
CSA / ULC

CITY OF IQALUIT

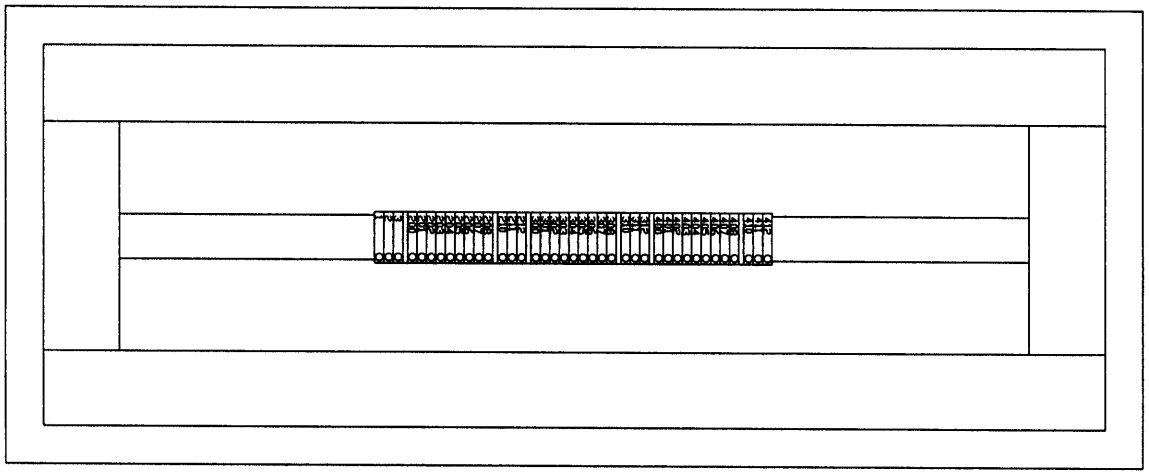
WASTEWATER TREATMENT PLANT
PHASE 1

RAW WASTE WATER PUMP CONTROL PANEL (OUTSIDE)

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CHECKED BY:	NTS	JUNE 13TH, 2006	0
CADD SYSTEM: AutoCAD	DWG NO. CADD SYSTEM	REV. 0	CONTRACT 0

REP: REPERTOIRE:

13.4.1



PART LIST
=========

2 WIRING DUCT PANDUIT 2"x28" T2X3HDG
2 WIRING DUCT COVER 2"x28"

2 WIRING DUCT PANDUIT 2"x6" T2X3HDG
2 WIRING DUCT COVER 2"x6"

1 RAIL 28" 1492-DR6

TERMINAL BLOCKS (TOTAL 39)
- 24 RED 1492-W4-R
- 6 BLACK 1492-W4-BL
- 4 GREEN 1492-W4-G
- 3 YELLOW 1492-W4-Y
- 1 GRAY 1492-W4
- 1 WHITE 1492-W4-W

2 STOP BLOCK 1492-EA35
1 END COVER
6 TERMINAL SEPARATORS

REV.	DESCRIPTION	DATE	BY
A	REVISION-A	DATE	NOM
B	REVISION-B	DATE	NOM
C	REVISION-C	DATE	NOM

REV.	DESCRIPTION	DATE	BY
D	REVISION-D	DATE	NOM
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INSTRUMENTATION

PLC SHEMATIC DIAGRAM
I/O CARD 0000

CITY OF IQALUIT

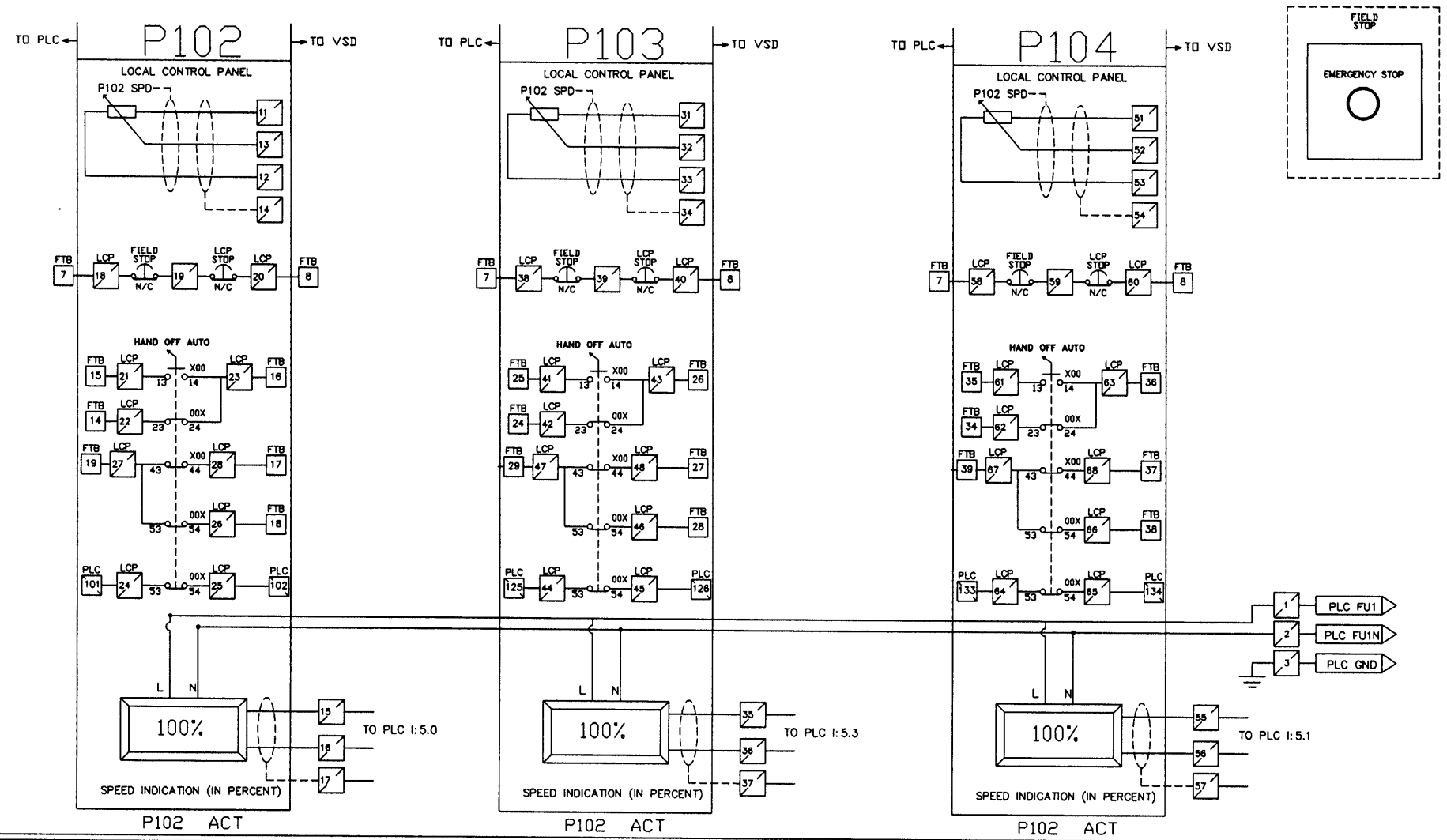
WASTEWATER TREATMENT PLANT
PHASE 1

RAW WASTE WATER PUMP CONTROL PANEL (INSIDE)

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

REP: REPERTOIRE:

13.4.8



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REV.	DESCRIPTION	DATE	BY
D	REVISION-D	DATE	NOM
E	REVISION-E	DATE	NOM
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INSTRUMENTATION

PLC SHEMATIC DIAGRAM
I/O CARD 0000

JEYCAR TECHNOLOGIES
CSA / ULC

CITY OF IQALUIT

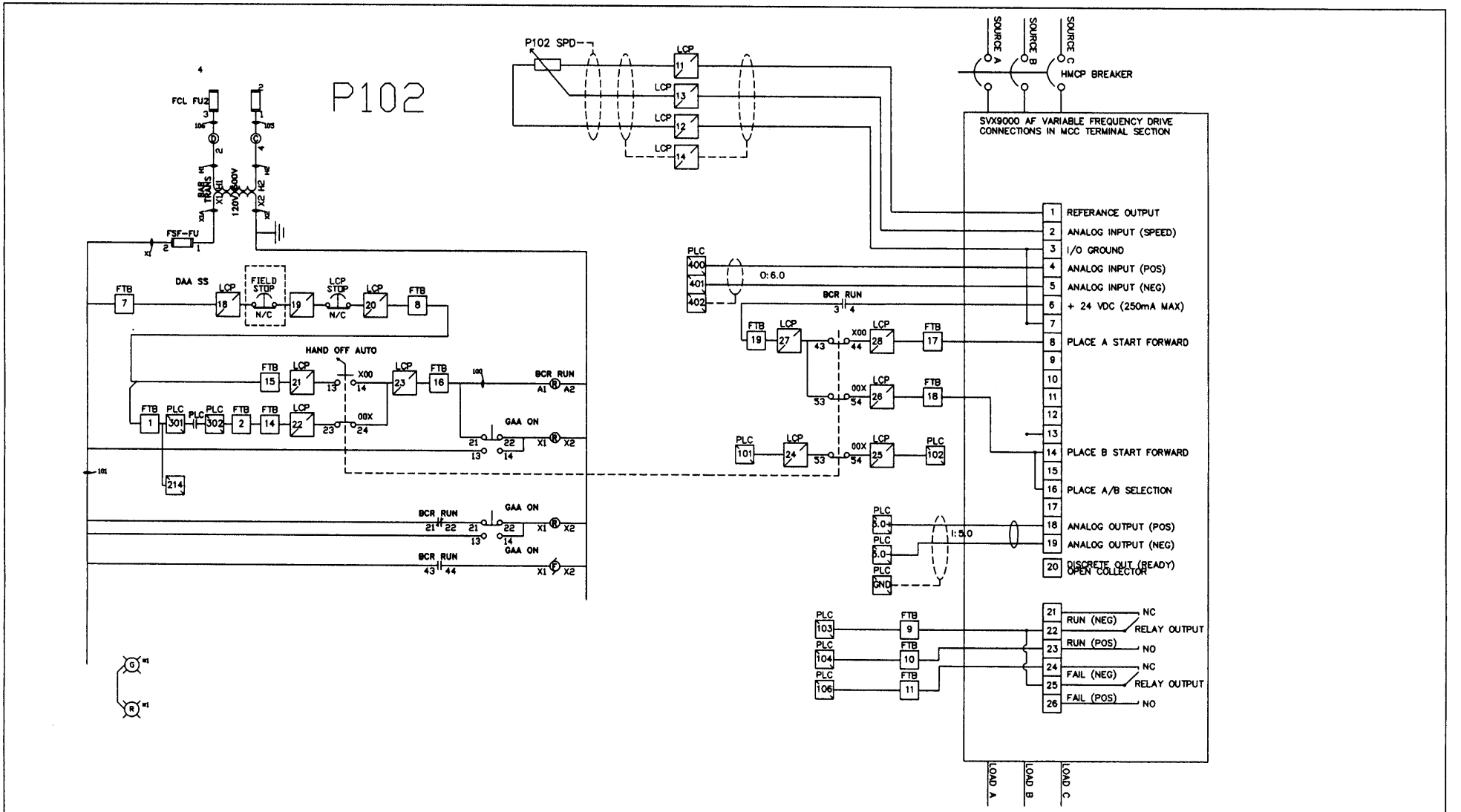
WASTEWATER TREATMENT PLANT
PHASE 1

RAW WASTE WATER PUMP CONTROL PANEL

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REP: REPERTOIRE:

13.4.3



REV.	DESCRIPTION	DATE	BY
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INSTRUMENTATION

PLC SHEMATIC DIAGRAM
I/O CARD 0000

JEVCAR TECHNOLOGIES

CITY OF IQALUIT

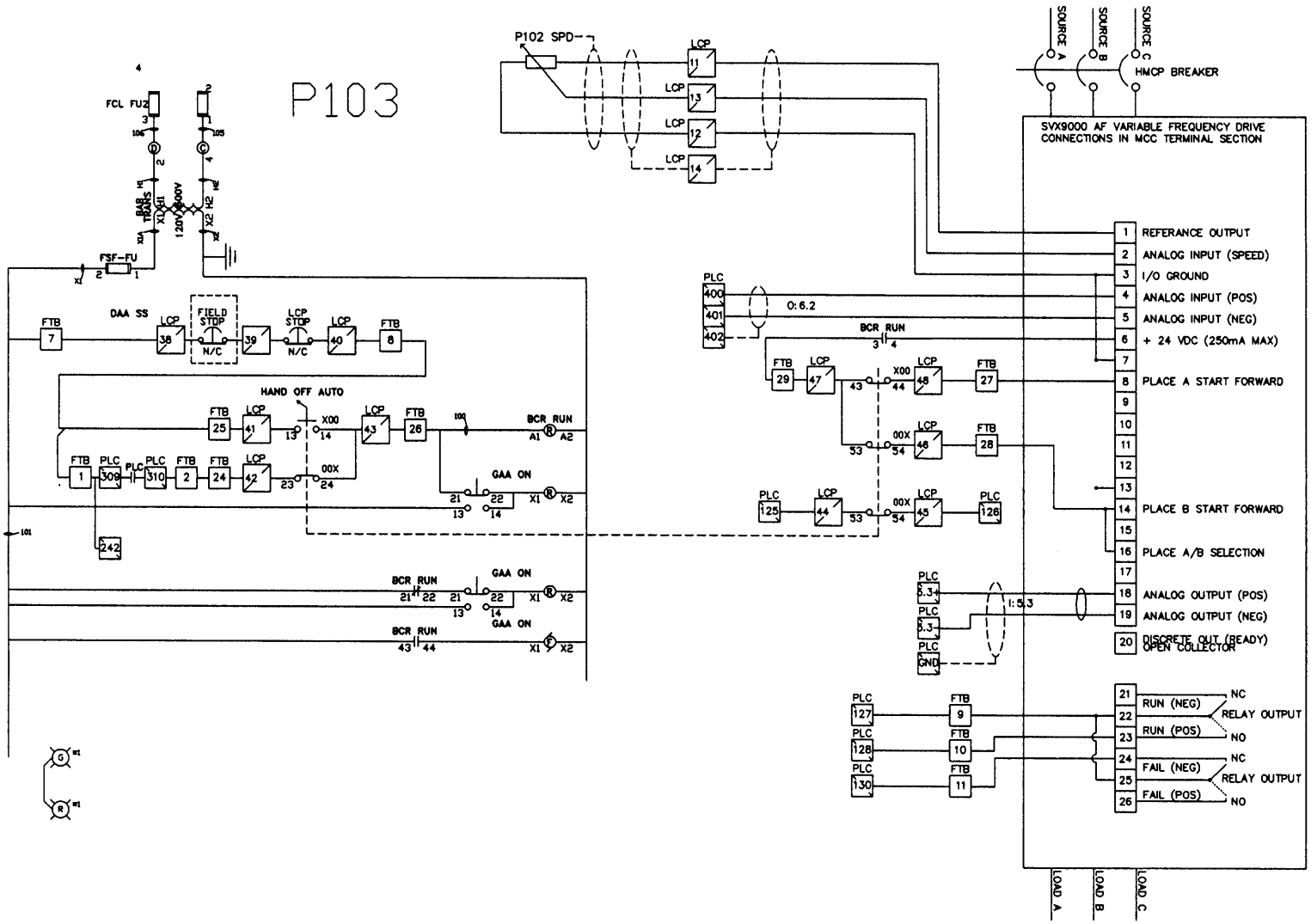
WASTEWATER TREATMENT PLANT
PHASE 1

RAW WASTE WATER PUMP CONTROL PANEL (P102)

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CHECKED BY:			
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REP: REPERTOIRE:

13.4.4



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B	REVISION-B	DATE	NOM
C	REVISION-C	DATE	NOM

REV.	DESCRIPTION	DATE	BY
D	REVISION-D	DATE	NOM
E	REVISION-E	DATE	NOM
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INSTRUMENTATION

PLC SHEMATIC DIAGRAM
I/O CARD 0000

JEYCAR TECHNOLOGIES

CITY OF IQALUIT

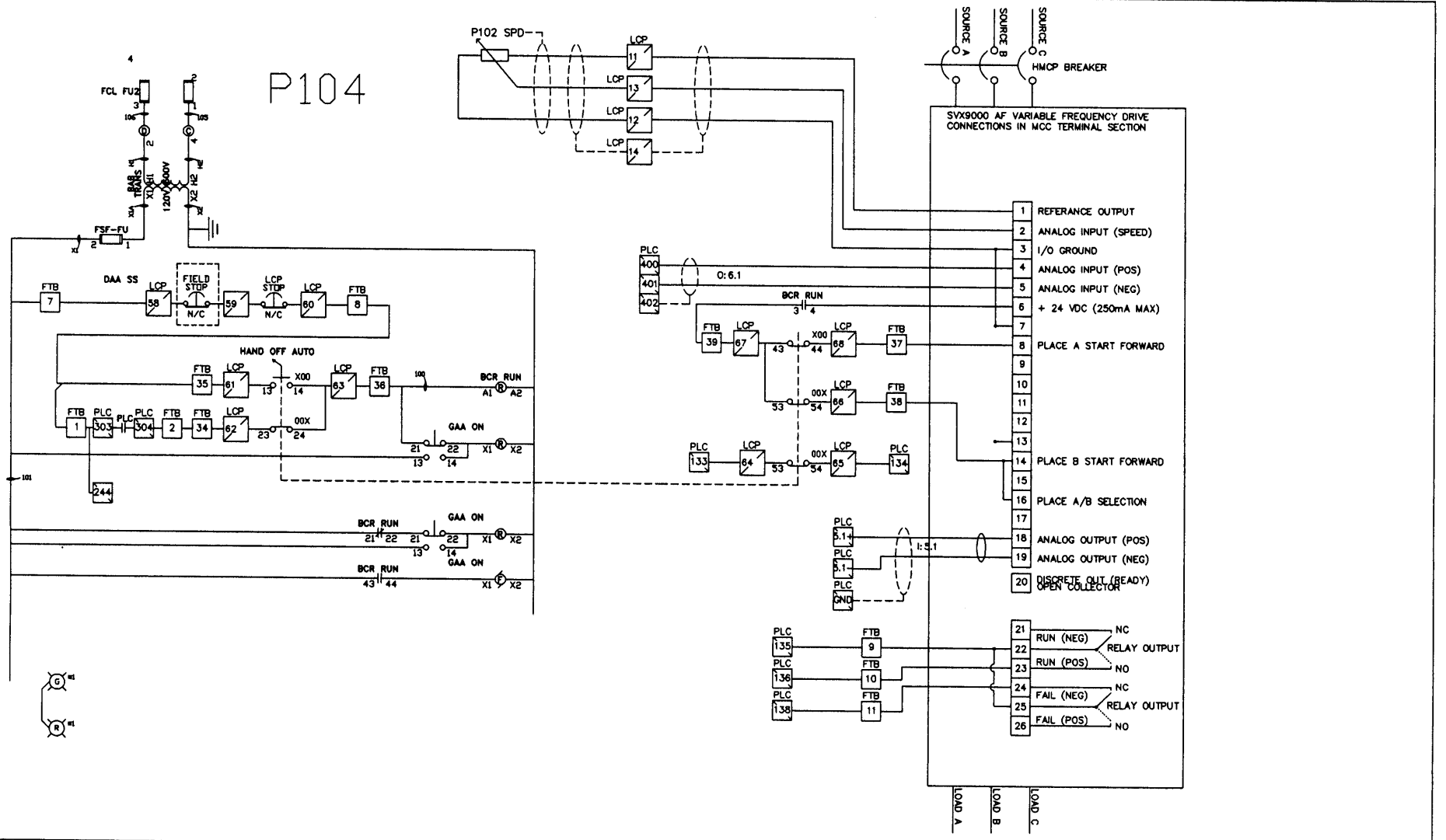
WASTEWATER TREATMENT PLANT
PHASE 1

RAW WASTE WATER PUMP CONTROL PANEL (P103)

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12.4.5



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INSTRUMENTATION

PLC SHEMATIC DIAGRAM
I/O CARD 0000

DEVCAR TECHNOLOGIES

CITY OF IQALUIT

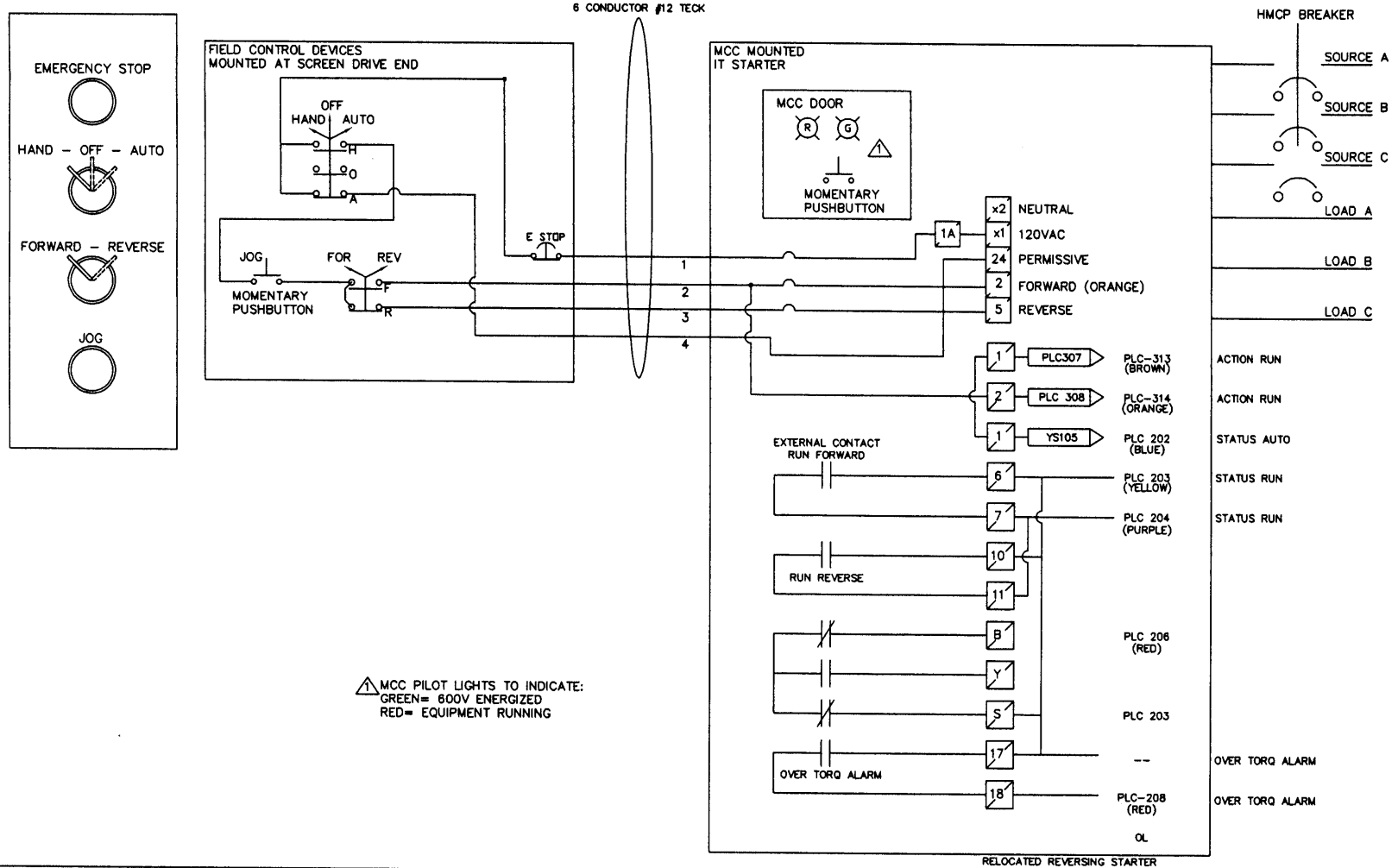
WASTEWATER TREATMENT PLANT
PHASE 1

RAW WASTE WATER PUMP CONTROL PANEL (P104)

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REP: REPERTOIRE:

SSCR 105



REV.	DESCRIPTION	DATE	BY
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B	REVISION-B	DATE	NOM
C	REVISION-C	DATE	NOM

REV.	DESCRIPTION	DATE	BY
D	REVISION-D	DATE	NOM
E	REVISION-E	DATE	NOM
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INSTRUMENTATION

SSCR 105
mcc connection

CITY OF IQALUIT

WASTEWATER TREATMENT PLANT
PHASE 1

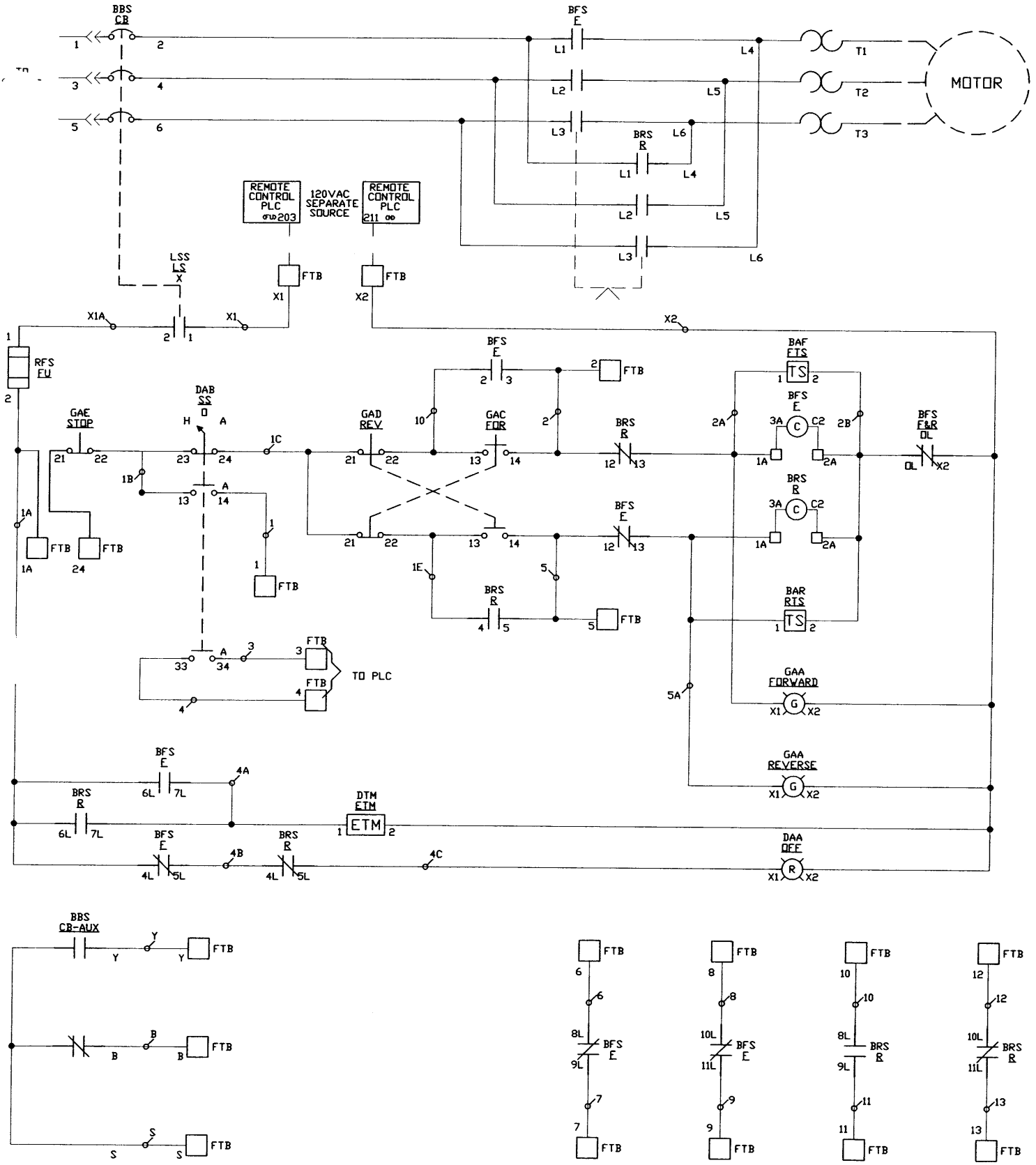
MOTOR CONTROL CENTER
SSCR 105 INTERCONNECT

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12.5.1

SSCR 105



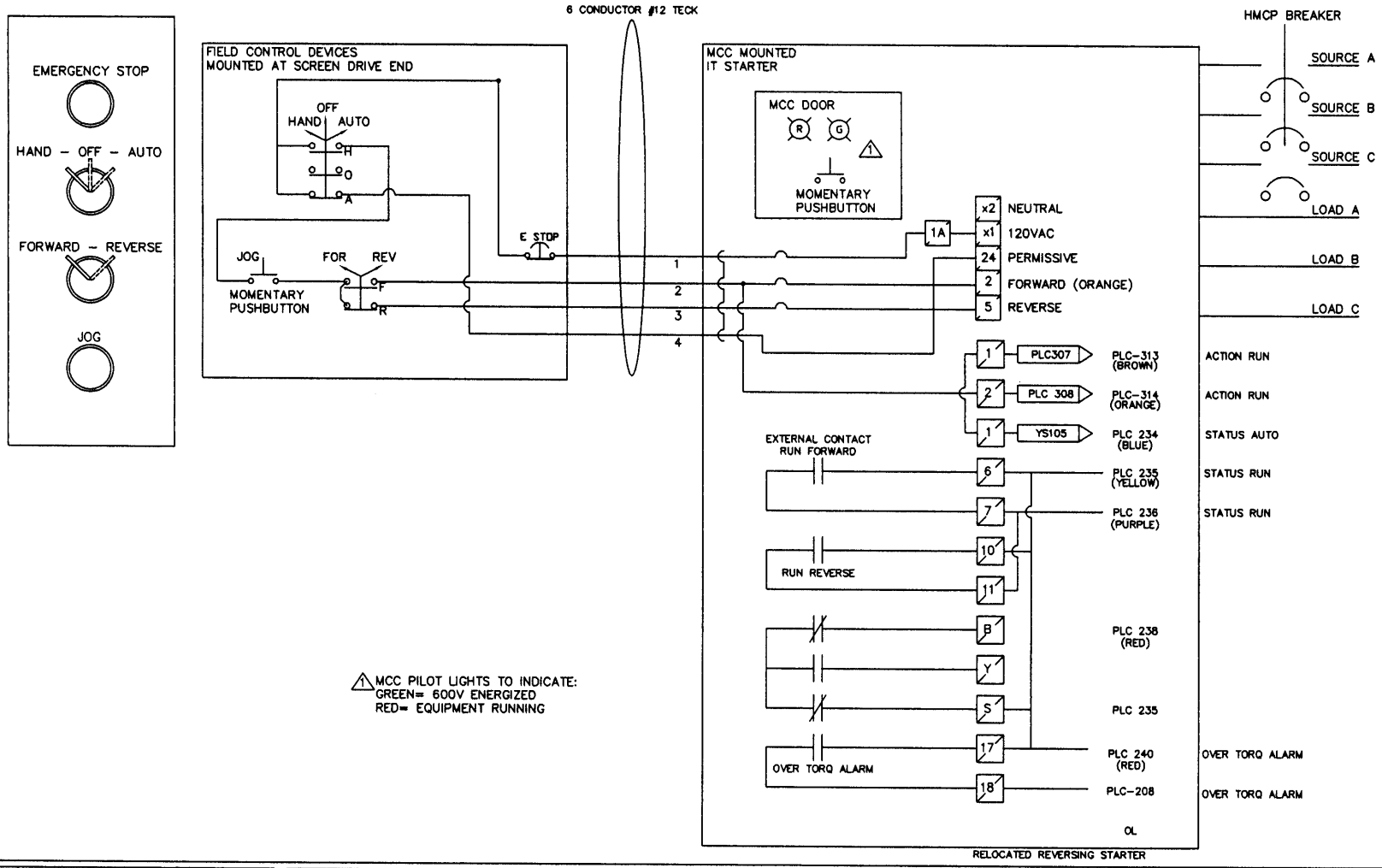
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JOB NAME :	HILL MURRAY & ASSOCIATES
JOB LOCATION :	SIDNEY, BC
DRAWN BY :	CAD
ENGR :	S.U.
DATE :	MAY 28, 1999
DRAWING STATUS :	RECORD

MOTOR CONTROL CENTER
SSCR 105

EQUIPMENT DESIGNATION :	MCC ADDER
EQUIPMENT TYPE :	MODEL 6 MOTOR CONTROL CENTER
DRAWING TYPE :	ELEMENTARY DIAGRAM
DRAWING # :	E12461865-001-02
REVISION :	AS BUILT MARCH 2006
PAGE :	- - -

SSCR 106



⚠1 MCC PILOT LIGHTS TO INDICATE:
GREEN= 600V ENERGIZED
RED= EQUIPMENT RUNNING

REV.	DESCRIPTION	DATE	BY
A	REVISION-A	DATE	NOM
B	REVISION-B	DATE	NOM
C	REVISION-C	DATE	NOM

REV.	DESCRIPTION	DATE	BY
D	REVISION-D	DATE	NOM
E	REVISION-E	DATE	NOM
F	REVISION-F	DATE	NOM

INSTRUMENTATION

SSCR 106
mcc connection

DEVCAR TECHNOLOGIES CSA / ULC

CITY OF IQALUIT

WASTEWATER TREATMENT PLANT
PHASE 1

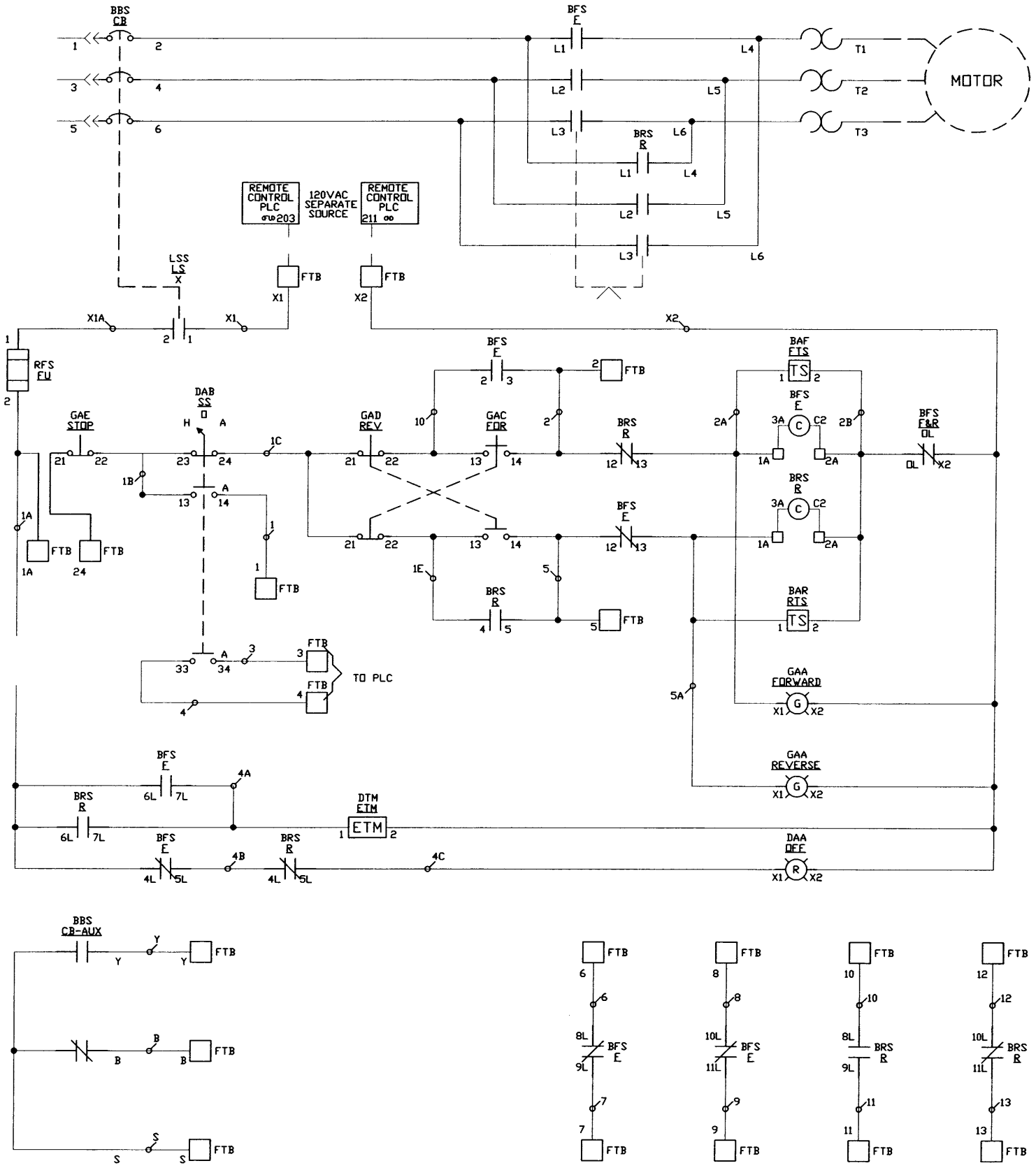
MOTOR CONTROL CENTER
SSCR 106 INTERCONNECT

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REP: REPERTOIRE:

3.9.3

SSCR 106

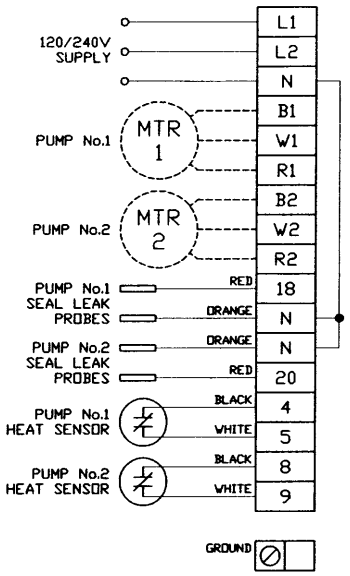


X1	X2	1	2	3	4	5	6	7	8	9	10	11	12	13	B	S	Y

JOB NAME :	HILL MURRAY & ASSOCIATES	MOTOR CONTROL CENTER SSCR 106	EQUIPMENT DESIGNATION :	MCC ADDER
JOB LOCATION :	SIDNEY, BC		EQUIPMENT TYPE :	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY :	CAD		DRAWING TYPE :	ELEMENTARY DIAGRAM
ENGR :	S.U.		DRAWING # :	E12461865-001-02
DATE :	MAY 28, 1999		REVISION :	AS BUILT MARCH 2006
DRAWING STATUS :	RECORD		PAGE :	- - -

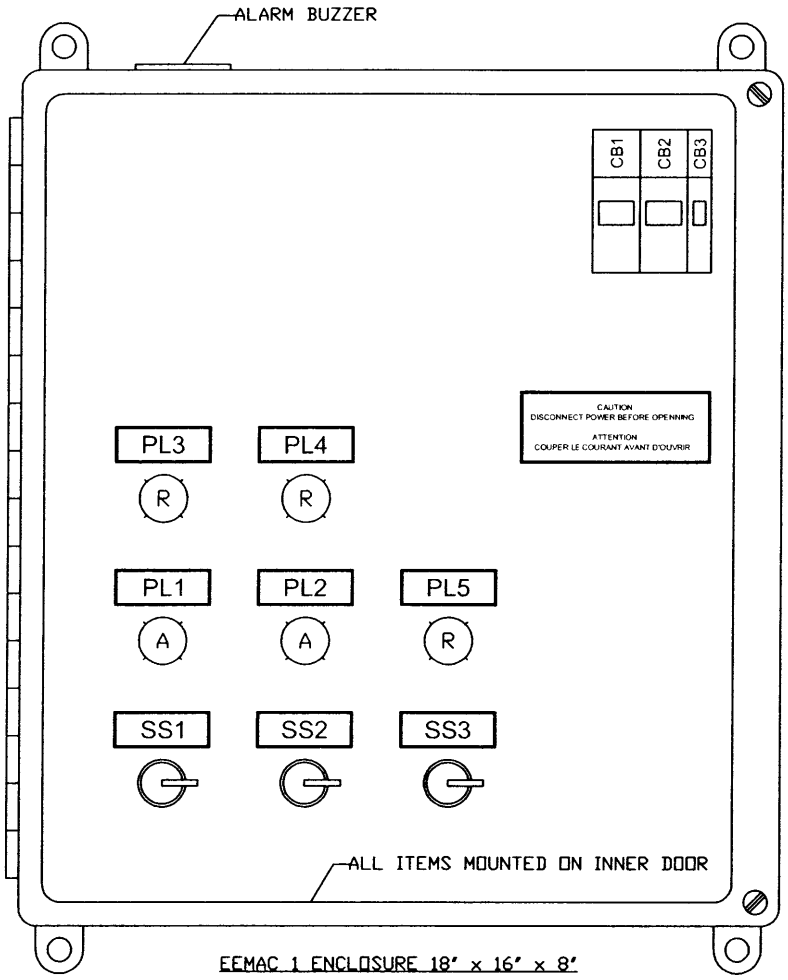
DUPLEX PUMP CONTROL SYSTEM

TERMINALS-TB1



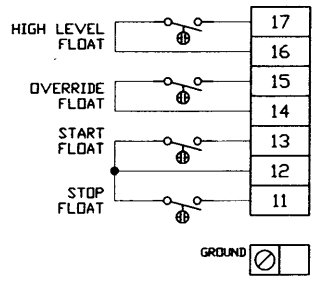
NOTES : A) INTRINSICALLY SAFE FLOAT WIRING MUST BE RUN IN SEPARATE CONDUIT TO TERMINALS IN CONTROL PANEL.

B) IF FLOATS ARE NOT WIRED DIRECTLY TO TERMINALS IN CONTROL PANEL, CAUTION MUST BE TAKEN TO PREVENT CONDENSATION FROM FORMING ACROSS FLOAT CONTACT CIRCUIT. THIS MAY CAUSE FALSE OPERATION OF INTRINSICALLY SAFE RELAY.



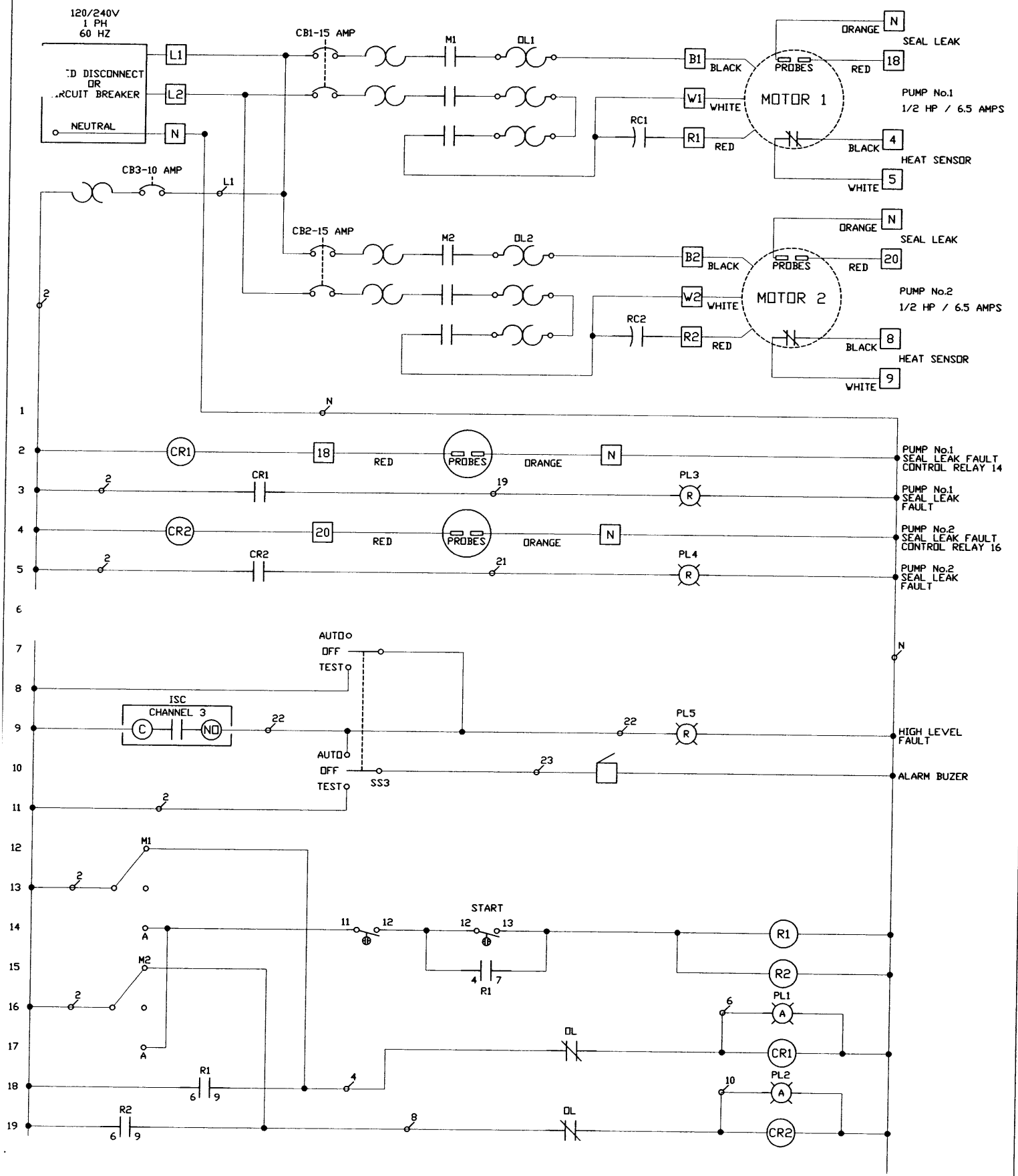
EEMAC 1 ENCLOSURE 18" x 16" x 8"

TERMINALS-TB2



JOB NAME :	F.E. MYERS COMPANY	DUPLEX PUMP CONTROL SYSTEM LAYOUT	EQUIPMENT DESIGNATION : DUPLEX PUMP CONTROL SYSTEM
JOB LOCATION :	ONTARIO		EQUIPMENT TYPE : MODEL No. : CPSX5-21D
DRAWN BY :	A. BELTON		DRAWING TYPE : ELEMENTARY DIAGRAM
ENGR :	R. IRWIN		CAD REF. : MY21821-2 DRAWING # : M2114-22365
DATE :	MARCH 10. 2005		REVISION : AS BUILT MARCH 2006
DRAWING STATUS :	RECORD		PAGE : - - -

DUPLEX PUMP CONTROL SYSTEM



JOB NAME :	F.E. MYERS COMPANY
JOB LOCATION :	ONTARIO
DRAWN BY :	A. BELTON
ENGR :	R. IRWIN
DATE :	MARCH 10, 2005
DRAWING STATUS :	RECORD

DUPLEX PUMP CONTROL SYSTEM LAYOUT

EQUIPMENT DESIGNATION :	DUPLEX PUMP CONTROL SYSTEM
EQUIPMENT TYPE :	MODEL No. : CPSX5-21D
DRAWING TYPE :	ELEMENTARY DIAGRAM
CAD REF. : MY21821-2	DRAWING # : M2114-22365
REVISION :	AS BUILT MARCH 2006
PAGE :	- - -

Chapter 13
GAS POINT , GAS MONITORING EQUIPMENT

MANUFACTURER/DISTRIBUTOR:

WEIR Canada
8600 ST-PATRICK STREET
LaSalle ,QUEBEC.CA
H8N-1V1
PH:514-366-5900 FAX:8167

13.1 GAS POINT GENERAL INFORMATION "7 PAGES42 "

13.2 GAS POINT , INSTALLATION AND OPERATING INSTRUCTION.

13.3 GAS POINT TRANSMITTER OPERATING INSTRUCTION.

END OF CHAPTER 13

A	2	**H2S Gas Detector**
		GP-HD BW GAS POINT EXPLOSION
		PROOF / AIT-110
B	2	**Combustible Gas Detector**
		GP-IR-WD COMBUSTIBLE INFRA RED
		GAS POINT EXPLOSION PROOF
		AIT-112/ AIT-114
C	1	IR-RW03 ASSEMBLY REPLACEMENT
		COMBUSTIBLE INFRA RED AIT-113
		SPARE PARTS ART.2.1.2..1.2.
D	1	SS-RH02 ASSEMBLY REPLACEMENT
		HYDROGEN SULFIDE 17300-2.1.2.2
E	2	calibration gaz regulator
		TEST GAS CYLINDER
F	1	G0042-H25 25 PPM H2S
F	1	CG2-j2 58 litres methan calibration
H	4	KIT FOR REMOTE SENSING HEAD
		HOUSING PLUS CABLES
G	1	**GAZ DETECTOR CONTROLLER cr-4000**

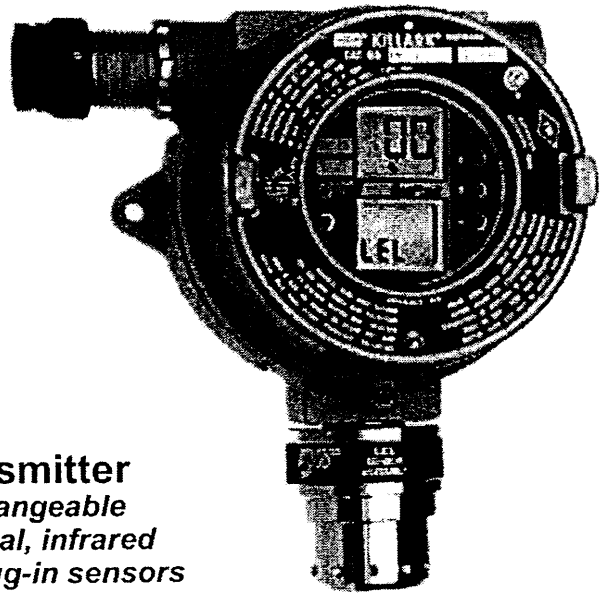
GasPoint

H_2S, CO, NH_3, HCN, NO_2, SO_2, O_2, Cl_2 Combustibles (Catalytic 0-100% LEL) or Combustibles (IR 0-100% LEL)

Gas Transmitter with Internal Alarm Relays

"INNOVATORS IN GAS DETECTION"

BW Technologies



One Transmitter
with interchangeable electrochemical, infrared and catalytic plug-in sensors

FEATURES:

The GasPoint transmitter provides a 4-20 mA output signal that can be connected to any control system (DCS, PLC, etc.). With advanced sensor technology and microcontroller based operation, the GasPoint provides continuous monitoring of hazardous gases.

- △ The GasPoint transmitter can accept any GasPoint sensor type: electrochemical, catalytic or IR (infrared). All plug-in sensor assemblies are field-interchangeable.
- △ Full function sensor integrity test (auto) continuously advises gas sensing ability and life ended
- △ Non-intrusive, one-person calibration with auto zero and auto span
- △ Equipped with three 5-amp relay contacts—two gas alarm relays (low/high) and fault alarm. Field-selectable normally energized/ de-energized and latching/non-latching alarm relay functions.
- △ Two backlit alphanumeric LCDs advise all environmental and gas hazard conditions as well as instrument and sensor status
- △ Remote toxic/oxygen sensors can be installed over 3,900 ft./ 1,100 m away; combustible sensors over 1,550 ft./475 m. Kit can be installed at any time.
- △ Alarm setpoints displayed on demand—simply press the external button
- △ Field programmable alarm levels
- △ Backlight (auto) in low light conditions and alarm
- △ Extensive fault diagnostics
- △ 2-way digital communication using MODBUS module

ISO 9001:2000 Registered

Fixed Gas Monitoring Systems

Ordering Information

GP-WD	Gas Transmitter with Combustible Catalytic Sensor
GP-IR-WD	Gas Transmitter with Combustible Infrared Sensor
GP-HD	Gas Transmitter with H_2S Sensor
GP-MD	Gas Transmitter with CO Sensor
GP-AD	Gas Transmitter with NH_3 Sensor
GP-ZD	Gas Transmitter with HCN Sensor
GP-DD	Gas Transmitter with NO_2 Sensor
GP-SD	Gas Transmitter with SO_2 Sensor
GP-XD	Gas Transmitter with O_2 Sensor
GP-CD	Gas Transmitter with Cl_2 Sensor

Accessories and Spares

GP-POWER1	120-240 VAC Power Supply
GP-MBUS3	2-wire MODBUS Communication Expansion Module
GP-MBUS3-4	4-wire MODBUS Communication Expansion Module
GP-SEP	Sensor Separation Kit
GP-1	Gas Transmitter
GP-SSPB	Stainless Steel Process Baffle
GP-SSCAL4	Stainless Steel GasPoint Splash Guard
GP-DUC-K1	Duct Mount Adaptor

Replacement Sensor Assemblies

SS-RH02	H_2S	SS-RM02	CO	SS-RA02	NH_3
SS-RZ02	HCN	SS-RD02	NO_2	SS-RC02	Cl_2
SS-RS02	SO_2	SS-RX02	O_2		
SS-RW02	Combustible Catalytic Sensor Assembly				
IR-RW03	Combustible IR Sensor Assembly				

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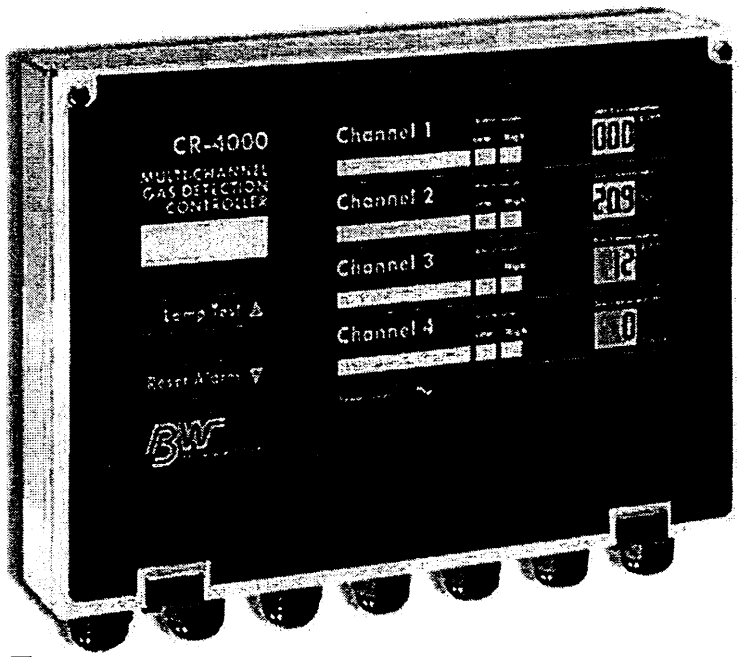
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CR-4000

Four-Channel Controller

6

4-20 mA AC/DC



Print this page

Entirely self-contained, the CR-4000 4-channel, 4-20mA, AC/DC controller provides continuous uninterrupted monitoring and of toxic gases, combustibles and oxygen hazards. The CR-4000 delivers 24 VDC power to any 4-20 mA transmitter.

Application-focused, solution-orientated and competitively priced, the CR-4000 will meet your needs today and in the future. Flexibility is built-in for easy adaptation to changing requirements.

Features

- Individual continuous alphanumeric status LCD for each channel
- Slim profile-- only 2.4 inches (6.35 cm) deep
- Easy installation simply hang on the wall, connect the power (AC or DC) and gas transmitters
- Local 85 dB audible alarm
- Extensive system fault diagnostics
- Programmable alarm levels on each channel
- Mix, match, or change the gases monitored
- Three common, 10-amp SPDT relays (standard)
- LOW, HIGH and fault alarms

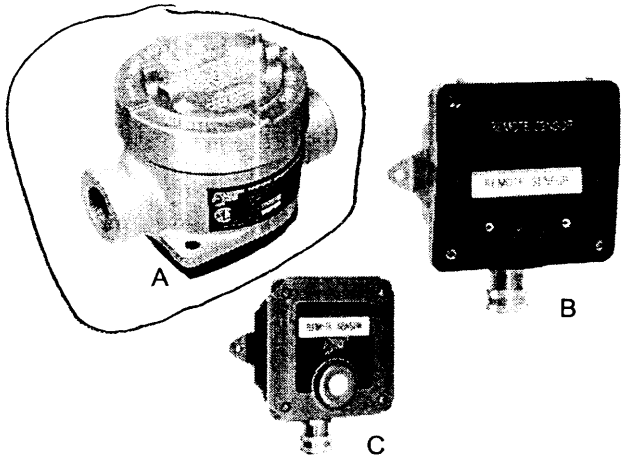
Fixed Equipment

Accessories, Spares and Options

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Accessories and options are designed to meet the special requirements of the individual user, providing the flexibility to work safely and comfortably in diverse working environments. For convenience, accessories are compatible with the different detectors (where applicable).

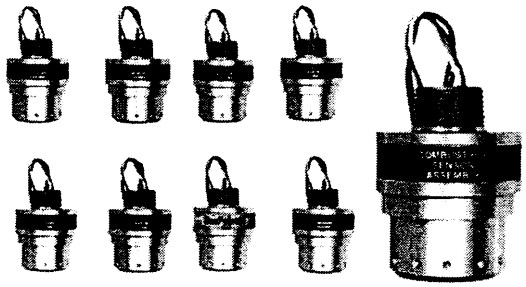


Remote Sensor Separation Kits

All BW standard Sensor Separation Kits can be added at any time. Mount the Separation Kit in difficult to reach locations such as ceilings, under floor grates and in tanks, etc. The Sensor Separation Kits are powered by the transmitters. Transmission distances from the transmitter are listed below.

ORDER and COMPATIBILITY INFORMATION

	Transmitter	*Separation Kit*	*Distance (assumes 22 AWG; 0.64 mm cable)*
A.	GasPoint	GP-SEP	1,548 ft. (472 m) Toxic/O_2 Sensor 619 ft. (189 m) Combustible Sensor
B.	I.S. Plant Rat	UA-SEP-K2	250 ft. (76 m)
	Alarm Rat	UA-SEP-K2	250 ft. (76 m)
C.	CD-420	CD-SEP-K3	250 ft. (76 m)

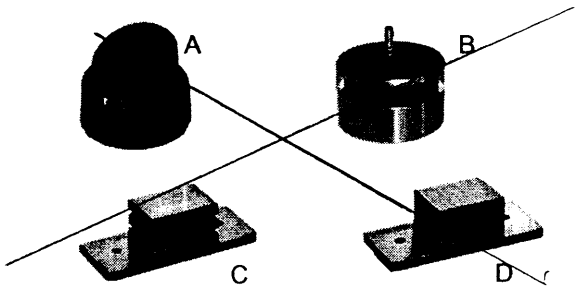


GasPoint Sensor Assemblies

All GasPoint stainless steel Sensor Assemblies are field interchangeable providing the flexibility as field requirements change and evolve.

ORDER INFORMATION *(*Compatible with GasPoints Serial No: 2-000100 up)*

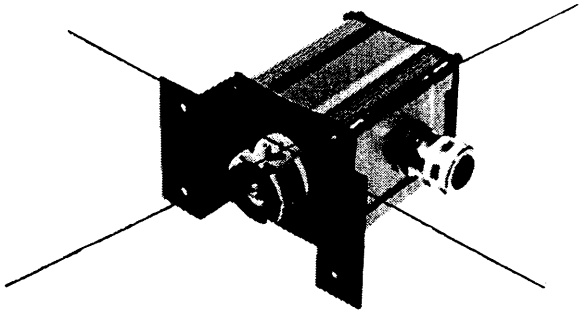
Sensor	*Gas monitored*
SS-RW02	Combustible 0-100% LEL (Catalytic)
IR-RW03	*Combustible 0-100% LEL (IR)
SS-RH02	Hydrogen Sulfide
SS-RM02	Carbon Monoxide
SS-RA02	*Ammonia Sensor
SS-RZ02	*Hydrogen Cyanide
SS-RD02	*Nitrogen Dioxide
SS-RS02	Sulfur Dioxide
SS-RX02	Oxygen



Remote Splash Guards/Calibration Cups and Baffles

	Transmitter(s)	*Order No.*	*Application*
A.	GasPoint	GP-CAL-3	Splash Guard / Remote Calibration Cup (ABS)
B.	GasPoint	GP-SSCAL4	Stainless Steel Splash Guard / Remote Calibration Cup
C.	I.S. Plant Rat Alarm Rat	SG-CAL-1	Splash Guard / Remote Calibration Cup
D.	I.S. Plant Rat Alarm Rat	PB-CAL-1	Process Baffle

Note: Items C & D are anodized aluminum. For use with Cl_2 and ClO_2 sensors, add suffix "-T" for teflon coating



Duct Mount Kit

Designed to monitor hazardous gases in ducts, the easy-to-install Remote Duct Mount kit can be added at any time. The UA-DUC-K2 is equipped with a Duct Mount Adaptor, Remote Calibration Coupler, pre-drilled mounting flanges and a terminal wiring block.

ORDER and COMPATIBILITY INFORMATION

Transmitters	*Duct Mount Kit*	*Distance with 22 AWG (0.64 mm) cable*
I.S. Plant Rat	UA-DUC-K2	250 ft. (76 m)
Alarm Rat		250 ft. (76 m)
CD-420		250 ft. (76 m)

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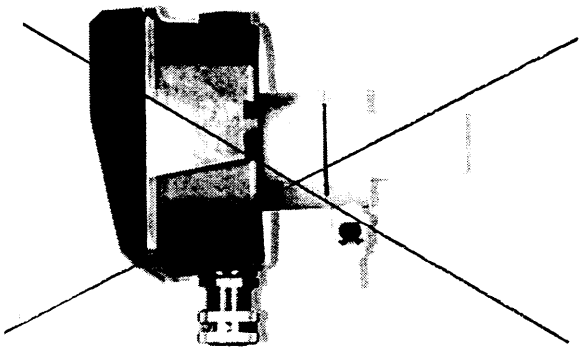
Flue Vessel Mount Sensors *(I.S. Plant Rat/Alarm Rat)*

The I.S. Plant Rat or Alarm Rat models for Flue Vessel Mounting are designed for monitoring hazardous gases in non-pressurized pipes. The flue vessel unit comes complete with quick connect and a remote calibration fitting. The flue vessel adaptor is equipped a 1 in. n.p.t. pipe thread and a plug-in sensor.

ORDER and COMPATIBILITY INFORMATION

Flue Vessel Sensor Units	*Order No.*
I. S. Plant Rat c/w Flue Vessel Sensor	ISPF5-(N/D)(x)(#)
*Sensor Separation Unit	UA-SEP-F5(x)(#)

***Sensor Separation Unit** (I.S. Plant Rat and Alarm Rat) Transmitters and Flue Vessel Sensor Separation Units must be ordered together. Alarm Rat Flue Vessel is available only in a sensor separation unit.*

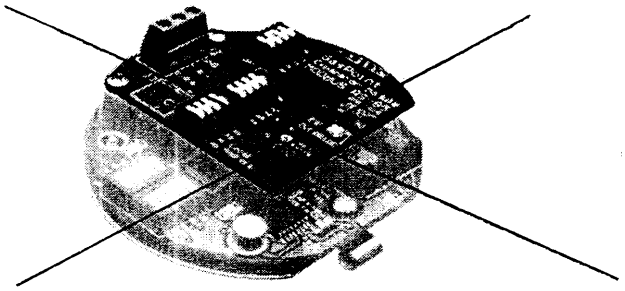


GasPoint MODBUS Communications Module

The GasPoint MODBUS Communications Module is a plug-in card, powered by the GasPoint and provides a MODBUS two-way addressable (1 to 247) communications interface. The RTU-485 output provides status, alarm, fault, relay control, latched alarm control plus other information for operation, troubleshooting or programming the unit.

ORDER INFORMATION (Compatible with GasPoints Serial No. 2-000100 and up.)

Order No.	*Description*
GP-MBUS1	GasPoint MODBUS Communications Expansion Module

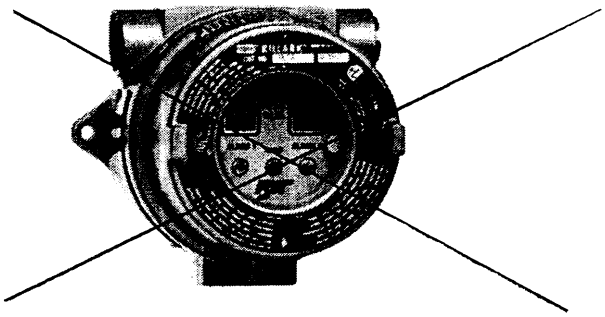


Field Relay Module

The Field Relay Module provides an output to re-transmit the 4-20 mA gas transmitters signal to a central control system or is used as a Controller for a single point system. Equipped with three 5 amp SPDT relays, two field settable alarm levels, the explosion-proof module provides power to the Gas Detector. No calibration is required.

ORDER and COMPATIBILITY INFORMATION
Compatible with all BW fixed monitors.

Order No.	*Description*
FRM-AC	Includes AC power supply (24 VDC) 110 to 230 AC
FRM-1	DC external power requirements 15-28 VDC

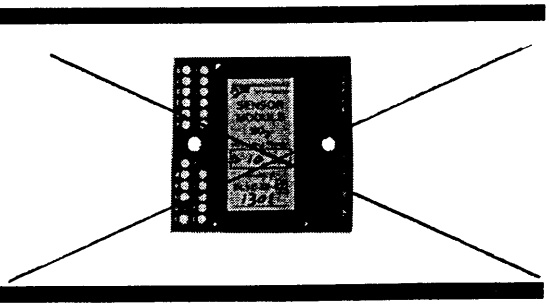


Measuring Range Modules and Sensor Change Kits

To change the Measuring Range or gas sensed, simply plug-in a new gas specific Module to configure the Transmitter to the new range and/or gas. Sensor Change Kits: Order the sensor separately.

ORDER and COMPATIBILITY INFORMATION
For use with I.S. Plant Rat, CD-420 and Alarm Rat only.

Order No.	*Description*
PL(x)S-50-(#)-2	Measuring Range Module (specify gas and measuring range)

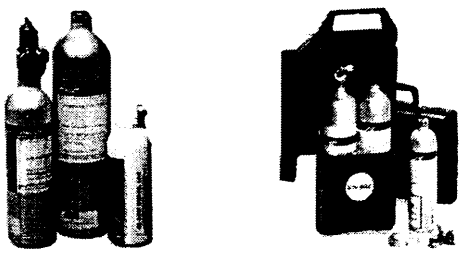


Calibration Gases and Equipment

BW Technologies quality test gases are made to the highest accuracy and trace ability to N.I.S.T. standards. A full range of gases are available in Calibration Cylinders and Calibration Kits.

ORDER INFORMATION For a full list of gases available, contact your local BW Distributor or BW office for type and delivery.

1 X 25 PPM H2S
1 X 58 LITRES METHANE



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Accessories, Spares and Options

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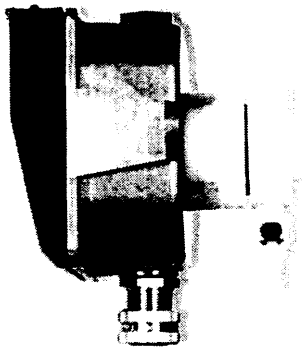
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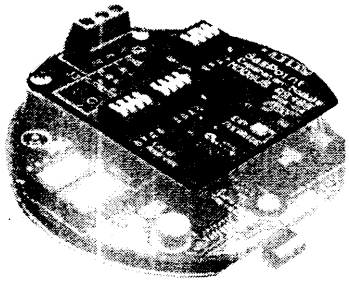


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ORDER INFORMATION (Compatible with GasPoints Serial No. 2-000100 and up.)

Order No.	*Description*
GP-MBUS1	GasPoint MODBUS Communications Expansion Module

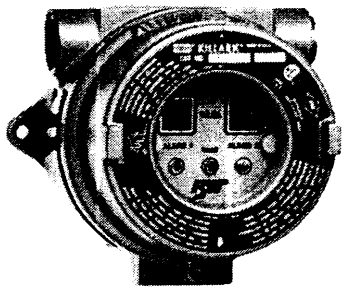


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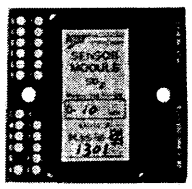


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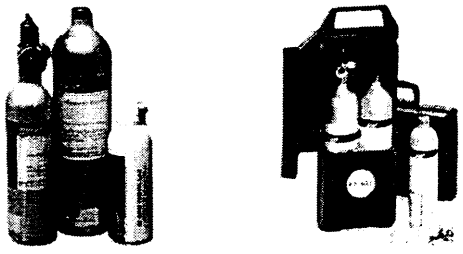
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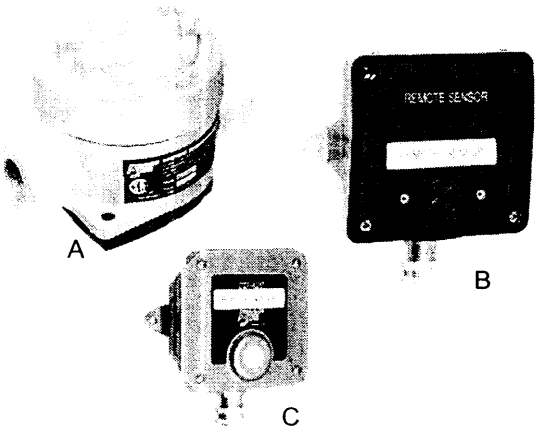
Fixed Equipment

Accessories, Spares and Options

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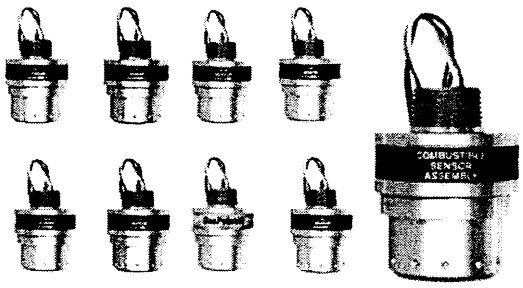


Remote Sensor Separation Kits

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ORDER and COMPATIBILITY INFORMATION

	Transmitter	*Separation Kit*	*Distance (assumes 22 AWG; 0.64 mm cable)*
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B.	I.S. Plant Rat	UA-SEP-K2	250 ft. (76 m)
	Alarm Rat	UA-SEP-K2	250 ft. (76 m)
C.	CD-420	CD-SEP-1	250 ft. (76 m)

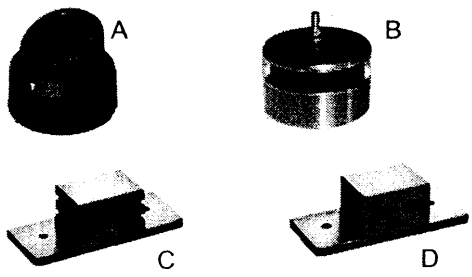


GasPoint Sensor Assemblies

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ORDER INFORMATION (*Compatible with GasPoints Serial No: 2-000100 up)

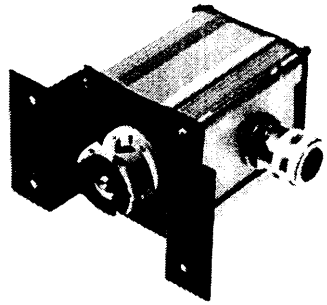
Sensor	*Gas monitored*
SS-RW02	Combustible 0-100% LEL (Catalytic)
IR-RW03	*Combustible 0-100% LEL (IR)
SS-RH02	Hydrogen Sulfide
SS-RM02	Carbon Monoxide
SS-RA02	*Ammonia Sensor
SS-RZ02	*Hydrogen Cyanide
SS-RD02	*Nitrogen Dioxide
SS-RS02	Sulfur Dioxide
SS-RX02	Oxygen



Remote Splash Guards/Calibration Cups and Baffles

	Transmitter(s)	*Order No.*	*Application*
A.	GasPoint	GP-CAL-3	Splash Guard / Remote Calibration Cup (ABS)
B.	GasPoint	GP-SSCAL4	Stainless Steel Splash Guard / Remote Calibration Cup
C.	I.S. Plant Rat Alarm Rat	SG-CAL-1	Splash Guard / Remote Calibration Cup
D.	I.S. Plant Rat Alarm Rat	PB-CAL-1	Process Baffle

Note: Items C & D are anodized aluminum. For use with Cl_2 and ClO_2 sensors, add suffix "–T" for teflon coating



Duct Mount Kit

Designed to monitor hazardous gases in ducts, the easy-to-install Remote Duct Mount kit can be added at any time. The UA-DUC-K2 is equipped with a Duct Mount Adaptor, Remote Calibration Coupler, pre-drilled mounting flanges and a terminal wiring block.

ORDER and COMPATIBILITY INFORMATION

Transmitters	*Duct Mount Kit*	*Distance with 22 AWG (0.64 mm) cable*
I.S. Plant Rat	UA-DUC-K2	250 ft. (76 m)
Alarm Rat		250 ft. (76 m)
CD-420		250 ft. (76 m)

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CR-4000

Four Channel Controller

Installation and Operating Instructions

4-20 mA Fixed Gas Monitoring System

I

"INNOVATORS IN GAS DETECTION"

BW TECHNOLOGIES

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Safety Information - Read First

⚠IMPORTANT

FOR SAFETY REASONS, THIS EQUIPMENT MUST BE OPERATED AND SERVICED BY QUALIFIED PERSONNEL ONLY. READ AND UNDERSTAND THE USER MANUAL COMPLETELY BEFORE OPERATING OR SERVICING.

- ⇒ **Warning: Substitution of components may impair intrinsic safety.**
- ⇒ **The controller warranty will be void if the unit is disassembled, adjusted, or serviced by non-BW Technologies personnel.**
- ⇒ **Do not use the controller if it or any system components are damaged. Inspect the system on a regular basis and keep a log. If the controller is damaged or something is missing, contact BW Technologies immediately.**
- ⇒ **Do not attempt to disassemble, adjust, or service the controller unless instructions are contained in the manual for that procedure and/or that part is listed as a replacement part. Use only BW parts.**
- ⇒ **Do not expose the controller to electrical shock and/or severe continuous mechanical shock.**
- ⇒ **Do not change or charge batteries in a hazardous location. Doing so will impair the intrinsic safety of the controller and may lead to fire or explosion.**
- ⇒ **Warning: Do not disconnect or replace assemblies/equipment unless power has been switched off or the area is known to be non-hazardous.**
- ⇒ **Any rapid up-scaling reading followed by a declining or erratic reading may indicate a gas concentration beyond upper scale limit, which may be hazardous.**
- ⇒ **Electromagnetic Interference (EMI) signals may cause incorrect operation.**

Ratings and Certifications

Symbol	Meaning
	Approved to both U.S. and Canadian Standards by the Canadian Standards Association.
IEC	Certified to IEC (International Electrotechnical Commission)
CE	Conforms to European Union directives

International Symbols

Symbol	Meaning
	Protective Earth Conductor Terminal (Ground)
	Caution (consult all accompanying documents, product labels and markings)
	Recyclable
	Waste Disposal

Contacting BW Technologies

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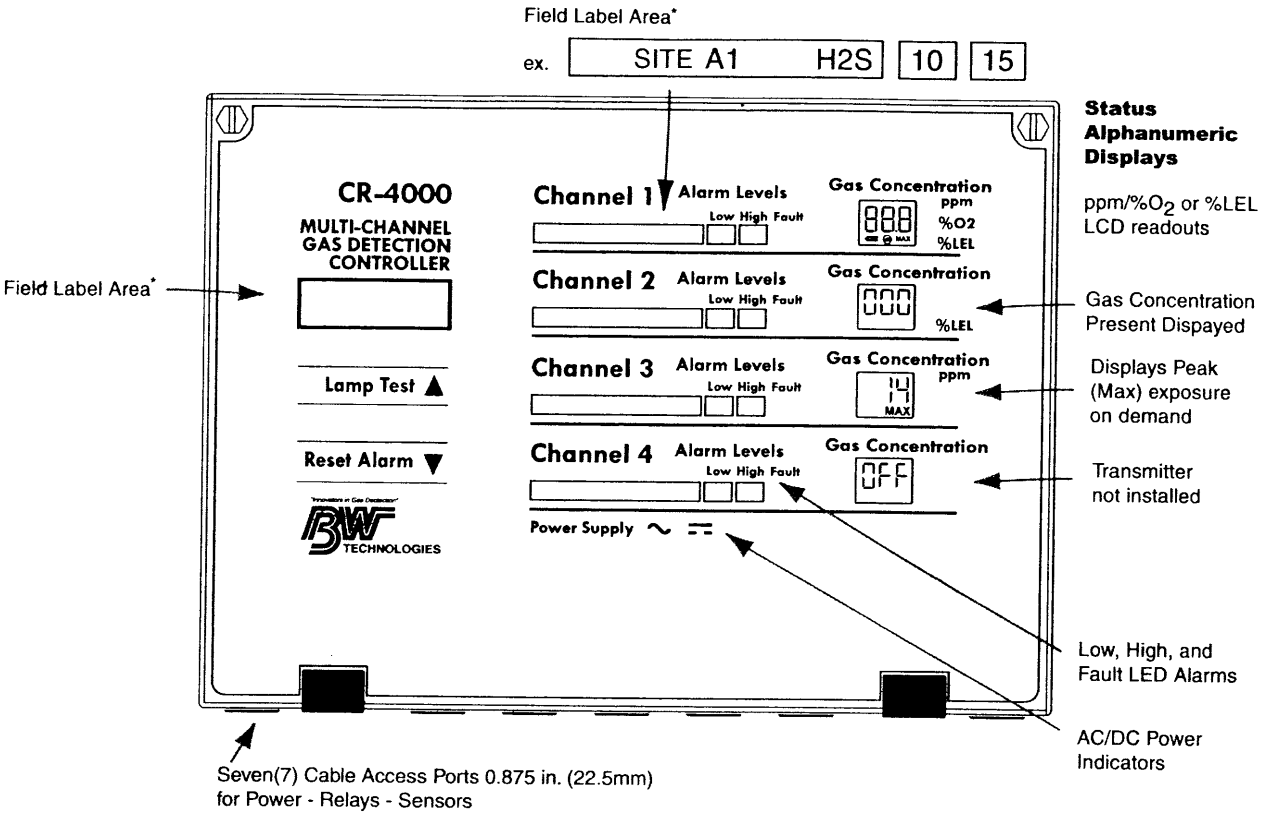
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Installation and Operating Instructions

Figure 1: Elements Drawing



*Field Label Areas: White Blank areas provided for customer to label.

***NOTE:** White area blocks provide space for the customer to label the Controller for field specific information: General Controller Label, Three Labels per Channel (General and Low/High Alarm setpoints).

COMPATIBILITY

The CR-4000 Controller has a direct linear isolated output making it compatible with almost all 4-20 mA gas transmitters, as well as the following BW Technologies Transmitters:

- GasPoint
- GasPoint IR
- I.S. Plant Rat
- CD-420 Series
- ToxyPoint
- RRJ-sensor/transmitters

INTRODUCTION

The CR-4000 is a microprocessor based four-channel controller with four independent LCD displays. Each individual channel is capable of measuring and controlling commonly used gas detectors with 4-20 mA output with varying measuring ranges (see **Channel Select**). The controller channel field selectable switches are programmed for easy setup when selecting the desired measurements. Two dip switches along with a rotary switch are used to set up each channel. The rotary channel select switch is used to select the desired range and type of gas. The two dip switches are used to set the low and high alarm points and configure the audible alarm and relays.

Each LCD display is accompanied with six LED indicators. The LEDs indicate low alarm, high alarm, fault alarm, and gas type (O2, PPM, %LEL). In fault conditions, a special string will be displayed on the LCD indicating open circuit (-OC) for "no gas detector" installed, short circuit (-SC) if the detector is causing a short in the power line of the channel, and fault condition (-FC) if the input signal is below 2 mA.

The audible alarm (two 75dB buzzers) are common to all channels and are activated whenever an alarm condition exists on any channel(s). Each channel can be isolated (disabled) from the common audible alarm, using the AUDIBLE dip switch.

The standard CR-4000 is equipped with: a non-latching, de-energized, common low alarm relay; a latching, de-energized, common high alarm relay; and an energized common fault relay. The controller can be ordered with two optional relays (low and high) per channel. Optional relays are function selectable using the dip switches. Low and high alarm optional channel relays are field selected to function as energized or de-energized and latching or non-latching.

Two front panel touch-pad switches - **Reset Alarm** ▼ and **Lamp Test** ▲ - are used as control switches to acknowledge (alarm reset) alarms and as a general system test. The control switches are also used to calibrate the LCD display (if necessary) and to adjust the alarm set points when in calibration mode.

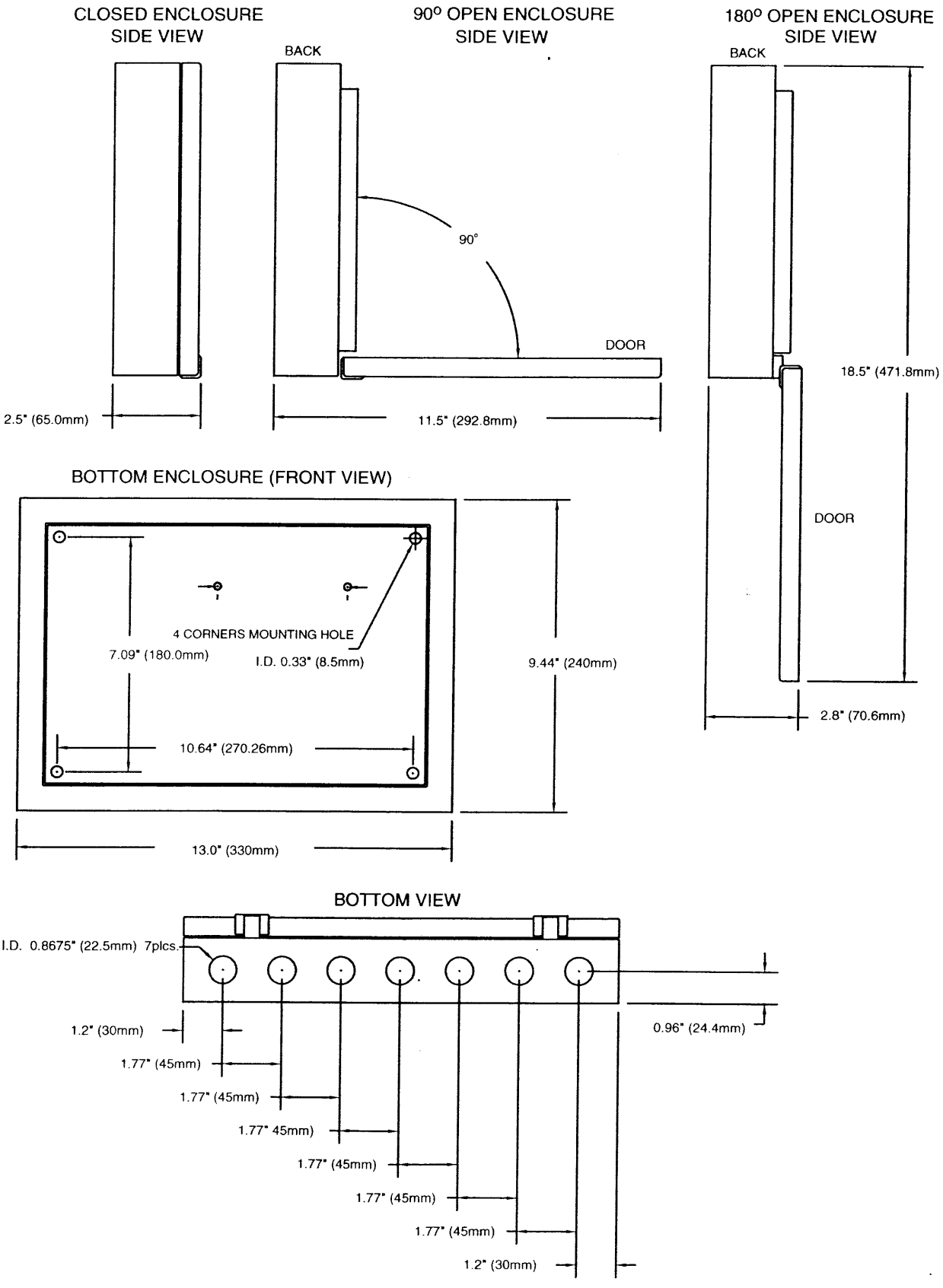
The controller power is field selectable for either 110 VAC or 220 VAC 50/60 Hz or 24 VDC by selecting the position of the power select slide switch. The controller can also operate on external power of 18-28 VDC 1.5A. Optional battery backup (2 x 12V 1.8 amphr. in series) is also available.

NOTE: The power is not field selectable in the Hazardous Location Division 2 version.

Designed for easy installation, the instrument is housed in a slim wall mounted, hinged swing-down door enclosure. All the wiring terminals are located inside, opposite the applicable port for conduit/compression fitting. The RFI/EMI protected enclosure is enameled steel.

Installation

Figure 2: Enclosure Outline Drawing



GENERAL

The CR-4000 Controller is designed for installation in general-purpose or Class I, Division 2 hazardous (provided Division 2 installation rules are followed for Division 2 version) areas. Installation personnel should be qualified technicians. All the required electrical codes and safety standards MUST be observed during installation. If the CR-4000 is to be located in Division 2 areas, see the section **Class I, Division 2 Installation**.

RECOMMENDED: Please use the recommended (supplied) port glands in all unused ports.
CAUTION: Circuit has live terminals - Installation and maintenance should be performed by qualified personnel.

MOUNTING (See Figure 2)

Prior to mounting the Controller, locate a mounting wall where there is minimum vibration, away from local heat with room for ventilation, and within easy reach of operating personnel.

The mounting wall must provide support for the 2.2 kg (4.85 lbs.) Controller. Make sure that the electrical cable/ conduit routing and support are planned. (See figure 2 for cable/conduit port location and enclosure mounting holes.)

1. Remove the two #10 Phillips top screws and open the swing-down door of the Controller. Remove the four small rubber bumpers on the back of the enclosure. Use the four holes as a template to mark the mounting holes location. Drill the wall using the correct drill bit for the preferred screws.

   NOTE: You may remove the front door. First remove the grounding wire from the front enclosure (see **Grounding** below). Then with a small tool depress the lock side of the white hinge pins and pull out. To replace the pins simply line up the hinges and reinsert the hinge pins. Reinstall the grounding wire. (See illustration below.)

2. Replace the four rubber bumpers. Mount the enclosure by inserting the four screws through the rubber bumpers into the wall, thus maintaining the enclosure rating. Secure in place.

   Grounding: Ensure ground (earth) wire is left connected between the lid and the case. Ensure it is installed correctly.

3. Ensure the enclosure is grounded using the 5 mm x 12 mm stud at the bottom left side of the enclosure back.

4. Ensure the enclosure door is grounded using the stud at the bottom left side of the door PCB next to the transformer.

CLASS I, DIVISION 2 INSTALLATION

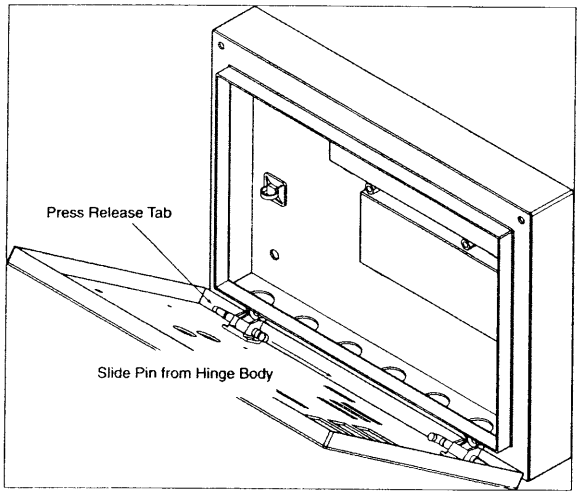
A version of the CR-4000 Controller has been certified for installation in a Division 2 hazardous location. Follow these rules when ordering the Division 2 version.

Conduit or approved hazardous location cables must be used when connecting devices to the Controller.

Approved sealing fittings must be installed within 18 inches (45.72 cm) of the Controller at each port.

Hazardous location cable and sealing fittings must be approved for Class I, Div. 2 Gr. A, B, C, D hazardous locations.

Use approved National Electrical code installation methods.



Installation

Figure 3: System Wiring Diagram

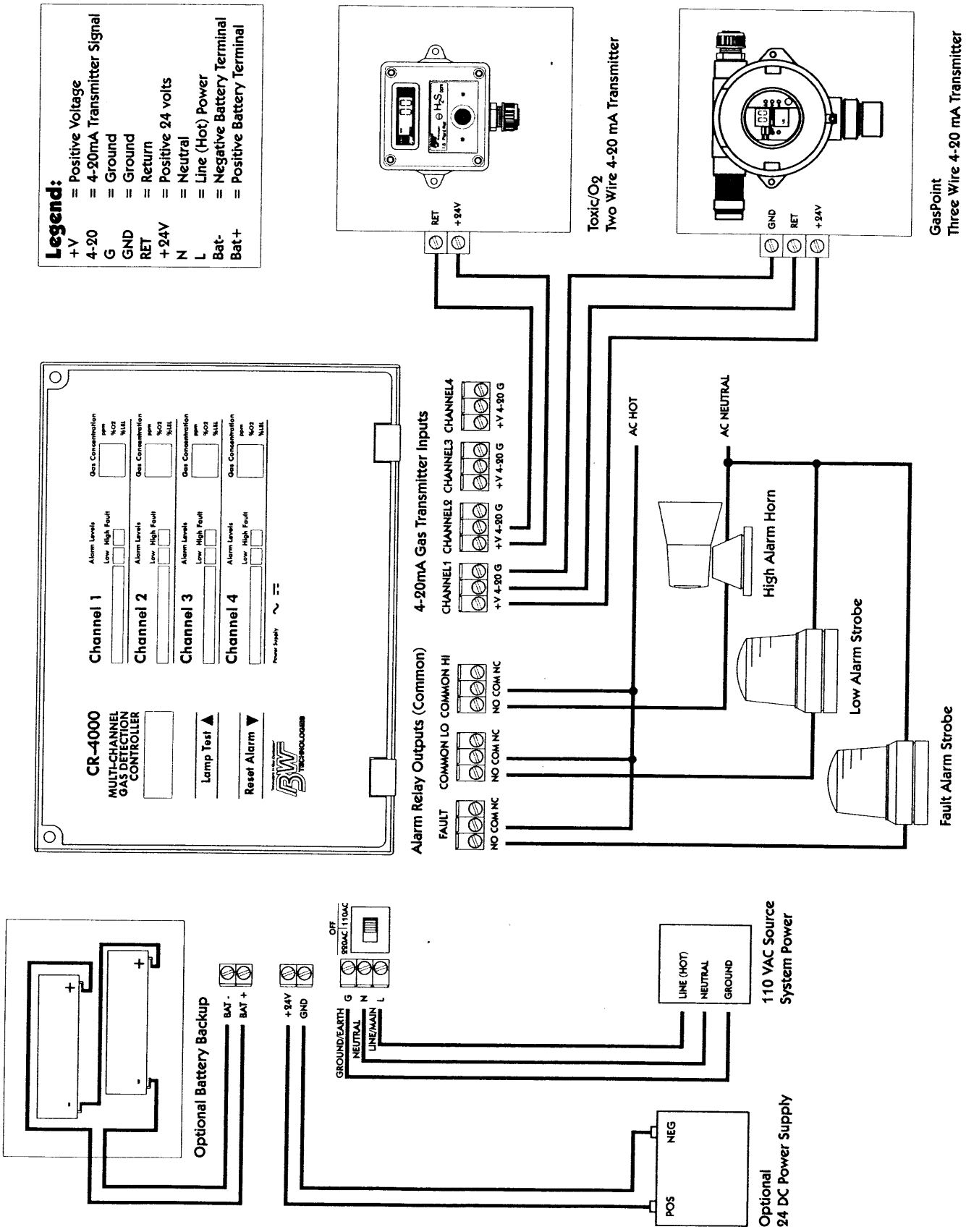
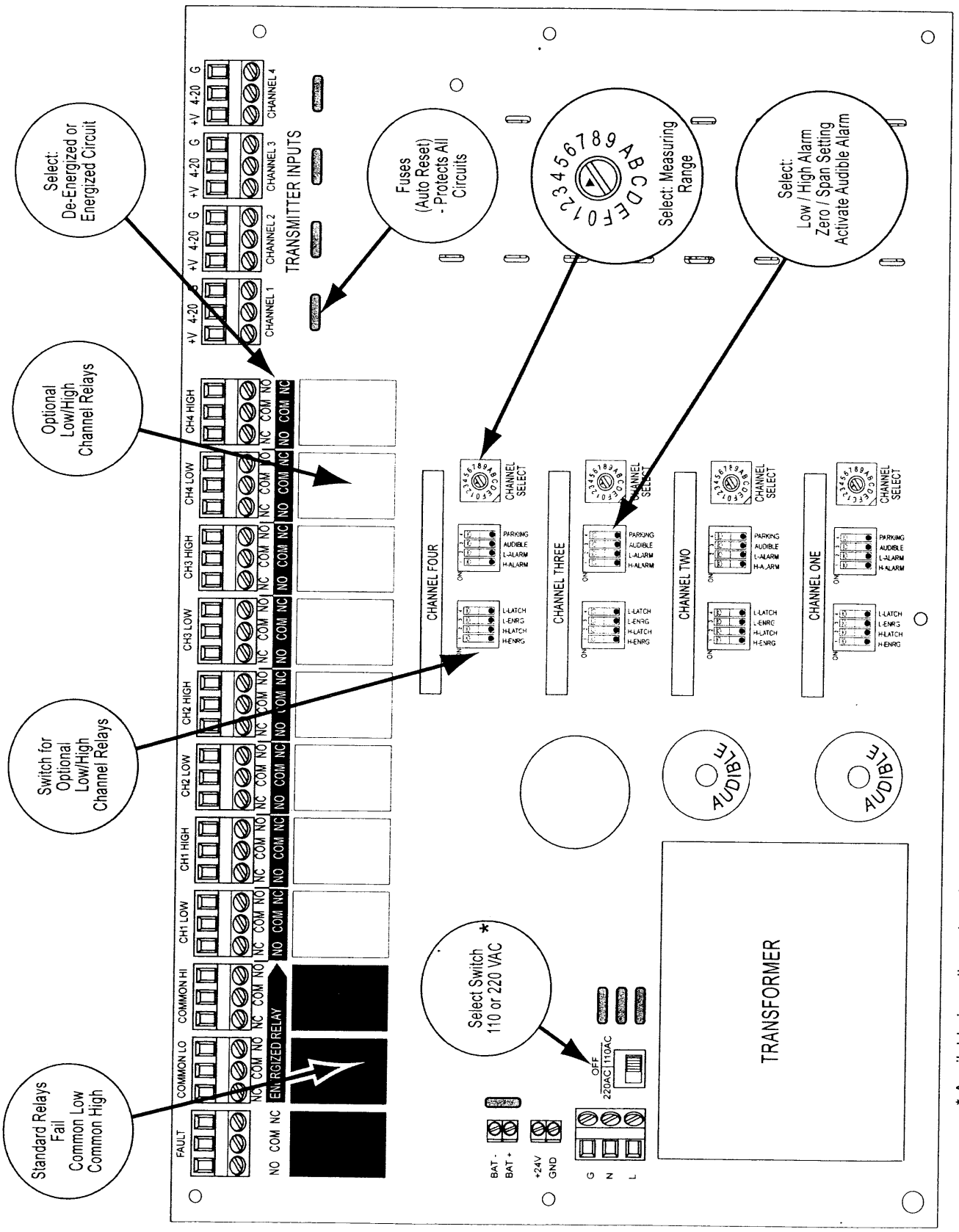


Figure 4: Main Board Elements Diagram



* Available in ordinary location version.

Installation

4-20 mA TRANSMITTER WIRING: (See Figure 3 and Figure 4)

Specifications

Cable Power:	16-20 AWG (dependant on distance)
Relays:	16-22 AWG
Electrical Supply:	115 VAC, 0.18 A; 230 VAC, 0.36 A; 50-60 Hz; 24 VDC, 1.5 A (field selectable)
Controller Resistance:	121 ohm
Wiring Ports:	3.4 inch (1.77 in; 44.98 mm)

NOTE 1: A layout diagram is fixed inside the case. Review it before proceeding.

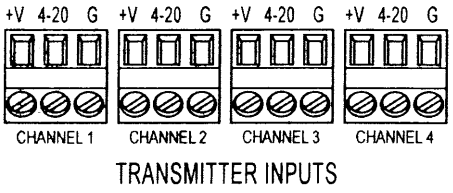
NOTE 2: Extend wiring leads a minimum of 5.5 inches in length inside the unit (see wire cut line in case drawing). **Exception:** Power line, extend a minimum of 9 inches inside the case.

General

The 4-20 mA input of the Controller receives its loop current from +24 VDC supply (+V terminal) built into the Controllers. The DC supply is connected to the transmitter when the transmitter wiring connection is made. The +V terminals are protected by a resettable (auto) fuse and each can handle up to 250 mA of load current.

1. Route the signal cable through the signal port, using the port closest to the selected channel terminal block. Extend the cable until it reaches the selected channel terminal block, (cable length a minimum 5.5 inches (14 cm) inside the unit.) .
2. Use a small, flat screwdriver to loosen the screw on the channel terminal block.
3. Strip approximately 5/16 inch (8 mm) of insulation from one end of each wire and insert the wire at the assigned terminal. Do not over tighten the terminal screws. The two-wire and three-wire 4-20 mA transmitter wiring is shown in Figure 5 below.

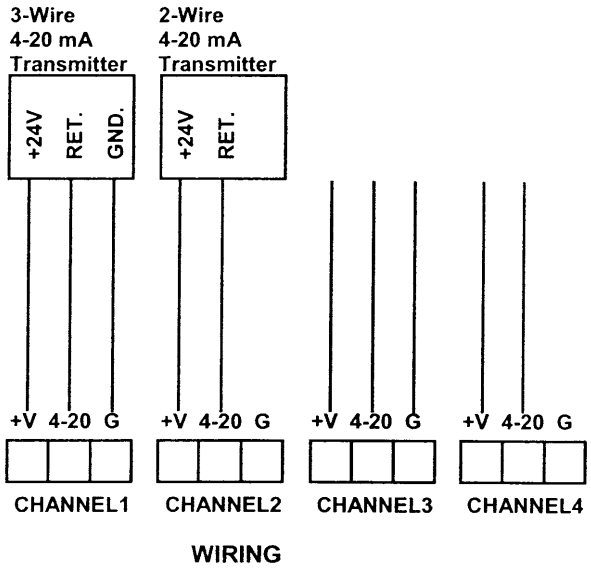
Figure 5: 4-20 mA Wiring Guide



(Board Layout)

3-Wire Transmitter Wiring:
Applicable for any 3-wire, 4-20 mA transmitter and the BW LEL Plant Rat.

2-Wire Transmitter Wiring:
Applicable for any 2-wire, loop-powered, 4-20 mA transmitter and the BW I.S. Plant Rat, CD-420 gas detectors.



POWER CONNECTION

WARNING: To avoid electrical shock, AC power must not be connected to the distribution panel (AC source) until all wiring procedures are completed.

NOTE 1: Be advised that main supply voltage fluctuations are not to exceed 10% of the nominal supply voltage.

NOTE 2: A circuit breaker shall be included in the building installation as a disconnect device for the equipment. The disconnect device shall be installed in close proximity to the equipment and the device shall be marked as a disconnecting means for the equipment.

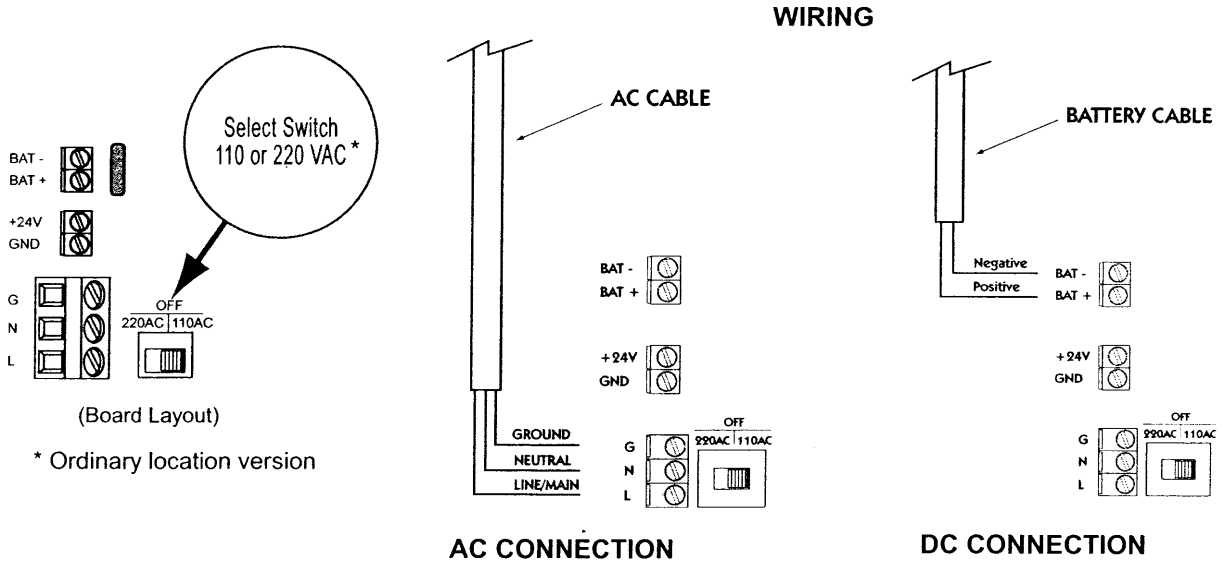
NOTE 3: Before applying power, set up the channel select switches. See page 12.

All power wiring must be in compliance with the requirements of applicable local electrical codes and regulations, as well as industry regulations.

1. Route the power cable through the far left cable/conduit port. Extend the cable until it reaches the AC terminal block.
2. Use a small, flat screwdriver to loosen the screw on the AC terminal block.
3. Strip approximately 5/16 inch (8 mm) of insulation from one end of each wire and insert wire at the assigned terminal. Secure terminal screws (do not overtighten the terminal screws). The AC power connections are made to the three-pin terminal block and are labeled N (neutral), L (line/hot), and G (ground).
4. Secure the wire in the grey cable tray.
5. Select either 110 or 220 VAC power by switching the power slide switch to 110 V or 220 V.
   NOTE 4: You can only select the power on the ordinary location version of the Controller.

NOTE 5: If External DC Power is preferred, the two pin terminal block labeled EXTERNAL +24 VDC can be used.

Figure 6: Power Select Wiring Guide



AUTO RESET

Fuses reset automatically when the circuit power returns to normal. No fuse replacement is required.

RELAY CONNECTION

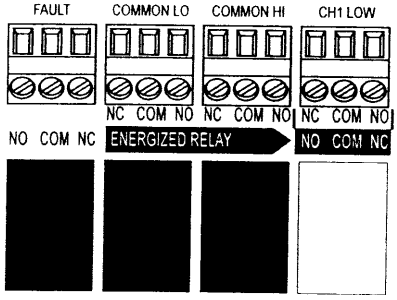
Specifications

Type:	SPDT
Load:	Resistive Load (p.f. = 1)
Rated Load:	10 amps at 120 VAC; 8 amps at 30 VDC
Carry Current:	10 amps
Max. Operating Voltage:	250 VAC; 125 VDC
Max. Operating Current:	10A AC; 8A DC
Max. Switching Capacity:	1250VA, 240W

Four relay wiring ports are provided for your convenience. All Controllers are equipped with three standard relays: common fault; common low alarm, and common high alarm. Individual low and high channel alarms are a factory installed option.

1. Route the relay cable through each relay cable/conduit port. Extend the cable about 5.5 inches. Use a small, flat screwdriver to loosen connection on the relay terminal blocks required.
2. Strip approximately 5/16 inch (8 mm) of insulation from one end of each wire and insert wire at the selected terminal. Secure terminal screws (do not over tighten the terminal screws). The relay connections are made to the three-pin terminal block and are labeled NO (normally open), COM (common), NC (normally closed).
3. Select the configuration your require.

Important: See the **Alarm Relay Configurations** section before wiring optional channel relays to select energized or de-energized relay.



Common Relays

Channel Relay

BATTERY BACKUP

The battery backup is an optional accessory to the CR-4000. Two 12 V, 1.8 Ah, rechargeable, sealed, lead acid batteries are connected in series to supply the 24 V backup. If the battery backup is included in the Controller, the battery wire harness has to be connected to the BAT+ and BAT- terminals during installation (see **Battery Connections** below). The battery backup is being charged all the time when an AC source or DC source is present.

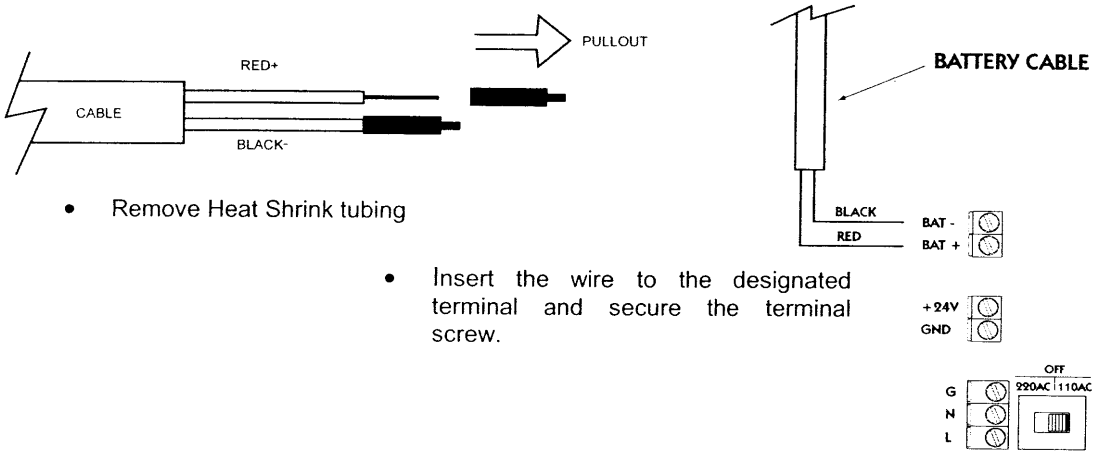
If the DC source is being used and the battery backup is required, the DC supply voltage should be at least equal to or higher than 24 V (27.5 V recommended) to charge the two batteries in series to its maximum capacity.

See **Figure 8: Battery Backup Kit Assembly Drawing** for field installation of optional battery.

BATTERY CONNECTIONS

CAUTION: Pull out the heat shrink tubing from either the red or black wire. The heat shrink tubing has to be removed from each wire (red or black) one at a time to avoid shorting the wires.

Figure 7: Battery Backup Connection



- Remove Heat Shrink tubing
- Insert the wire to the designated terminal and secure the terminal screw.

SETUP

INTRODUCTION

After installation is complete, controller setup must be performed prior to operation. Controller setup includes:

- ▲ selecting the proper sensor types and measuring ranges for each individual channel;
- ▲ low and high alarm settings;
- ▲ LCD zero and span calibration ;
- ▲ alarm relays setting (optional).

The following are the five basic steps of setting up the CR-4000 Controller and should be performed in this order.

A. **CHANNEL SELECT** – The channel select switches are factory set to 0 (zero) position. Setup the channel select switches before applying power to the Controller. (See Table 1 on page 12.)

B. **POWER UP** – Apply power to the controller.

C. **LCD DISPLAY CALIBRATION** – Follow the LCD display calibration procedures to zero and span the LCD of Channel 1. Repeat the LCD calibration for Channel 2, Channel 3, and Channel 4.

D. **ALARM SETUP** – Set the low alarm and high alarm trip-point as outlined in the alarm setup section. Repeat the alarm setup for Channel 2, Channel 3, and Channel 4.

E. **ALARM RELAY CONFIGURATIONS (OPTIONAL)** – If the optional alarm relays are present, follow the alarm relay configurations procedure to setup the low alarm and high alarm relays.

A. CHANNEL SELECT

Set or change the gas measuring range by rotating the channel select switch - with the provided screwdriver - until the pointer of the rotary switch is positioned to the selected measuring range as described in the table below.

1. Identify the measuring range of the 4-20 mA transmitter installed to the Channel 1 terminal connection.
2. Setup the measuring range of the channel as described by channel select.
3. Repeat step #2 for Channel 2, Channel 3, and Channel 4.
4. If there is no transmitter installed to the channel terminal connection, leave the channel select switch at position 0 (zero).

Switch position to 0 (zero): If the channel select switch is positioned at zero, the power of the terminal connection is disabled and the LCD displays **OFF**.

Sample



0 - OFF



A - 0 to 200 ppm

Table 1: Measuring Range Selection

Switch Position (Arrow Point)	LED Gas Indicator	Range	Display/Resolution
0	None	None	OFF
1	O_2 (% by vol.)	0-25 (% by vol.)	0.2 (% by vol.)
2	%LEL	0-100%	1%
3	PPM	0-1.0	0.1 ppm
4	PPM	0-5.0	0.1 ppm
5	PPM	0-10	1 ppm
6	PPM	0-10.0	0.1 ppm
7	PPM	0-20	1 ppm
8	PPM	0-50	1 ppm
9	PPM	0-100	1 ppm
A	PPM	0-200	1 ppm
B	PPM	0-500	5 ppm
C	PPM	0-1000	5 ppm
D	PPM	(Multi) 0-20mA	On
E	None	(Smoke) 0-20mA	On
F	N/A	N/A	N/A

NOTE 1 (Multi-Gas (0-20 mA) Application): For future use.

NOTE 2 (Smoke Sensing Device (0-20 mA) Application): The smoke sensing device channel is used for devices with high output current in standby or non-alarm condition. Since the output current is too high to zero adjust, the LCD shows **On** when the channel is below the alarm trip-point and displays **AL** when the current of the device goes over the alarm trip-point. When setting the low and high alarm setpoints, the LCD display is the equivalent mA units. If the desired alarm setpoint is 18.5 mA, adjust the display to read 18.5 mA. All alarm indications will react to the detector the same as way it reacts to the 4-20 mA gas transmitter.

B. POWER UP

On power up, the transmitter power of Channel 1 is enabled and the LCD of Channel 1 starts to countdown from 5. After the countdown, the LCD displays the signal level of the 4-20 mA transmitter installed to Channel 1. The startup continues with Channel 2 and so on until all the channels are enabled.

C. LCD DISPLAY CALIBRATION

Since the measuring ranges of the channel select switches are fixed, the LCD reading is normally the equivalent value of the 4-20 mA transmitter measured by the particular channel.

The LCD zero and span adjustments of the Controller are useful to 4-20 mA transmitters that do not have zero and span adjustments and to fine adjust transmitters with significant tolerance between LCD display reading and the measured value of the transmitter.

IMPORTANT: Do the **zero adjust** procedure first before completing the LCD calibration with the **span adjust** procedure.

ZERO ADJUST

1. Setup the calibration dip switches for zero adjust as described below in Table 2.
2. The LCD will alternately display the message **CAL** and the zero value of the transmitter.
3. Apply zero gas to the sensor of the 4-20 mA transmitter. Ambient air can be used as long as there is no surrounding gas present.
4. If the 4-20 mA transmitter is equipped with LCD display and zero/span adjust, adjust the zero of the transmitter until the display reads zero.
5. Press **Lamp Test** ▲ or **Reset Alarm** ▼ located in the front panel of the Controller to increase or decrease the existing value until the LCD of the selected channel reads zero.

SPAN ADJUST

1. Set-up the calibration dip switches for span adjust as described below in Table 2.
2. The LCD will alternately display the message **SPn** and the span value of the transmitter.
3. Apply a known concentration of gas to the sensor of the 4-20 mA transmitter.
4. Press **Lamp Test** ▲ or **Reset Alarm** ▼ located in the front panel of the Controller until the LCD reading of the selected channel is the same as the concentration of test gas being used.

NOTE: It is recommended to use a test gas with a concentration of at least 25% of the full scale of the measuring range.

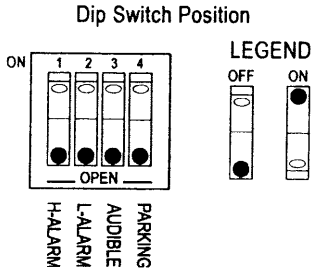


Table 2: LCD Calibration - Dip Switch Position

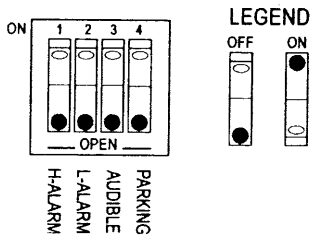
	DIP SWITCH POSITION			
	Alarm 1 (High)	**Alarm 2 (Low)**	**Audible**	**Parking**
Zero Adjust	ON	ON	ON/OFF	OFF
Span Adjust	ON	ON	ON/OFF	ON

A25 - Low 10 High 15

IR - 10 20

D. ALARM SETUP

Each controller channel has a bank of four dip switches to setup the low alarm, high alarm, audible alarm, and parking mode. The alarm trip-point for low and high alarms are adjustable using the corresponding pushbutton switches and the configuration dip switch.



LOW ALARM

To change the low alarm trip-point of the selected channel, toggle the **L-ALARM** dip switch to the **ON** position and the **H-ALARM** to **OFF**. The low alarm LED is turned on to indicate the alarm point is being changed. Press **Lamp Test** ^ or **Reset Alarm** v to increase or decrease the existing value.

HIGH ALARM

To change the high alarm trip-point of the selected channel, toggle the **H-ALARM** dip switch to the **ON** position and the **L-ALARM** to **OFF**. The high alarm LED is turned on to indicate the alarm point is being changed. Press **Lamp Test** ^ or **Reset Alarm** v to increase or decrease the existing value.

AUDIBLE ALARM

The audible alarm is common to all channels of the Controller. Any alarm conditions (low, high, or fault) of any channels will activate the audible alarm depending on the **AUDIBLE** switch position. To isolate the particular channel from the common audible alarm, toggle the **AUDIBLE** dip switch to the **OFF** position. A speaker off symbol is displayed on the LCD to indicate the channel is disabled from the common audible alarm.

PARKING MODE

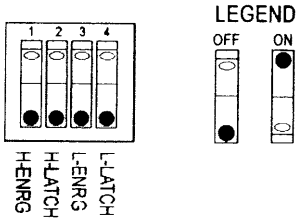
The parking mode is used specifically for the low and high alarm relays. When **PARKING** is selected (switch is **ON**), only one of the relays will be activated if the channel goes into alarm. That is, when the channel alarm condition changes from low alarm to high alarm, the low alarm relay will be deactivated and only the high alarm relay will be activated. If the **PARKING** switch is in the **OFF** position, the low alarm relay will remain activated.

E. ALARM RELAY CONFIGURATIONS (OPTIONAL)

These procedures apply to Controllers with optional relay models only (CR4-R1000, CR4-R1200, CR4-R1230, and CR4-R1234).

Each controller channel has a bank of four dip switches designated to individually control the low alarm and high alarm relays. These control switches can be set to configure the desired relay to function as energized or de-energized, and to operate as latching or non-latching (self-clearing).

Optional Low/High Alarm Relay Dip Switches



When **L-ENRG** is selected (switch is **ON**), the low alarm relay of that particular channel is energized. Two wiring labels for normally open (N/O) and normally closed (N/C) contacts identify the terminal wiring of the relay. Use the label indicated by ENERGIZED RELAY if the energized relay is being selected.

When **L-LATCH** is selected (switch is **ON**), the low alarm relay of that particular channel will operate in latching mode. An alarm condition will activate and latch the selected relay and stay activated even if the channel goes out of alarm.

When **H-ENRG** is selected (switch is **ON**), the high alarm relay of that particular channel is energized. Two wiring labels for normally open (N/O) and normally closed (N/C) contacts identify the terminal wiring of the relay. Use the label indicated by ENERGIZED RELAY if the energized relay is being selected.

When **H-LATCH** is selected (switch is **ON**), the high alarm relay of that particular channel will operate in latching mode. A high alarm condition will activate and latch the selected relay and stay activated even if the channel goes out of alarm.

OPERATION

INTRODUCTION

Simple to use touch pads make the operation easy.

1. Display panel shows the status of the Transmitter
   - Alarms: Low (red), High (red), and Fault (amber)
   - Power: On, AC or DC (green)
   - Gas: Measuring ppm, % O_2, or % LEL
2. To perform a general system test, press **Lamp Test** ⮝ and all (6 per channel) LEDs are illuminated and the audible alarm is activated.
3. To display the maximum gas level detected (MGLD), press **Reset Alarm** ⮟. The **MAX** symbol and the MGLD will be displayed. The maximum gas level is continuously saved and will over write the previous level if a new, higher level is detected. To clear the MGLD, press and hold **Reset Alarm** ⮟ until the display reads **CLr** (approximately 3 seconds).
4. To reset the relay from latching, press **Reset Alarm** ⮟. Once the reset alarm switch is pressed, the alarm is acknowledged and the LED alarm indicator and relay will reset when the gas level drops below the latching alarm set point.

Table 3: LCD Display Symbol/Message

Message	Description
OFF	The channel is off. The channel select switch is positioned to 0 (zero). When the channel is in off mode, the power is not available to the channel power terminal (V+).
-OL	**Overload:** The signal level of the 4-20 mA transmitter is over 20 mA.
-OC	**Open Circuit:** No gas detector is installed. The common fault relay is activated and the LED fault indicator is turned on.
-SC	**Short Circuit:** The gas detector installed is causing a short in the power line of a particular channel. The common fault relay is activated and the LED fault indicator is turned on.
-AL	Channel in alarm if in smoke detector mode.
-FC	**Fault Condition:** The signal level of the 4-20 mA transmitter is below 2 mA. The common fault relay is activated and the LED fault indicator is turned on.
Err	**Calibration Error:** More than one channel is in calibration mode. The **Err** display ensures that only one channel at a time can be set for calibration. To clear the error message, switch **ALARM 1** and **ALARM 2** of the channels not being calibrated to the **OFF** position.
MAX	**Maximum Gas Level Detected (MGLD):** ppm / %LEL / %O2 (lowest level detected).
CLr	Maximum Gas Levels Detected (MGLD) are cleared.
🔇	**Disabled Audible Alarm:** The audible alarm is common to all channels and will be activated if any alarm condition exists. If the **AUDIBLE** switch of the selected channel is switched to the **OFF** position, that particular channel is isolated from the common audible alarm. A speaker off symbol is displayed on the LCD to indicate that channel is disabled from the common audible alarm. **NOTE:** If one of the other channel **AUDIBLE** switches are on, the audible alarm will still activate if that particular channel goes into alarm.
CAL	LCD display in calibrate mode (alternates with zero value of the transmitter).
SPn	LCD display is being spanned (alternates with the span value of the transmitter).

MAINTENANCE

The CR-4000 is designed to provide years of service with only regular care and minimal maintenance. At regular intervals inspect the instrument and check that it is operating normally.

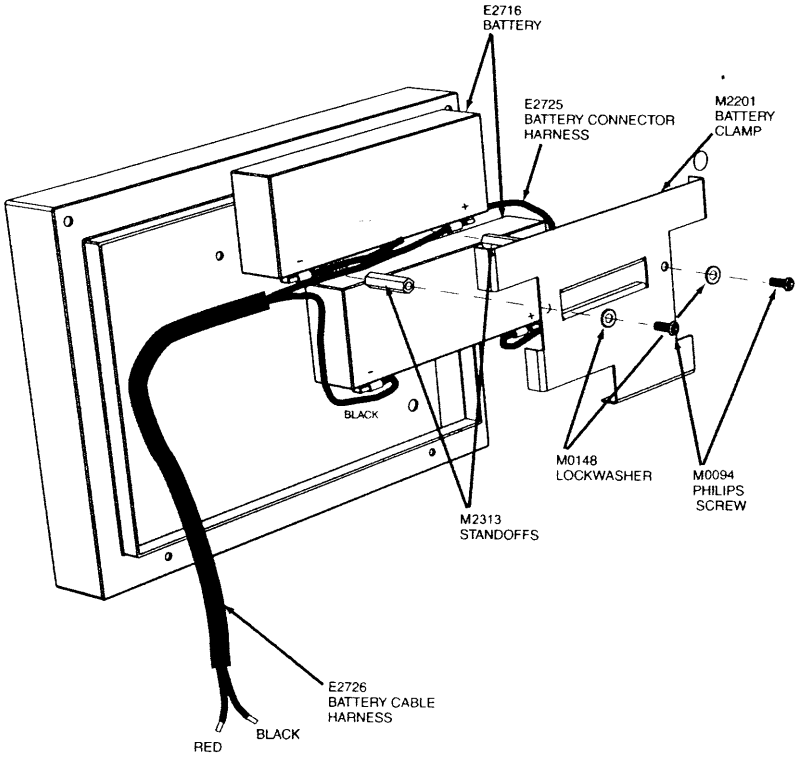
To clean the CR-4000 exterior, wash it with a mild soap and clean water.

Table 4: Troubleshooting Guide

PROBLEM	POSSIBLE CAUSE	SOLUTION
The AC power is activated and the LCD is blank. The LCD backlights are off.	The power slide switch is positioned to OFF.	Position the power slide switch to 110 AC or 220 AC depending on the voltage of the power source.*
The DC power is activated and the LCD shows blank. The backlights are off.	Blown fuse of the DC power supply. The DC power supply has low current rating and cannot handle the load of the Controller.	Replace the fuse of the DC power supply. Replace the external power supply. Make sure the external power supply has a minimum 1.5 A rating.
LCD shows **-OC**. Fault LED indicator is lit.	The 4-20 mA transmitter is not installed. If installed, the wiring is not secured.	Make sure the transmitter wiring is connected properly to the terminal block. Secure the wiring from the terminal block.
LCD shows **-FC**. Fault LED indicator is lit.	The signal from the 4-20 mA transmitter is less than 2 mA. The 4-20 mA transmitter is not calibrated properly.	If the transmitter does not have zero and span adjustment, replace the transmitter. Calibrate the zero and span of the 4-20 mA transmitter.
LCD shows **Err**.	Two or more channels are being calibrated at the same time.	Toggle all the **L-ALARM** and **H-ALARM** dip switches to off except for the channel.
LCD shows **-OL**.	The signal from the 4-20 mA transmitter over 20 mA.	Wait for the sensor to stabilize (common to any biased sensor, e.g., Ammonia).
High LED indicator is lit, common high alarm relay is activated, and the LCD display shows less than high alarm trip-point.	High alarm is latched.	Press **Reset Alarm** ▼ to acknowledge the alarm.
No audible alarm when low or high alarm condition exists. The speaker off icon is displayed.	The **AUDIBLE** switch is set to **OFF**.	Toggle the **AUDIBLE** switch to the **ON** position. The speaker off icon will disappear.
The green DC LED indicator is blinking. **NOTE:** This indicates the power supply of the controller is low (below 17 V).	The Controller is using an external +24 VDC supply and the supply can not handle the load. The Controller is using the backup battery and the battery is low.	Replace the external power supply. Make sure the external power supply has a minimum 1.5 A rating. Recharge the battery backup.

* Applicable in ordinary location version.

Figure 8: Battery Backup Kit Assembly Drawing



Field Installation

1. Assemble as shown in the enclosure.
2. See page 8 for wiring connections.

To replace one of the sealed lead acid rechargeable batteries, remove the old batteries as shown in Figure 8, replace, and reassemble.

Replacement batteries must be lead acid 12 volt, 2.2 Ah. (Rechargeable batteries, Panasonic LCR12V2.2P or equivalent.) Do not use non-rechargeable batteries.

Note

This instrument contains sealed lead acid rechargeable batteries. Spent batteries should be disposed of in accordance with local regulations and guidelines.

Table 5. Replacement Parts

Qty.	Description	Part No.
2	12 volt 2.2 Ah rechargeable battery	E2716
1	Battery clamp	M2201
2	Aluminum hex standoff	M2313
2	Stainless steel lockwasher	M0148
2	Philips screw	M0094
1	Battery cable harness	E2726
1	Battery connector harness	E2725

NOTES

SPECIFICATIONS

Power:	Field Selectable for AC (115 and 230) or DC (24 VDC)
Electrical Supply:	115 VAC, 0.36 A; 230 VAC 0.18 A; 50/60 Hz; 24 VDC, 1.5 A
Optional Back-up:	Rechargeable 12 volt battery kit supplies approx. 3 hours in normal operation dependant on the draw of each transmitter connected.
Fuse Rating:	250 mA @ 30 watts
Fuse Type:	Resettable (Auto)
Environmental:	
Operating Temperature:	-4 to +122°F (-20 to +50°C)
Relative Humidity:	5 to 99% (non-condensing)
Altitude:	Up to 2000 m (6,565 ft.)
Enclosure Rating:	NEMA 12
Physical:	
Dimensions (d x w x h):	2.4 x 13 x 9.5 in. (6 x 33 x 24 cm) approx.
Weight:	4.85 lb. (2.2 kg)
Enclosure:	Enameled Steel RFI/EMI protected
Wire Terminations:	Screw type terminal block
Wiring Ports:	Seven 3/4 in. (22 mm) NPT ports
Mounting:	Wall mounted - equipped with hanging slots and hinged door
Alarms:	Two setpoints - user programmable - with simple rotary switch
Audible:	85 dB buzzer
Relay Outputs:	SPDT Relays Rated Load: 10 amps at 115 VAC; 8 amps at 230 VDC amp Operation Load (Max): 250 VAC; 125 VDC
Alarm Relays:	Standard: One common low gas alarm, de-energized, non-latching One common high gas alarm, de-energized, latching One common fault, normally energized, non-latching Optional: One low gas alarm and one high gas alarm (2) per channel Field selectable energized/de-energized, latching/non-latching; Zoning (Park) function and audible alarm ON/OFF
Display Panel:	Backlit LCDs: Four independent 3-digit alphanumeric status displays %LEL, PPM, or O_2% by vol. readouts (field selectable) LED Indicators: Alarms: Low (red), High (red), and Fault (amber) Power: On, AC or DC (green) Gas: Concentration Icon - ppm, O_2%, and %LEL
Controls:	Two large pushbutton controls: Reset Alarm ▼ (acknowledge, peak exposures) Lamp Test ▲ (audible/visual alarm test) Alarm Setpoints: Simple up/down buttons
Ratings and Certifications:	
Area Classification:	General Purpose/Class I, Division 2 (under proper installation practices) CE: Declared to electromagnetic compatibility directive and low voltage directive. CAN/CSA C22.2 152 ANSI/ISA –S12.13 Part 1 ANSI/UL 913 C22.2 213 ANSI/ISA S82.01; CAN/CSA C22.2 No. 1010-1 IEC 61010-1
Pollution Degree:	2
Installation Category:	II
Warranty:	Two years, non-prorated

DUE TO ON-GOING RESEARCH AND PRODUCT IMPROVEMENT, SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

Limited Warranty & Limitation of Liability

BW Technologies Ltd. (BW) warrants this product to be free from defects in material and workmanship under normal use and service for a period of two years, beginning on the date of shipment to the buyer. This warranty extends only to the sale of new and unused products to the original buyer. BW's warranty obligation is limited, at BW's option, to refund of the purchase price, repair, or replacement of a defective product that is returned to a BW authorized service center within the warranty period. In no event shall BW's liability hereunder exceed the purchase price actually paid by the buyer for the Product.
This warranty does not include:

a) fuses, disposable batteries or the routine replacement of parts due to the normal wear and tear of the product arising from use;
b) any product which in BW's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation, handling or use;
c) any damage or defects attributable to repair of the product by any person other than an authorized dealer, or the installation of unapproved parts on the product; or

The obligations set forth in this warranty are conditional on:

a) proper storage, installation, calibration, use, maintenance and compliance with the product manual instructions and any other applicable recommendations of BW;
b) the buyer promptly notifying BW of any defect and, if required, promptly making the product available for correction. No goods shall be returned to BW until receipt by the buyer of shipping instructions from BW; and
c) the right of BW to require that the buyer provide proof of purchase such as the original invoice, bill of sale or packing slip to establish that the product is within the warranty period.

THE BUYER AGREES THAT THIS WARRANTY IS THE BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. BW SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, WHETHER ARISING FROM BREACH OF WARRANTY OR BASED ON CONTRACT, TORT OR RELIANCE OR ANY OTHER THEORY.

Since some countries or states do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any provision of this warranty is held invalid or unenforceable by a court of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

GasPoint

Gas Transmitter

Installation and Operating Instructions

4-20mA Fixed Gas Monitor

"INNOVATORS IN GAS DETECTION"

BW Technologies

13.2

BW Technologies LP
Calgary, Alberta

ERRATA

GasPoint
118238

The following information has changed in the user manual.

Introduction (page 2)

The LCD is an intuitive user interface, indicating:
- when a toxic or combustible sensor has "failed" its self-test

Changing the Alarm and Calibration Gas Setpoints (page 10)

Table 4. Factory Default Setting - Select Measuring Ranges

Gas Sensed	Units of Measure	Select Measuring Range			Range LO 4 Range HI 5	Alarm Setpoints		Calibration Gas
		Factory Default 4. Open 5. Open	Or Select 4. Closed 5. Open	Or Select 4. Open 5. Closed	Or Select 4. Closed 5. Closed	Factory Defaults (Field Settable)		Factory Default Value Level Expected Note 2
		1	2	3	4	LOW	HIGH	
Hydrogen Cyanide (HCN)	ppm	0 to 20.0	N/A	N/A	N/A	4.7 ppm	10 ppm	17 ppm

Connecting the Controller and Power Supply (page 12)

3. During the countdown to normal operation, the transmitter will communicate with the sensor, determine the sensor type, test the sensor integrity, test all circuitry, and allow the sensor to stabilize before normal operation begins. The transmitter will also determine the sensor range. Once the initialization is complete, the transmitter enters normal operational mode (in the system loop) providing a signal to the controller of the gas present.

Fault Alarm Conditions and Advice (page 17)

Fault Condition	
SENSOR SELF-TEST FAIL (At start-up, the self-test has failed)	

Order Numbers (page 29)

Transmitters c/w Sensor Assemblies and Relays

GP-LD Transmitter c/w hydrogen chloride sensor

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Installation and Operating Instructions

Manufacturer's Notes and Warnings

1. Read the Safety Warnings and Cautions at the beginning of this manual.
2. The GasPoint is fully tested and calibrated in the factory.
   Installation of the GasPoint should be done by qualified personnel.

GasPoint Element Drawings (1a, 1b, and 1c)

Figure 1a: GasPoint Monitor

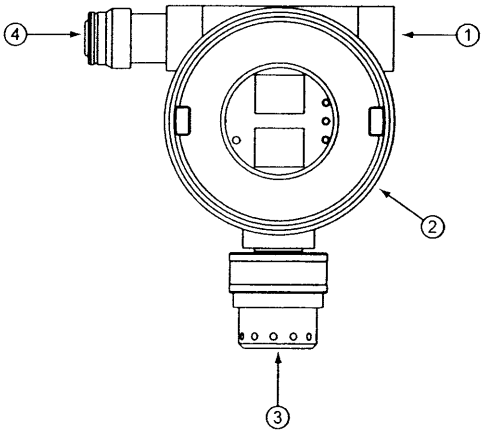


Table 1a: GasPoint Monitor

Item	Description
1	Cable conduit access
2	Explosion-proof enclosure
3	Sensor
4	Calibration pushbutton

Figure 1b: Control Bay

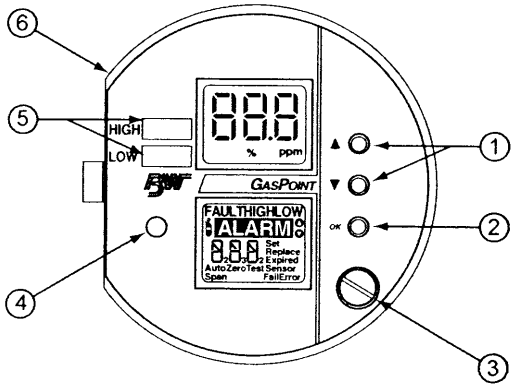


Table 1b: Control Bay

Item	Function
1	Edit buttons: increment/decrement value
2	OK button: access user setpoints, or save displayed values
3	Faceplate security screw
4	Low light sensor
5	High/Low alarm settings: user label
6	Slip hinge

Figure 1c: Liquid Crystal Display

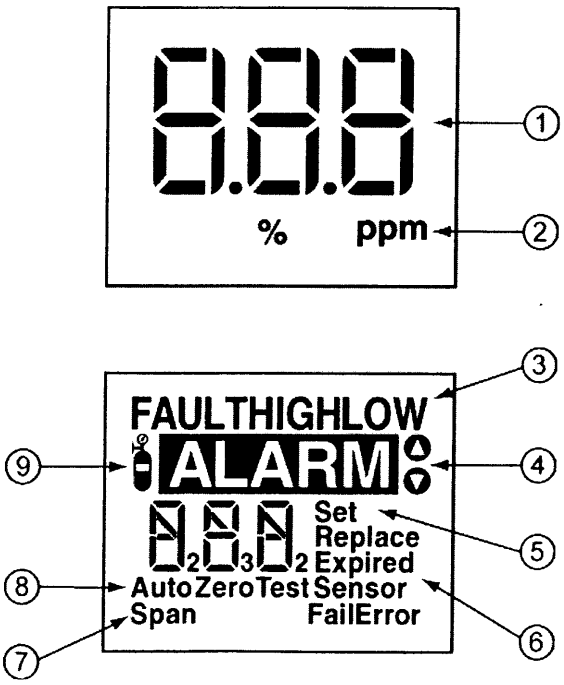


Table 1c: Liquid Crystal Display

Item	Function
1	Numeric reading
2	Units of measure (ppm or %)
3	Alarm level/type
4	Increment/decrement prompt arrows
5	Set value arrow prompts
6	Sensor advice
7	Span advise icon
8	Automatic zero advise icon
9	Apply gas advise icon

Mounting the Enclosure

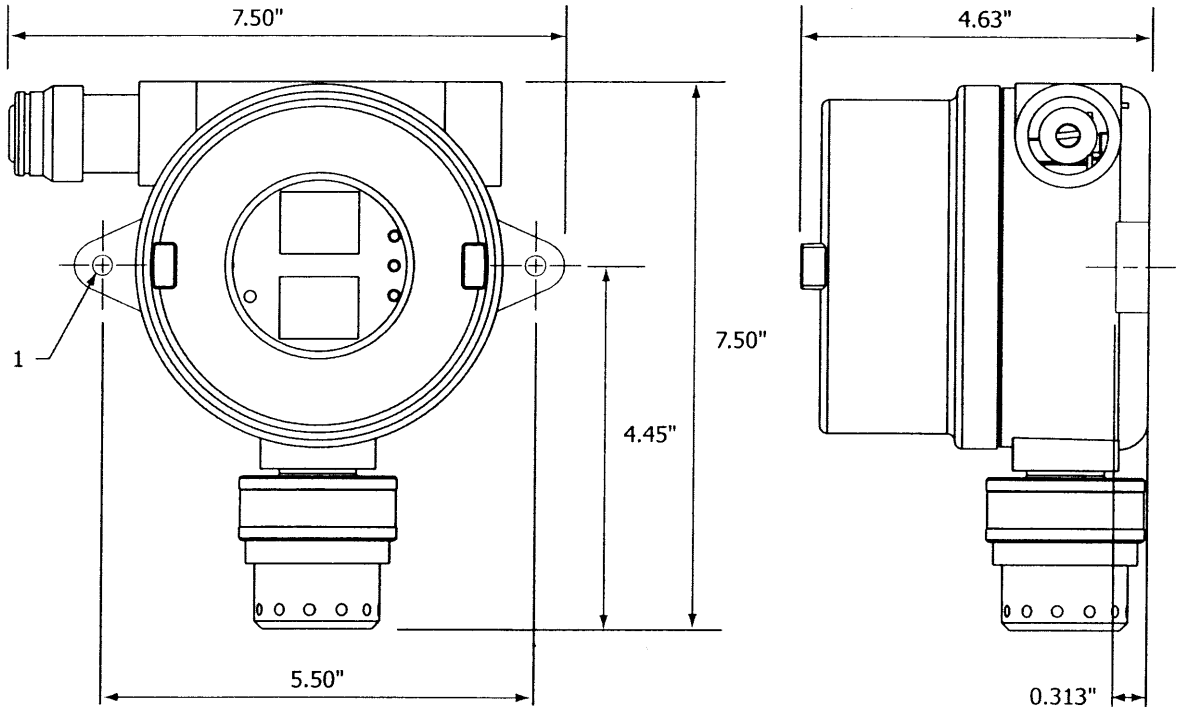
Modular design simplifies the installation of the GasPoint. The Transmitter's main board is mounted to the inner control door, which is equipped with slip hinges. The Transmitter's back enclosure contains the relays and power board and is equipped with a threaded 3/4 inch NPT conduit fitting outlet and pre-drilled mounting flanges. Power and signal lines connect to the plug-in terminal block on the power board. The GasPoint may be disassembled, simplifying the installation.

Recommend: Qualified personnel should perform the installation according to applicable electrical codes, regulations, and safety standards. Ensure correct cabling and sealing fitting practices are implemented.

Install the GasPoint. The predrilled mounting flanges: I.D. 0.25 on 5.5 inch centers.
It is preferable to attach the Transmitter to a wall or bracket, using bolts through the two mounting holes. These mountings, however, may be omitted if the electrical conduit is sufficiently rigid to support the weight of the Transmitter.

Note: The sensor should never be installed pointing upwards.

Figure 2: Outline Drawing



1 Mounting Holes (0.250 inch diameter)

4-20 mA Loop Installation

Cable Routing: Separate cables are required for each GasPoint. In classified areas cable should be in conduit or should be approved hazardous location cable.

Power Supply: Ensure power supply meets the minimum requirements of all components of your system (i.e., alarms, relays, etc.). BW recommends that the power supply be regulated.

Caution: Polarity must be observed. If the RETURN and +24 volt wires are reversed, the GasPoint Transmitter will not work. Do not apply electrical power to the GasPoint until all connections are made, the sensor is in place, and the Transmitter is complete.

1. Remove the GasPoint cover, open the inner hinged control door and remove, if desired.
2. Attach the conduit, if applicable, and pull cable(s) into the enclosure.
3. Connect the 3-pin power terminal block.

   Return (R): 4-20 mA signal to the labeled terminal
   Supply (V): (+) positive (12-32 volts) to the labeled terminal
   Ground (G): Ground wire to the labeled terminal

Note 1: (If using shielded cable) To avoid radio frequency (RF) interference, the shield (including mylar) must be grounded. Simply tying a bare drain wire to ground will not ground a shield. Keeping the shield as short as possible, tie the shield to the internal grounding screw. Tie any unused wires to ground.

Relay Cable Installation

GasPoint is equipped with three relays: low gas alarm, high gas alarm, and fault alarm. Select to connect the applicable relays required in each situation. Relay connections are labeled: NO (normally open), C (common), and NC (normally closed). Attach wires as required to the applicable terminals.

Note 2: The fault relay connections are reversed.

Note 3: Set the alarm dip switches before applying power. Once power is applied, if desired, change the alarm setpoints.

Connecting the Controller and Power Supply

Ensure the GasPoint Transmitter is complete with external cover in place before applying power. Follow the procedures and recommendations in the Control Systems manuals to complete the installation.

1. Ensure the GasPoint is tied to the Controller ground, to the earth ground, and to the negative terminal of the power supply.
2. Attach wires to the Controller and power supply as shown in the wiring diagram.

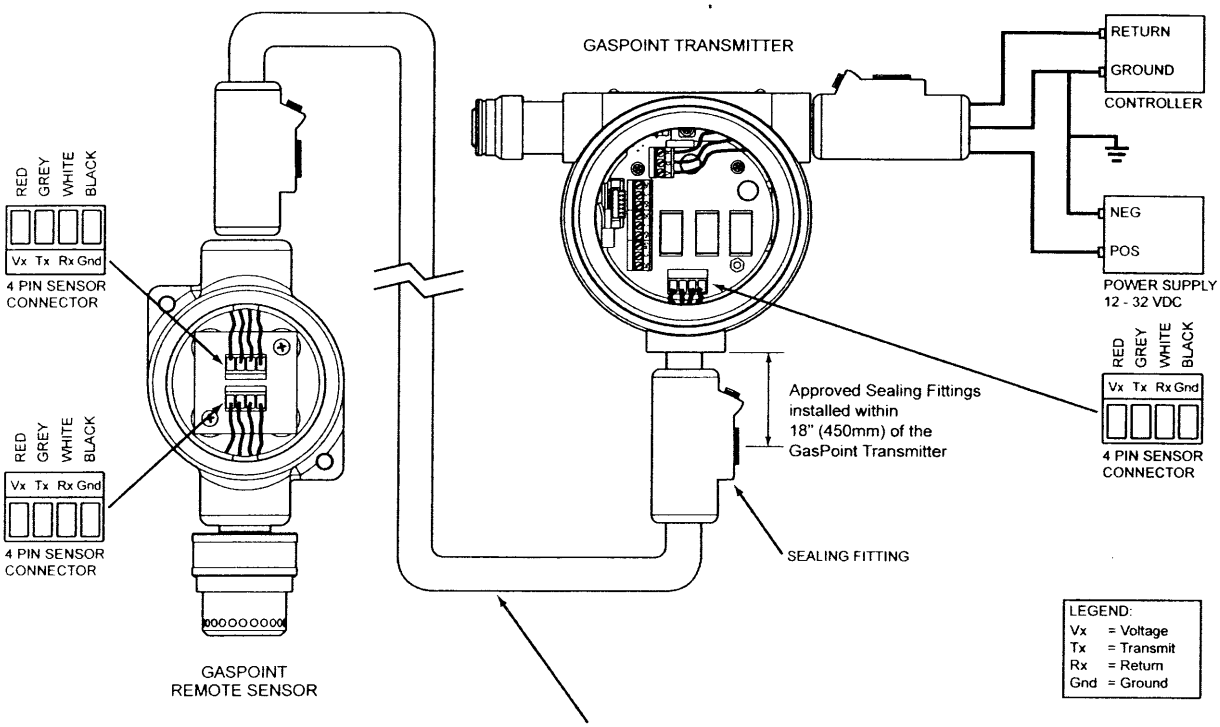
Remote Sensor Separation Kit

The GasPoint sensor separation kit can be mounted at the following distances dependent of the cable size.

Table 3: Distances for Sensor Separation Kit (equipped as follows)

Conductor Size		Catalytic/IR Combustible Sensor		Toxic/O_2 Sensor	
Sq mm	AWG	feet	meters	feet	meters
0.64	22	619	188.5	1,548	472
0.75	20	985	300	2,463	750
1.0	18	1,564	476	3,912	1,174
1.5	16	2,487	758	6,218	1,895

Figure 4: Sensor Separation Kit Wiring Diagram



APPROVED NATIONAL ELECTRICAL CODE INSTALLATION

CONDUIT or **APPROVED HAZARDOUS LOCATION CABLE** connecting the Remote Sensor and Transmitter must have Sealing Fittings at both ends within 18" (450mm) of each unit.

HAZARDOUS LOCATION CABLE and **SEALING FITTINGS** must be approved for Class 1. Div. 1 Gr. B,C,D Hazardous Locations.

Mounting the Sensor Separation Kit Enclosure

1. The separation kit is equipped with predrilled flanges: I.D. 3065 (7.68 mm) on 4.35 in (10.6 mm) centers.
2. Disconnect the wires from the Transmitter terminal block and remove the sensor from the Transmitter. Screw the sensor fully into the separation kit housing and install the wires, as shown on the diagram, to the adjacent terminal block in the separation kit.
3. Install cable as shown. Ensure correct cabling and sealing fitting practices are implemented.

Dip Switch Settings

The dip switches are located on the upper control board. To access the dip switch banks, remove the top of the explosion-proof enclosure, loosen the control board access screw (located just below the buttons), and open the control door which is on slip hinges. The dip switches are clearly labeled.

Caution: The GasPoint must be powered down before removing the outer cover. If it is in a classified area, either remove the GasPoint or declassify the area.

Note: Any latched relay will be released upon one push of the external button.

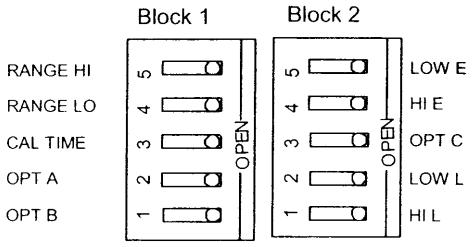


Table 5: Dip Switches

Dip Switch		Function
Block 1: Calibration and Measuring Ranges		
1	OPT B	Not used
2	OPT A	Not used
3	CAL TIME	Calibration wait period Open - 0.5 min. Closed - 6 min.
4	RANGE LO	Set measuring range
5	RANGE HI	Set measuring range
Block 2: Gas Alarm Relay Settings		
1	HI L (High alarm)	Open - Non-latching relay Closed - Latching relay
2	LOW L (Low alarm)	Open - Non-latching relay Closed - Latching relay
3	OPT C	Not used
4	HI E (High alarm)	Open - De-energized relay Closed - Energized relay
5	LOW E (Low alarm)	Open - De-energized relay Closed - Energized relay

Changing the Alarm Setpoints and Calibration Gas Setpoints

The setpoint mode allows the user to change the calibration gas concentration level, the low alarm setpoint, and the high alarm setpoint. See **Select Field Settings** for factory default settings. To change the values:

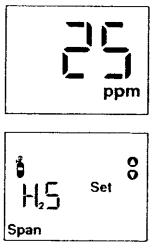
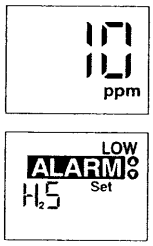
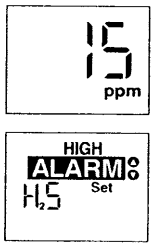
1. Screw off the enclosure top. (Allows access to edit buttons).
2. Press OK button for 2 seconds to access setpoint mode and change factory default settings.

GAS ALARM SETPOINTS:

1. GasPoint is equipped with two setpoints, low and high.
2. If only one setpoint is required, set one level to zero to turn it off. Set the other setpoint as desired.

Note: If both low and high are set to the same value, the GasPoint will trigger a high alarm condition if that setpoint is met or exceeded.

3. To turn off both alarm levels, set both setpoints to zero.

Changing Setpoints	LCD Icons Displayed	Display
CHANGE THE CAL GAS CONCENTRATION LEVEL The LCD will first display the current cal gas concentration value. Press OK to accept the current displayed value or proceed to change the value. **Set new calibration gas level** • Press ▲up button to increase the value. • Press ▼down button to decrease the value. • Press OK button to accept the new value displayed on the screen and end the set calibration gas level. **Note 1:** The factory default span for O_2 is set at 20.9% and cannot be adjusted.	• Numeric display shows current calibration gas value expected • **Set Span** advice flashes • Gas cylinder icon flashes • Up/down arrow icons flash • Gas monitored is constantly displayed	
CHANGE THE LOW ALARM SETPOINT The next screen displays the current low alarm setpoint as shown. Press OK to accept the current displayed value or proceed to change the value. **Set new low alarm setpoint** • Press ▲up button to increase the value. • Press ▼down button to decrease the value. • Press OK button to accept the new low alarm value displayed on the screen. • For O_2, see Note 2 below.	• Numeric display shows current low alarm setpoint • **LOW ALARM Set** advice lights • Up/down arrow icons flash • Gas monitored is constantly displayed	
CHANGE THE HIGH ALARM SETPOINT The next screen displays as shown. **Set new high alarm setpoint** • Press ▲up button to increase the value. • Press ▼down button to decrease the value. • Press OK button to accept the new high alarm value displayed on the screen. • For O_2, see Note 2 below. GasPoint will return automatically to normal operation and display gas currently present.	• Numeric display shows current high alarm setpoint • **HIGH ALARM Set** advice lights • Up/down arrow icons flash • Gas monitored is constantly displayed	

3. **Settings Complete—Verification (optional)**
   Test the GasPoint using a gas cylinder other than the one used in the calibration steps. The gas concentration should not exceed the sensor's detection range. Confirm that the display shows the expected concentration.

Note 2: Oxygen low and/or high gas alarm setpoints can be set to either enrichment and/or deficiency alarms as desired. If the alarm setpoint is set below 20.9% (deficiency alarm), an alarm will be triggered if the concentration present is below 20.9%. If the alarm setpoint is set above 20.9% (enrichment alarm), an alarm will be triggered if the concentration present exceeds 20.9%. You can choose to set both alarms above or below 20.9%, or one alarm above and one below 20.9%.

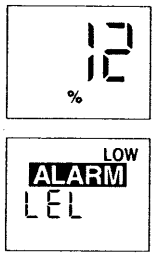
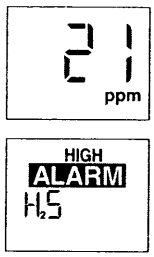
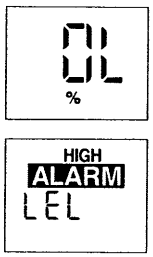
Gas Alarm Conditions and Advice

If the current gas concentration meets or exceeds either alarm setpoint, the GasPoint gas alarm functions will activate.

Note 1: If both or either gas alarm is turned off (set to zero or set to the same value), then no gas alarm condition will exist for that alarm level.

The following alarm advice will activate in any gas alarm condition (low or high):

- The backlight will activate.
- The 4-20 mA loop output will be normal (from 4 to 20 mA according to calibrated values).
- When the alarm condition no longer exists, GasPoint will exit alarm mode and enter normal operations. **Exception:** If a relay is set to the latching position on either low or high gas alarm, the relay will remain on until the alarm is reset (acknowledged). Press the external button to reset the relay.

Alarm Condition	Alarm Relay	LCD Icons Displayed	Display
LOW GAS ALARM The current gas concentration present meets or exceeds the low alarm setpoint. For O_2, see Note 2 below.	Low alarm relay triggers field interface if the relay is connected and a low alarm setpoint is entered.	• Numeric display will show the gas currently present (ppm/%) • **LOW** icon lights • **ALARM** icon flashes • Gas type monitored is constantly displayed	
HIGH GAS ALARM If the current gas concentration present meets or exceeds the high alarm setpoint. For O_2, see Note 2 below.	High Alarm Relay triggers a field interface if the relay is connected and a high alarm setpoint is entered.	• Numeric display will show the gas currently present (ppm/%) • **HIGH** icon lights • **ALARM** icon flashes • Gas type monitored is constantly displayed	
OVER RANGE (over level or over range) GAS CONDITION If the gas concentration present meets or exceeds the full measuring range.		• **OL** icon lights • Gas type monitored is constantly displayed • **Note:** If the alarms are turned off, then no alarm icons will be displayed.	

Note 2: (Also see Note 2 on page 13) An Oxygen alarm level will depend on which alarm setpoints have been set to low and high. The Oxygen low and/or high gas alarm setpoints are user selectable for either enrichment and/or deficiency alarms as desired.

Caution: High off-scale readings may indicate an explosive concentration.

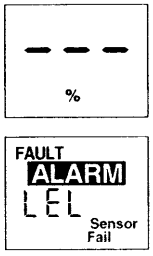
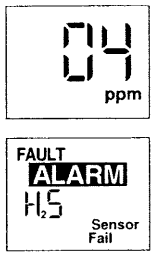
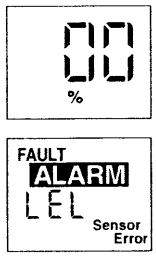
Fault Alarm Conditions and Advice

In the event of a fault condition, the fault alarm will trigger activating any connected field interface. GasPoint will advise which fault condition has occurred.

Under the fault alarm conditions:

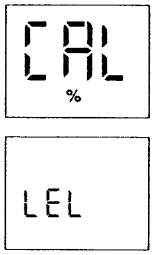
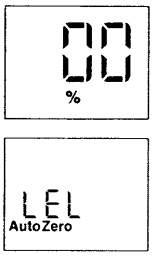
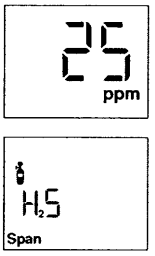
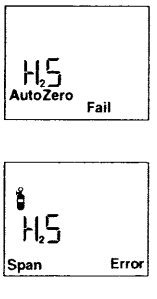
- The non-latching fault relay will be on (de-energized) during a fault condition.
- The backlight will activate.

When the problem is corrected, GasPoint automatically returns to normal operation.

Fault Condition	4-20 mA Output	LCD Icons Displayed	Display
SENSOR SELF-TEST FAIL (The self-test has failed)	2.00 mA	• Three (3) bars will flash on numeric display. • **FAULT** icon lights • **ALARM** icon flashes • **Sensor Fail** advice lights • Gas type monitored is constantly displayed	
SENSOR FAULT (No communication)	2.00 mA	• Numeric display will read the last value (ppm/%) present before sensor fault occurs • **FAULT** icon lights • **ALARM** icon flashes • **Sensor Fail** advice lights • Gas type monitored is constantly displayed	
SENSOR DRIFT	2.00 mA	• Numeric Display will read **00** • **FAULT** icon lights • **ALARM** icon flashes • **Sensor Error** advice lights and flashes • Gas type monitored is constantly displayed	

Automatic Calibration Routine

Calibration can be run at any time during normal operation except the self-test period (from 10 minutes before the self-test until the self-test is complete). Calibration is a one-man operation and virtually automatic.
Note: For calibration gas concentrations and flowrates for each gas, see **Appendix A**.

Calibration Steps	LCD Icons Displayed	Display
START CALIBRATION 1. Press and hold the external button down while the LCD displays the alarm setpoints. Continue to hold the button until the display reads **CAL** (approximately 5 seconds) and then release the button. • The 4-20 mA output will be 3 mA throughout calibration. Calibrating the GasPoint will not cause false alarms at the Controller.	• First, the low and high alarm setpoints will be displayed (8 seconds approximately) • Next, the **CAL** icon lights for 3 seconds • Gas type is constantly displayed • Backlight is activated	
AUTO ZERO 2. The GasPoint will then take a zero level reading. • Combustible and Toxic sensors: If background gas is present, apply zero gas (pure air or 100% Nitrogen) to zero the sensor. Restart the calibration sequence. • Oxygen sensor: Gas is not required. Auto zero sequence will take 30 to 60 seconds.	• Numeric display will read **00** • **Auto Zero** advice flashes • Gas monitored is constantly displayed	
AUTO SPAN 3. Insert cal cap (1) and apply gas to the sensor for approximately 2 minutes (Ammonia 5 minutes). (See **Appendix A** for concentrations and flowrates.) 4. When the countdown (300 to 00) begins, span is complete. Disconnect the gas. • If Span Fails: Check calibration gas cylinder used and concentration expected. Replace the cylinder and/or change the cal gas expected value, if required. Recalibrate. • Oxygen Sensor: Use pure air calibration gas (20.9% O_2) in case of deficient to enriched atmosphere.	• Numeric display will show calibration gas value expected • Gas cylinder icon flashes • **Span** advice lights • Gas type is constantly displayed • After a successful calibration, GasPoint automatically returns to normal operation and displays the current reading (ppm or %) present	
CALIBRATION FAIL OR ERROR **Auto Zero Fail**: If the **Fail** icon lights, the LCD will display a countdown from 300 to 00, before GasPoint begins normal operation. **Auto Span Error**: If the **Error** icon lights, the LCD will display a countdown from 300 to 00, before GasPoint begins normal operation. **Note:** If either fail condition occurs, all previous information values are retained. Retry calibration.	• **Auto Zero:** If the target or an interfering gas is present, GasPoint will refuse to auto zero. The **Fail** icon lights. The **Fail** icon will also light if the external pushbutton is pressed during auto zero. • **Span:** If the calibration gas is not within expected values, the GasPoint will refuse to span. The **Error** icon will light.	

Calibration is complete.

13.2

MAINTENANCE SERVICE

Servicing the GasPoint

Disassembling: Observe all safety and electrical codes and regulations before removing front cover. Unscrew the thumbscrew and open the service bay door.
Assembling: When reassembling the GasPoint, ensure that it is electrically complete. Close the service bay door. Ensure the thumbscrew is aligned and tighten it down. Replace the outside glass cover. Reapply power and reinitialize the Transmitter's power-up procedure (see **Power-Up**). Change the alarm setpoints if desired.
Important: Calibrate the GasPoint whenever a component is replaced.

Sensor Assembly Replacement

To replace the entire sensor assembly:

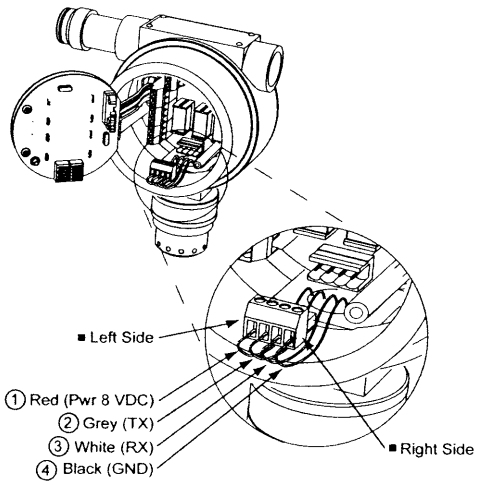
1. Disconnect the wires from the 4-pin plug-in terminal block at J5 on the power board and remove the old sensor.
2. Feed the new wires through the opening. Fully screw in the new sensor. Attach the wires to the plug-in terminal block. Ensure that all colored wires are correctly matched to the board labels from left to right. See Figure 5.

Caution: Check that all connections are correct. Incorrect wiring may damage the sensor and/or the power board.

3. See **Dip Switch Settings** (Table 5) to select a measuring range if required.

For sensor replacement part numbers see **Appendix A**.

Figure 5: Sensor Wiring Diagram



Sensor Wiring Configuration			
#	Board Label	Wire Color	Description
1	Pwr 8 VDC	Red	Power 8 VDC (left)
2	TX	Grey	Transmission
3	RX	White	Signal
4	GND	Black	Ground (right)

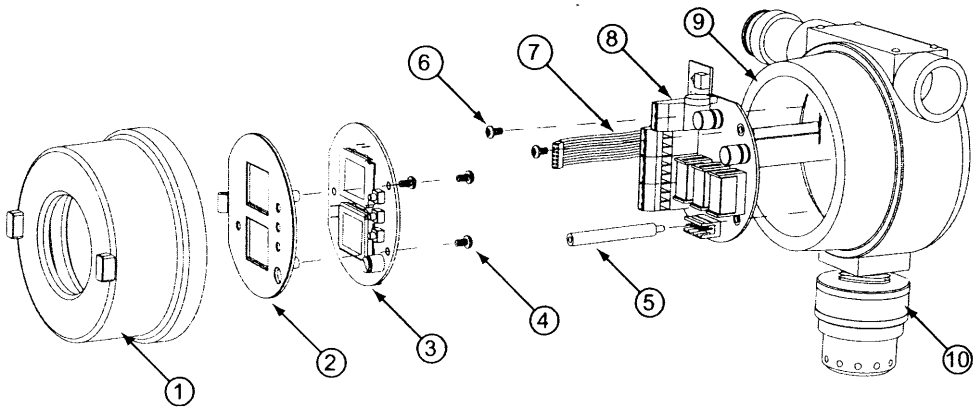
Other Component Replacement

1. Unplug the sensor terminal block from the power board if required.
2. Replace the component, ensuring all wiring connections are complete and reassemble as shown below. (Also refer to the **Installation** section.)
3. Ensure all field selectable options are set (measuring range, etc.).
4. Apply power and reinitialize power-up.
5. Set the alarm setpoints if required.

Table 6: GasPoint Replacement Parts

#	Qty.	Description Rating/TOL	Part #
1	1	External faceplate window cover	M1147
2	1	Internal hinged door faceplate cover	M2345
3	1	Transmitter main LCD board (PCB)	E2737/2
4	3	#6-32 x 1/4 inch machine Phillips screws	M0262
5	1	Threaded stand-off – accepts thumbscrew	M2394
6	2	#6-32 x 1/4 inch machine Phillips screws	M0262
7	1	Plug-in ribbon cable	E2802
8	1	Power/Relay Board (PCB)	E2739/1
9	1	Transmitter housing c/w external switch	M2346K
10	1	Sensor Assembly	Appendix A

Figure 6: Assembly Drawing



13.2

Appendix A

Sensor Information
Sensor Specifications 26
Relative Sensitivity of Combustible Gases 27
Instrument Specifications 28

Relative Sensitivity of Combustible Gases/Vapors

Recommend: For the most accurate measurements, calibrate using the gas or vapor under investigation. Where this is not possible see the applicable catalytic or infrared relative sensitivity table for combustible gases/vapors. The GasPoint catalytic and combustible sensors are calibrated to methane (with 50% methane calibration gas) at the factory prior to shipping.

Catalytic Sensor Relative Sensitivity of Common Combustible Gases/Vapors

Gas/Vapor	Relative Sensitivity	Gas/Vapor	Relative Sensitivity
Methane	100	Carbon monoxide	105
Propane	60	Hydrogen	100
n-Butane	60	Ammonia	125
n-Pentane	50	Cyclohexane	50
n-Hexane	40	Ethylene	85
Acetylene	80		

Note: Each sensitivity has been rounded to the nearest 5%.

Catalytic Bead Combustible Sensor
The table shows the variation of the catalytic combustible sensor on exposure to a range of gases and vapors at the same %LEL concentration. The figures are expressed relative to the methane signal (=100).
The results are intended for guidance only. For a more accurate measurement calibrate using the gas or vapor under investigation.

Special Note on the Combustible Sensor:
Catalytic Poisons - Certain substances have a detrimental effect on all catalytic bead sensors. The GP-WD combustible sensor has a higher degree of poison resistance and will outperform other catalytic bead sensors in poisonous atmospheres. However, catalytic sensors should not be exposed for prolonged periods of time to lead or sulfur containing compounds, silicones, or phosphates. Action is cumulative and may result in an irreversible decrease in sensitivity. Certain other compounds, such as halogenated hydrocarbons and hydrogen sulfide, may temporarily inhibit the sensor performance, but in most cases it will recover after a period in clean air.

Standard Model IR GasPoint Relative Sensitivity to Applicable Combustible Gases/Vapors

Gas/Vapor	Relative Sensitivity	Gas/Vapor	Relative Sensitivity
Acetone	60	n-Hexane	325
n-Butane	450	Methane	100
iso-Butane	450	n-Pentane	390
Butane-1	450	iso-Pentane	390
cis-Butane-2	450	Propane	410
trans-Butane-2	450	Propanol	230
Ethane	450	Propylene	310
Ethanol	330	o-Xylene	100
Ethylene	80	m-Xylene	100
n-Heptane	325	p-Xylene	100
MEK	365*	Methanol	80*
IPA	410*	Toluene	25*
Ethyl Chloride	120*	Mythyl Chloride	100*

* The relative sensitivity is just an estimate.
NOTE: This table is intended for guidance only.
Always calibrate using the gas or vapor under investigation.

Infrared Combustible Sensor
The standard model IR Combustible GasPoint is calibrated to methane. The table shows the variation of the IR (infrared) combustible sensor on exposure to applicable group combustible hydrocarbon gases and vapors at the same %LEL concentration. The figures are expressed relative to the methane signal (=100).
The results are intended for guidance only. For a more accurate measurement, calibrate using the gas or vapor under investigation.
Note: If the hydrocarbon desired is not listed, special models are available for other groups of hydrocarbons.
For IR sensors, use the specified gas to calibrate the system. IR sensors work very well in low or no Oxygen conditions. IR sensors monitors the molar concentration of the specific gases by a physical method. No chemical reaction takes places inside the sensor.
Caution: IR systems should always be calibrated as soon as you install the system to compensate for any change in pressure.

ORDER NUMBERS

Transmitters c/w Sensor Assemblies and Relays

GP-WD	Transmitter c/w Combustible Sensor
GP-IR-WD	Transmitter c/w IR Combustible Sensor
GP-HD	Transmitter c/w Hydrogen Sulfide Sensor
GP-MD	Transmitter c/w Carbon Monoxide Sensor
GP-SD	Transmitter c/w Sulfur Dioxide Sensor
GP-ZD	Transmitter c/w Hydrogen Cyanide Sensor
GP-XD	Transmitter c/w Oxygen Sensor
GP-AD	Transmitter c/w Ammonia Sensor
GP-DD	Transmitter c/w Nitrogen Dioxide Sensor
GP-CD	Transmitter c/w Chlorine Sensor
GP-VD*	Transmitter c/w Chlorine Dioxide Sensor
GP-YD*	Transmitter c/w Hydrogen Sensor
GP-LD*	Transmitter c/w Hydrogen Chloride Sensor
Add Suffix "-SS"	For optional stainless steel Transmitter enclosure

*Contact BW Technologies (page ii) for sensor availability
Note: Sensor Assembly enclosures are stainless steel (standard)

Accessories and Spares

GP-1	Gas Transmitter only c/w LCDs and Relays (No Sensor)
GP-SEP	Sensor Separation Kit
GP-MBUS3	MODBUS Communication Expansion Module
SS-RW02	Combustible Sensor Assembly
IR-RW03	IR Combustible Sensor Assembly
SS-RH02	Hydrogen Sulfide Sensor Assembly
SS-RM02	Carbon Monoxide Sensor Assembly
SS-RS02	Sulfur Dioxide Sensor Assembly
SS-RA02	Ammonia Sensor Assembly
SS-RZ02	Hydrogen Cyanide Sensor Assembly
SS-RD02	Nitrogen Dioxide Sensor Assembly
SS-RX02	Oxygen Sensor Assembly
GP-CAL-3	Non-conductive Remote Calibration Cup and Splash Guard
GP-SSCAL4	Stainless Steel Remote Calibration Cup and Splash Guard
GP-SSPLASH4	Stainless Steel Splash Guard
GPOINT-B	GasPoint Pushbutton protective boot
D1374/4	Manual

Limited Warranty & Limitation of Liability

BW Technologies Ltd. (BW) warrants this product to be free from defects in material and workmanship under normal use and service for a period of two years, beginning on the date of shipment to the buyer.

This warranty extends only to the sale of new and unused products to the original buyer. BW's warranty obligation is limited, at BW's option, to refund of the purchase price, repair, or replacement of a defective product that is returned to a BW authorized service center within the warranty period. In no event shall BW's liability hereunder exceed the purchase price actually paid by the buyer for the Product.

This warranty does not include:

a) fuses, disposable batteries or the routine replacement of parts due to the normal wear and tear of the product arising from use;
b) any product which in BW's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation, handling or use;
c) any damage or defects attributable to repair of the product by any person other than an authorized dealer, or the installation of unapproved parts on the product; or

The obligations set forth in this warranty are conditional on:

a) proper storage, installation, calibration, use, maintenance and compliance with the product manual instructions and any other applicable recommendations of BW;
b) the buyer promptly notifying BW of any defect and, if required, promptly making the product available for correction. No goods shall be returned to BW until receipt by the buyer of shipping instructions from BW; and
c) the right of BW to require that the buyer provide proof of purchase such as the original invoice, bill of sale or packing slip to establish that the product is within the warranty period.

THE BUYER AGREES THAT THIS WARRANTY IS THE BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. BW SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, WHETHER ARISING FROM BREACH OF WARRANTY OR BASED ON CONTRACT, TORT, OR RELIANCE OR ANY OTHER THEORY.

Since some countries or states do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any provision of this warranty is held invalid or unenforceable by a court of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

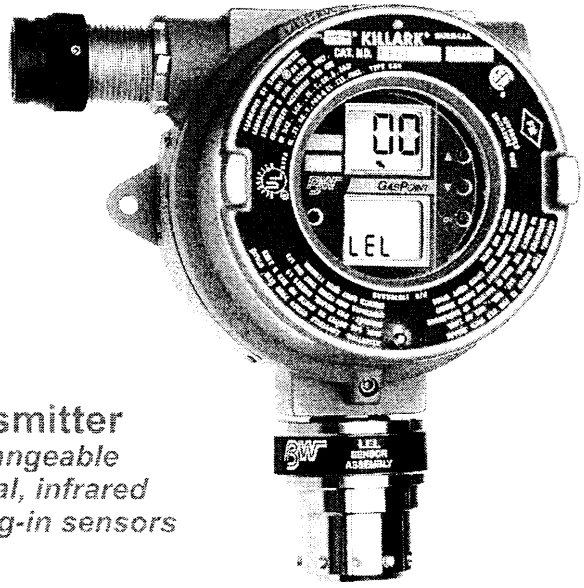
GasPoint

H_2S, CO, NH_3, HCN, NO_2, SO_2, O_2, Cl_2 Combustibles (Catalytic 0-100% LEL) or Combustibles (IR 0-100% LEL)

Gas Transmitter with Internal Alarm Relays

"INNOVATORS IN GAS DETECTION"

BW Technologies



One Transmitter
with interchangeable electrochemical, infrared and catalytic plug-in sensors

ISO 9001

Fixed Gas Monitoring Systems

FEATURES:

The GasPoint transmitter provides a 4-20 mA output signal that can be connected to any control system (DCS, PLC, etc.). With advanced sensor technology and microcontroller based operation, the GasPoint provides continuous monitoring of hazardous gases.

- The GasPoint transmitter can accept any GasPoint sensor type: electrochemical, catalytic or IR (infrared). All plug-in sensor assemblies are field-interchangeable.
- Full function sensor integrity test (auto) continuously advises gas sensing ability and life ended
- Non-intrusive, one-person calibration with auto zero and auto span
- Equipped with three 5-amp relay contacts—two gas alarm relays (low/high) and fault alarm. Field-selectable normally energized/ de-energized and latching/non-latching alarm relay functions.
- Two backlit alphanumeric LCDs advise all environmental and gas hazard conditions as well as instrument and sensor status
- Remote toxic/oxygen sensors can be installed over 3,900 ft./ 1,100 m away; combustible sensors over 1,550 ft./475 m. Kit can be installed at any time.
- Alarm setpoints displayed on demand—simply press the external button
- Field programmable alarm levels
- Backlight (auto) in low light conditions and alarm
- Extensive fault diagnostics
- 2-way digital communication using MODBUS module

Ordering Information

GP-WD	Gas Transmitter w/ Combustible Catalytic Sensor
GP-IR-WD	Gas Transmitter w/ Combustible Infrared Sensor
GP-HD	Gas Transmitter w/ H_2S Sensor
GP-MD	Gas Transmitter w/ CO Sensor
GP-AD	Gas Transmitter w/ NH_3 Sensor
GP-ZD	Gas Transmitter w/ HCN Sensor
GP-DD	Gas Transmitter w/ NO_2 Sensor
GP-SD	Gas Transmitter w/ SO_2 Sensor
GP-XD	Gas Transmitter w/ O_2 Sensor
GP-CD	Gas Transmitter w/ Cl_2 Sensor

Accessories and Spares

GP-POWER1	120-240 VAC Power Supply
GP-MBUS3	2-wire MODBUS Communication Expansion Module
GP-MBUS3-4	4-wire MODBUS Communication Expansion Module
GP-SEP	Sensor Separation Kit
GP-1	Gas Transmitter
SS-RW02	Combustible Catalytic Sensor Assembly
IR-RW03	Combustible IR Sensor Assembly
GP-SSPB	Stainless Steel Process Baffle
GP-SSCAL4	Stainless Steel GasPoint Splash Guard
GP-DUC-K1	Duct Mount Adaptor

Replacement Sensor Assemblies

SS-RH02.....H_2S	SS-RM02.....CO	SS-RA02.....NH_3
SS-RZ02.....HCN	SS-RD02.....NO_2	SS-RS02.....NO_2
SS-RS02.....SO_2	SS-RX02.....O_2	SS-RC02.....Cl_2

www.gasmonitors.com
Email: info@bwtnet.com

(1)
13.3

GasPoint

LEL, H_2S, CO, NH_3, HCN, O_2, SO_2, Cl_2 or O_2

4-20 mA Gas Transmitter

Display advises:

- △ Gas type monitored
- △ Continuous (%LEL, %v/v or ppm) readout of gas concentration
- △ Alarm level and type encountered—LOW/HIGH or FAULT
- △ When sensor has failed its automatic daily self-test
- △ "Sensor Replacement" and "Sensor Expired" indications
- △ When to apply gas during calibration

Special Features

Change gases monitored in the field at any time. The GasPoint Transmitter will recognize the sensor installed and test and reset itself to that sensor type.

No junction box connection required.

Daily sensor integrity test (auto) monitors sensor operation, length of time sensor has been in service and advises when sensor requires replacement.

GasPoint allows you to set or change calibration time and gas alarm setpoints in the field.

Select or modify the measuring range using a simple dipswitch.

The optional plug-in MODBUS expansion module provides an addressable communications interface (1-247).

"INNOVATORS IN GAS DETECTION"

BW Technologies

For further information:
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www.gasmonitors.com

BW1005-01-01-00-8.25x11-5006-3

SPECIFICATIONS

MONITOR: 3-wire, 4-20 mA gas transmitter with advanced microcontroller-based circuitry
Power Input: 12 to 32 volts DC
Output Current: Normal Operation: Isolated linear 4-20 mA output
Calibration Mode: Steady 3 mA (auto reset to normal operation)
Fault Mode: 2 mA signal (and less)
Power Consumption: Toxic Versions: 40 mA at 24 VDC
Combustible Version: 100 mA at 24 VDC
Relays: 50 mA per relay at 24 VDC

SENSORS: Plug-in, smart sensors
Detection Type: Combustible gases: catalytic or IR; Toxic gases and Oxygen: electrochemical
Self-Test:: Automatic daily self-test of sensor integrity and sensor life
Relative Humidity: 5 to 95% RH non-condensing
Drift: Zero: <5% per year; Span: <10% per year

Gas Monitoring Specifications	Detectable Accuracy	LCD Increment	Temperature Range	Units	Programmed Measuring Ranges
Combustibles - Catalytic	1%	1	-40 to +90°C / -40 to +194°F	%LEL	0-100
Combustibles - Infrared	1%	1	-40 to +70°C / -40 to +150°F	%LEL	0-100
H_2S	0.25 ppm	1	-40 to +50°C / -40 to +122°F	ppm	0-20, 0-50, 0-100, 0-500
CO	1 ppm	1	-20 to +50°C / -4 to +122°F	ppm	0-50, 0-100, 0-500, 0-1,000
NH_3	1 ppm	1	-10 to +50°C / +14 to +122°F	ppm	0-200, 0-50, 0-500, 0-1,000
HCN	0.1 ppm	0.1	-20 to +50°C / -4 to +122°F	ppm	0-20.0, 0-50.0, 0-100
NO_2	0.1 ppm	0.1	-20 to +50°C / -4 to +122°F	ppm	0-50.0, 0-10.0, 0-20.0, 0-99.9
SO_2	1 ppm	1	-20 to +50°C / -4 to +122°F	ppm	0-100, 0-50, 0-20, 0-10
O_2	0.1%	0.1	-20 to +50°C / -4 to +122°F	%v/v	0-30.0%
Cl_2*	0.1 ppm	0.1	-20 to +50°C / -4 to +122°F	ppm	0-5.0, 0-10.0, 0-100.0

**Note: Cl_2 not rated for Class I, Div. 1*

CALIBRATION: Non-intrusive, via pushbutton
Auto zero and auto span

DISPLAYS: Two backlit liquid crystal displays
LCD 1 3-digit continuous readout of the gas present (ppm, % LEL or %v/v)
LCD 2 Alphanumeric diagnostic status display

Alarm Setpoints: Two setpoints: user-selectable

RELAY CONTACTS: Three SPDT relays; 5 amps at 250 VAC
LOW/HIGH: Field selectable for normally energized/de-energized and latching/non-latching
FAULT: Normally energized and non-latching

TRANSMISSION RANGES: Relay contacts not considered. (For ranges with relays see manual.)

Conductor Size		Toxic /Oxygen Sensors		Combustible Sensors	
22 AWG	0.64 mm	6,712 ft.	2,045 m	3,356 ft	1,022 m
20 AWG	0.75 mm	10,953 ft.	3,253 m	5,336 ft.	1,626 m
18 AWG	1.0 mm	16,953 ft.	5,167 m	8,476 ft.	2,583 m

CONTROLS: Calibration: Non-intrusive via external pushbutton
Alarm Setpoints: Simple up/down pushbuttons with LCD readout of setpoints

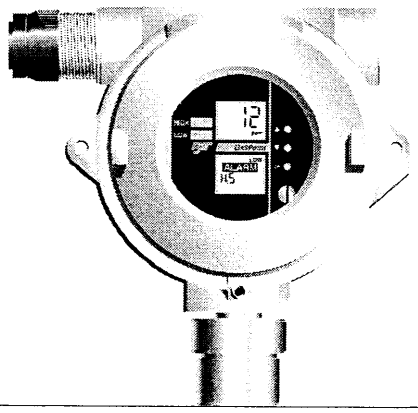
PHYSICAL: Size: 6.8 x 7 x 4.3 inches / 17 x 17.8 x 10.8 cm (approx.)
Weight: 4.85 lb. / 2.2 kg (approx.)
Transmitter: Nema 4, explosion-proof, anodized aluminum enclosure w/ mounting flanges
Sensor: Stainless steel enclosure

WARRANTY: Instrument: 2 years non-prorated; Sensor: 2 years full replacement warranty

DUE TO ONGOING RESEARCH AND PRODUCT IMPROVEMENT, SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

RATINGS AND CERTIFICATIONS: **CSA** Class I, Div. 1, Groups B, C, D; Class 1 Zone 0, Group IIA, IIB, IIC
Explosion Proof: ANSI/ISA: UL 1203; CSA: C22.2 No 30
Combustible Performance Standards: ANSI/ISA: ISA-S12.13; CSA: C22.2 No 152

1. Large, backlit LCD readout of gas concentration
2. Alphanumeric LCD showing transmitter STATUS and diagnostics
3. Non-intrusive calibration via simple pushbutton
4. Interchangeable sensor types: LEL (catalytic or IR), toxic gas or oxygen with common transmitter assembly
5. Three relays: two gas alarm relays, one fault relay



Locally distributed by:

(2)
13.3

GasPoint

Gas Transmitter

4-20 mA Fixed Gas Gas Monitor

Installation and Operating Instructions

"INNOVATORS IN GAS DETECTION"

BW Technologies

Limited Warranty & Limitation of Liability

BW Technologies LP (BW) warrants this product to be free from defects in material and workmanship under normal use and service for a period of two years, beginning on the date of shipment to the buyer. This warranty extends only to the sale of new and unused products to the original buyer. BW's warranty obligation is limited, at BW's option, to refund of the purchase price, repair, or replacement of a defective product that is returned to a BW authorized service center within the warranty period. In no event shall BW's liability hereunder exceed the purchase price actually paid by the buyer for the Product.

This warranty does not include:

a) fuses, disposable batteries or the routine replacement of parts due to the normal wear and tear of the product arising from use;
b) any product which in BW's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation, handling or use;
c) any damage or defects attributable to repair of the product by any person other than an authorized dealer, or the installation of unapproved parts on the product; or

The obligations set forth in this warranty are conditional on:

a) proper storage, installation, calibration, use, maintenance and compliance with the product manual instructions and any other applicable recommendations of BW;
b) the buyer promptly notifying BW of any defect and, if required, promptly making the product available for correction. No goods shall be returned to BW until receipt by the buyer of shipping instructions from BW; and
c) the right of BW to require that the buyer provide proof of purchase such as the original invoice, bill of sale or packing slip to establish that the product is within the warranty period.

THE BUYER AGREES THAT THIS WARRANTY IS THE BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. BW SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, WHETHER ARISING FROM BREACH OF WARRANTY OR BASED ON CONTRACT, TORT OR RELIANCE OR ANY OTHER THEORY.

Since some countries or states do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any provision of this warranty is held invalid or unenforceable by a court of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

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Safety Information – Read First

IMPORTANT

Users of the GasPoint ("the transmitter") require a full understanding of the operating and maintenance instructions. Use the transmitter only as specified in this manual, otherwise the protection provided by the transmitter may be impaired. Read the following **Warnings** and **Cautions** before using the transmitter.

⚠ Warnings

- ⇒ **Do not paint the sensor assembly or the transmitter.**
- ⇒ **Calibrate the transmitter at start-up and BW recommends a calibration check on a regular schedule, once at least every 90 days. More frequent checks or inspections are encouraged to spot problems such as mud collections on the sensor head, accidental painting over the sensor head, etc.**
- ⇒ **Do not use the transmitter if it is damaged. Before you use the monitor, inspect the case. Look for cracks or missing metals or plastics. If the transmitter is damaged or something is missing, contact BW Technologies immediately.**
- ⇒ **Make sure the cover is properly fastened before you operate the transmitter.**
- ⇒ **Use only a sensor assembly specifically designed for your GasPoint model. Refer to Replacement Parts and Accessories.**
- ⇒ **Periodically test the sensor's response to gas by exposing the monitor to a targeted gas concentration that exceeds the high alarm setpoint. Manually verify that visual alarms are activated.**
- ⇒ **Opening the sensor will invalidate the calibration.**

⚠ Cautions

- ⇒ **Do not expose the monitor to electrical shock and/or severe continuous mechanical shock.**
- ⇒ **Do not attempt to disassemble, adjust, or service the monitor unless instructions for that procedure are contained in the manual and/or that part is listed as a replacement part.**
- ⇒ **Do not allow liquids to condense and/or use high power sprays on the instrument.**
- ⇒ **The warranty will be voided if customer personnel or third parties damage the monitor during repair attempts. Non-BW Technologies repair/service attempts void this warranty.**

IMPORTANT

The GasPoint is only to be used for the purposes specified in this manual. BW Technologies' authorized service representatives and parts must be employed in carrying out repairs to the unit in order to maintain the validity of the warranty. Modification of components, use of non-BW parts, or use of incomplete or used parts will also invalidate the warranty.

CAUTION: FOR SAFETY REASONS THIS EQUIPMENT MUST BE OPERATED AND SERVICED BY QUALIFIED PERSONNEL ONLY. READ AND UNDERSTAND INSTRUCTION MANUAL COMPLETELY BEFORE OPERATING OR SERVICING.

Contacting BW Technologies

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ISO 9001

Email us at: info@bwtnet.com
Visit BW Technologies' website at: www.gasmonitors.com

Manufacturer's Notes and Warnings

1. Read the Safety Warnings and Cautions at the beginning of this manual.
2. The GasPoint is fully tested and calibrated in the factory. Installation of the GasPoint should be done by qualified personnel

GasPoint

Introduction

The GasPoint ("the transmitter") provides continuous monitoring of the atmosphere for hazardous gases in the workplace and is virtually maintenance-free. Its revolutionary design utilizes advanced microcontrollers and allows for enhanced diagnostics and fault analysis. Advanced design features make installation and operation simpler than ever, saving you time and money.

The transmitter provides a 4-20 mA output signal which can be connected to any control system (DCS, PLC, etc.). Designed with non-volatile memory, the transmitter has total memory retention.

The pushbutton, non-intrusive calibration can be easily performed by one person with no tools or magnet keys. Normally, only a periodic calibration check is needed to assure dependable performance. The backlight automatically activates in low light conditions and in an alarm condition.

The LCD is an intuitive user interface, indicating the following:

- When a toxic or combustible sensor has "failed" its self-test;
- Gas type monitored and concentration level (%LEL or ppm);
- Alarm level (field settable) and the type encountered (low, high, or fault);
- When to apply gas during calibration; and
- When a toxic or combustible sensor has "failed" its self-test.

The flexibility of the transmitter's modular design affords efficient installation. Wiring of the transmitter itself is straightforward. Field interchangeable plug-in sensor assemblies enable the user to change the gas monitored at any time. The transmitter recognizes the sensor installed and tests and resets itself to that sensor type.

The poison-resistant sensors have the fastest response times available. The transmitter is capable of responding to a momentary puff of gas that would otherwise remain undetected. The sensors have a proven history of reliable, long-term performance and are relatively unaffected by temperature or humidity variations. Gas enters the transmitter's sensor by convection and diffusion through a sintered stainless steel or wire-mesh screened opening.

The transmitter's explosion-proof design allows operation in areas where the combustible gas concentration may exceed the lower-explosive limit (LEL). Its rugged construction ensures a long life span in almost any environment.

The transmitter incorporates the best of both proven and new technologies that offer versatility in addition to reliable safety mechanisms.

Table 1. Ratings and Certification

C SP® US	All gases, except Cl_2, ClO_2, and HCl Approved by CSA (Canadian Standards Association) for use in both the USA and Canada Class I, Div. 1, Groups B, C, D Class II, Groups E, F, G (Toxic only) Combustible Performance Standards: ANSI/ISA. ISA—S12.13 CSA: C22.2 No 152
	GasPoint Cl_2, ClO_2, and HCl Approved by CSA (Canadian Standards Association) for use in both the USA and Canada for ordinary locations
	Approved Non-Incendive for installations in Class I, Division 2, Groups B, C, D Location's when both input power and relay outputs are connected to non-incendive sources not to exceed 32 Vdc (power input) and 24 Vdc (relay output) CSA: C22.2 No.213, UL: 1604

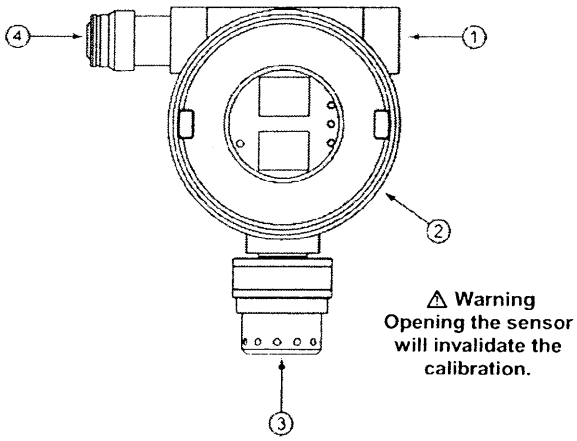


Figure 1. GasPoint Monitor

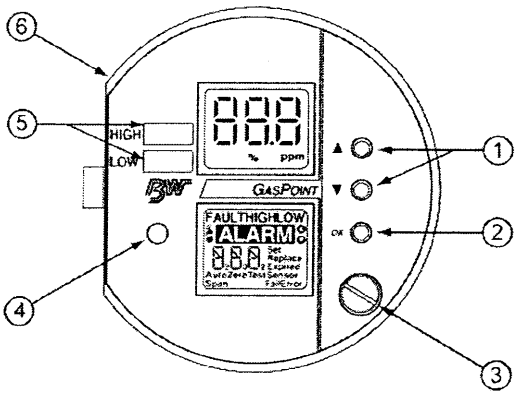


Figure 2. User Interface

Table 2. GasPoint Monitor

Item	Description
1	Cable conduit access
2	Explosion-proof enclosure
3	Sensor
4	Calibration pushbutton

Table 3. Control Bay

Item	Description
1	Edit buttons
2	OK button
3	Faceplate security screw
4	Low light sensor
5	High/Low alarm settings
6	Slip Hinge

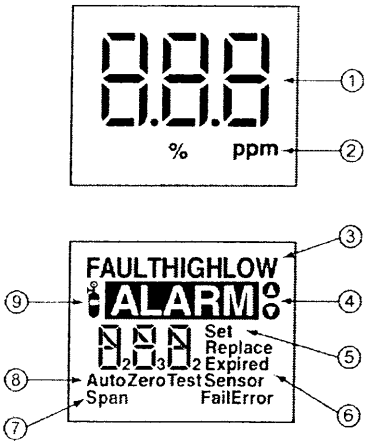


Figure 3. Liquid Crystal Display

Table 4. Liquid Crystal Display

Item	Description
1	Numeric reading
2	Units of measure (ppm or %)
3	Alarm level/type
4	Increment/decrement prompt arrows
5	Set value arrow prompts
6	Sensor advice
7	Span advise icon
8	Automatic zero advise icon
9	Apply gas advise icon

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Installation

Sensor Location

Several factors should be considered when selecting locations to install sensors. The following general suggestions should be considered to assure the detection of the target gas. Select the most suitable location for each sensor.

Air Currents: If there are fans, wind, or other sources of air movement, gases may tend to rise or collect in certain areas of a facility. The local air currents should be assessed to aid in selecting the sensor location. Outdoor situation considerations, such as prevailing winds, should also be accounted for. Air convection can often be more important in determining gas concentrated areas than factors of vapor density.

Vapor Density: When there are no air currents in the area, sensor placement may be affected where the gas (vapor) to be monitored is lighter or heavier than air. For gases lighter than air, BW suggests placing the sensor approximately 12 in. (30 cm) above the level of a potential gas release, or close to the ceiling or roof in indoor installation. For gases heavier than air, BW suggests placing the sensor 12 in. (30 cm) below the release site, or near the floor or ground. Gases with a density equal to air or slightly greater than air tend to rise (particularly when air currents are present).

Gas Emission Sources: As a rule, at least one sensor should be located in close proximity to each point where a leak is likely to occur. This is particularly important when a liquid with a low volatility is being monitored.

Environmental Factors: Designed for rugged outdoor use, consider the following in selecting a location.

- Install sensors where they are protected from wind, dust, snow, water, vibration, and/or shock.
- Observe the operating temperature range of the sensor. Refer to Sensor Specifications.

Mounting the Enclosure

Modular design simplifies the installation of the transmitter. The transmitter's main board is mounted to the inner control door, which is equipped with slip hinges. The transmitter's back enclosure contains the relays and power board and is equipped with a threaded 3/4 inch NPT conduit fitting outlet and pre-drilled mounting flanges. Power and signal lines connect to the plug-in terminal block on the power board. The transmitter may be disassembled, simplifying the installation.

⚠ **Caution: Qualified personnel should perform the installation according to applicable electrical codes, regulations, and safety standards. Ensure correct cabling and sealing fitting practices are implemented.**

Install the transmitter. The predrilled mounting flanges: I.D. 0.25 on 5.5 inch centers.

It is preferable to attach the transmitter to a wall or bracket, using bolts through the two mounting holes. These mountings, however, may be omitted if the electrical conduit is sufficiently rigid to support the weight of the transmitter.

Note: *The sensor should never be installed pointed upwards.*

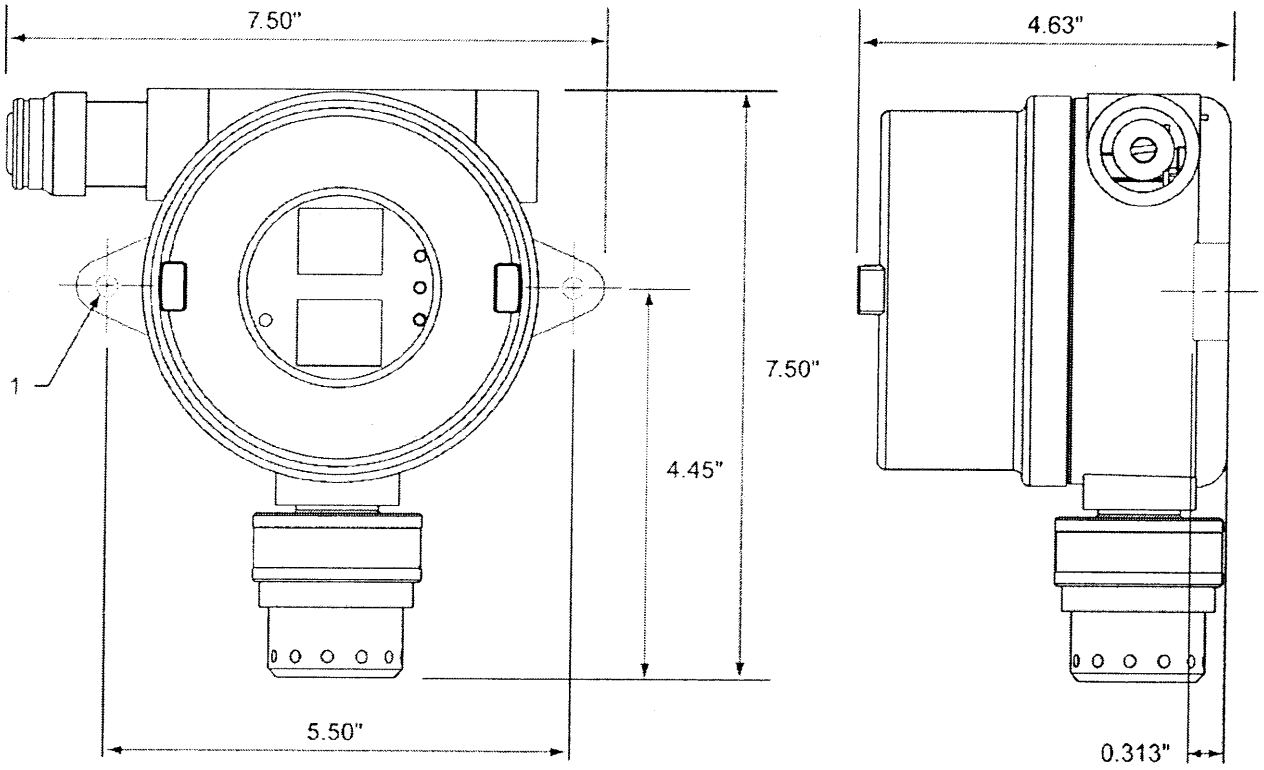


Figure 4. Outline Drawing

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System Design Specifications

Supply Voltage: 12 to 32 volts

Power Consumption: Catalytic Combustible Sensors: 100 mA @ 24 Vdc
IR Combustible Sensors: 75 mA @ 24 Vdc
Toxic/Oxygen Sensors: 40 mA @ 24 Vdc
Relays: 50 mA per relay (150 mA total)

Memory: Non-volatile memory, a battery back-up is not necessary to retain values in the event of power outages.

Loop Resistance: 650 ohms maximum

Cable: 4-20 mA: 3 conductor, 14 to 24 AWG; Relays: 3 conductor, 14 to 24 AWG
Sensor Separation Kit: 4 conductor, 16 to 22 AWG

Relays: 5 amp at 24 Vdc or 115 Vac SPDT; low, high, and fault
Low/High Relays: Field selectable for normally energized/de-energized; latching/non-latching
Fault Relay: Energized; non-latching

Sensor Separation Kit: Transmission distances (see tables below)

Cable Installation

Transmission Range: The distance the 4-20 mA signal can travel is dependent on several factors including the cable gauge. Maximum cable resistance is 650 ohms less the controller resistance.

The tables below assume a constant 24 volt power supply (at 20°C) copper wire and a controller resistance of 250 ohms. The signal range from the controller to the transmitter takes into account the return loop.

Note: *The BW CR-4000 Controller has a resistance of only 120 ohms.*

Table 5. Transmitter with Catalytic/IR Combustible Sensor
(Maximum cable lengths between the controller and transmitter)

Conductor Size		Relays Not Used		One Relay Connected		Two Relays Connected		Three Relays Connected	
Sq mm	AWG	feet	meters	feet	meters	feet	meters	feet	meters
0.64	22	3,356	1,022	2,368	722	1,830	557	1,491	454
0.75	20	5,336	1,626	3,767	1,148	2,910	887	2,371	722
1.0	18	8,476	2,583	5,983	1,823	4,623	1,409	3,767	1,148
1.5	16	13,474	4,106	9,511	4,106	7,749	2,240	5,988	1,825
I_c Current Factor		0.12		0.17		0.23		0.28	

Table 6. Transmitter with Toxic/Oxygen Sensor
(Maximum cable lengths between the controller and transmitter)

Conductor Size		Relays Not Used		One Relay Connected		Two Relays Connected		Three Relays Connected	
Sq mm	AWG	feet	meters	feet	meters	feet	meters	feet	meters
0.64	22	6,712	2,045	3,661	1,115	2,517	767	1,917	584
0.75	20	10,953	3,253	5,821	1,774	4,002	1,219	3,049	929
1.0	18	16,953	5,167	9,247	2,818	6,357	1,937	4,843	1,476
1.5	16	26,948	8,213	14,699	8,213	10,105	3,080	7,699	2,346
I_c Current Factor		0.06		0.110		0.160		0.210	

For other operating parameters use the formula below to establish the transmission range.

Formula: Maximum distance = $\{\{(V_P - V_T)/I_c\}-R_C\}/(2xR_L)$

where:
V_P = power supply voltage (minimum)
V_T = transmitter supply voltage (minimum) 12 volt
I_c = current through conductor (See Table 5 and 6 for factors)
R_C = total controller resistance
R_L = line resistance per 350 m (1,160 ft.)

4-20 mA Loop Installation

Cable Routing: Separate cables are required for each transmitter. In classified areas the cable should be in conduit or it should be an approved hazardous location cable.

Power Supply: Ensure power supply meets the minimum requirements of all components of your system (i.e., alarms, relays, etc.). BW recommends that the power supply be regulated.

⚠ Caution: Polarity must be observed. If the Return and +24 volt wires are reversed, the transmitter will not work. Do not apply electrical power to the transmitter until all connections are made, the sensor is in place, and the transmitter is complete.

1. Remove the transmitter cover, open the inner hinged control door and remove, if desired.
2. Attach the conduit, if applicable, and pull cable(s) into the enclosure.
3. Connect the 3-pin power terminal block.

Return (R): 4-20 mA signal to the labeled terminal
Supply (V): (+) positive (12-32 volts) to the labeled terminal
Ground (G): Ground wire to the labeled terminal

Note: *(If using shielded cable) To avoid radio frequency interference (RFI), the shield (including Mylar) must be grounded. Simply tying a bare drain wire to ground does not ground a shield. Keeping the shield as short as possible, tie the shield to the internal grounding screw. Tie any unused wires to ground.*

Relay Cable Installation

The transmitter is equipped with three relays: low gas alarm, high gas alarm, and fault alarm. Select to connect the applicable relays required in each situation. Relay connections are labeled: NO (normally open), C (common), and NC (normally closed). Attach wires as required to the applicable terminals.

Note: *The fault relay connections are reversed.*
Set the alarm dip switches before applying power. Once power is applied, if desired, change the alarm setpoints.

Connecting the Controller and Power Supply

Ensure the transmitter's external cover is in place before applying power. Follow the procedures and recommendations in the control systems manual to complete the installation.

1. Ensure the transmitter is tied to the controller ground, to the earth ground, and to the negative terminal of the power supply.
2. Attach wires to the controller and power supply as shown in the wiring diagram. Refer to Figure 5.

Remote Sensor Separation Kit

The transmitter sensor separation kit can be mounted at the following distances dependent of the cable size.

Table 7. Distances for Sensor Separation Kit

Conductor Size		Catalytic/IR Combustible Sensor		Toxic/O_2 Sensor	
Sq mm	AWG	feet	meters	feet	meters
0.64	22	619	188.5	1,548	472
0.75	20	985	300	2,463	750
1.0	18	1,564	476	3,912	1,174
1.5	16	2,487	758	6,218	1,895

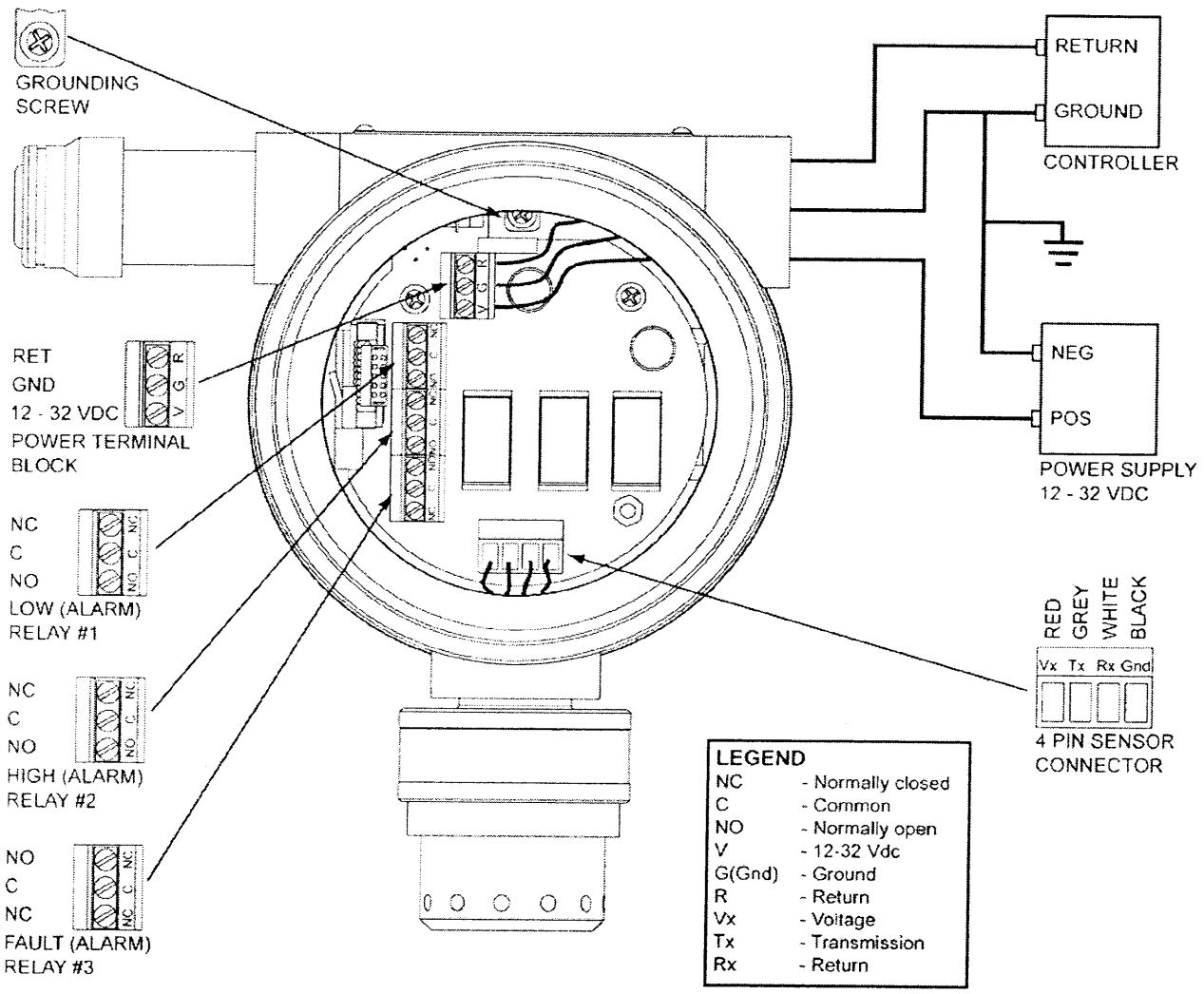
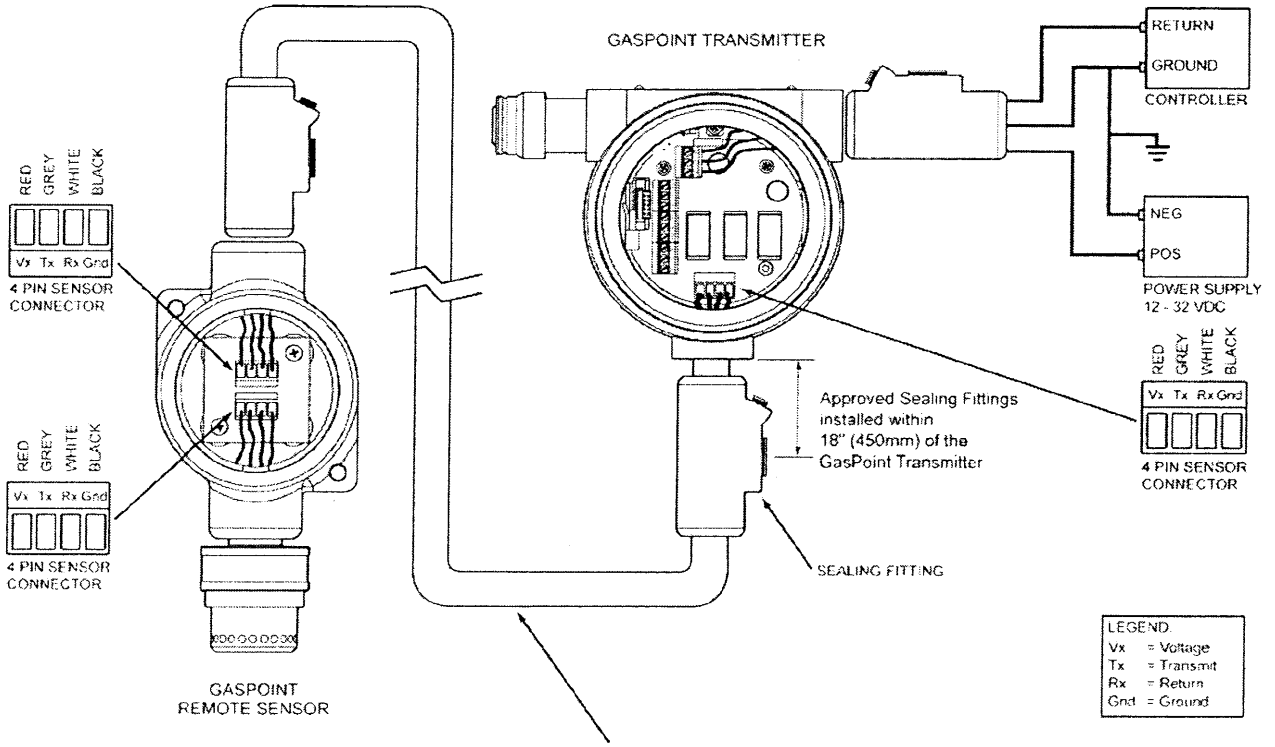


Figure 5. System Wiring Diagram

Modbus Expansion Module Note: For wiring of GasPoints equipped with the Modbus Communication Expansion Module, see the Modbus manual for additional wiring information.



APPROVED NATIONAL ELECTRICAL CODE INSTALLATION
CONDUIT or **APPROVED HAZARDOUS LOCATION CABLE** connecting the Remote Sensor and Transmitter must have Sealing Fittings at both ends within 18" (450mm) of each unit.
HAZARDOUS LOCATION CABLE and **SEALING FITTINGS** must be approved for Class 1, Div. 1 Gr. B,C,D Hazardous Locations.

Figure 6. Sensor separation Kit Wiring Diagram

Mounting the Sensor Separation Kit Enclosure

1. The separation kit is equipped with predrilled flanges: I.D. 3065 (7.68 mm) on 4.35 in. (10.6 mm) centers.
2. Disconnect the wires from the transmitter terminal block and remove the sensor from the transmitter. Screw the sensor fully into the separation kit housing and install the wires, as shown on the diagram, to the adjacent terminal block in the separation kit.
3. Install cable as shown. Ensure correct cabling and sealing fitting practices are implemented.

Factory Settings

The transmitter is calibrated and tested before shipping. Commonly used values are set at the factory. To change the factory default settings, refer to Changing the Alarm Setpoints.

The following settings are field selectable:

Dip Switch Overview

1. **Calibration Time Delay:** To set span, select a time delay of 30 seconds or 6 minutes. For remote calibration use the 6 minute setting to allow time for the gas to reach the sensor. To save time and calibration gas, the transmitter begins the span procedure when it senses the calibration gas.

Note: *The factory default is 30 seconds. See dip switch 3 (CAL TIME) to change to 6 minutes.*

2. **Measuring Range:** Select from up to four measuring ranges by setting Block 1 switch 4 and switch 5 to open or closed. Both switch 4 and 5 are factory set to open. Refer to Table 8.
3. **Low and/or High Relays:** Select non-latching or latching. Factory default is set to open (non-latching).
4. **Low and/or High Relays:** Select de-energized or energized. Factory default is set to open (de-energized).

Changing the Alarm and Calibration Gas Setpoints

5. **Gas Alarms:** Gas alarm levels are set to Occupational Safety & Health Administration (OSHA) standards prior to shipping. The transmitter is equipped with two alarm levels, low and high. To set, select two, one, or no alarm levels and set selected levels to any value desired. To change the levels, refer to Changing the Alarm Setpoints. The factory defaults are listed in Table 8.
6. **Calibration Gas Concentration Level:** To facilitate the auto span, the calibration gas concentration expected is preset. It can be changed at any time for the toxic and combustible gas sensors. Set the standard generally used in your facility. Refer to Changing the Calibration Gas Concentration Level to change the value.

   The oxygen sensor span is set to 20.9% and cannot be adjusted (For O_2 calibrate in normal 20.9% ambient air, or if the atmosphere may be deficient or enriched, use pure air calibration gas.)

Table 8. Factory Default Settings; Select Measuring Ranges

Gas Sensed	Units of Measure	Select Measuring Range			Range LO: 4 Range HI: 5	Alarm Setpoints		Calibration Gas
		Factory Default **4. Open** **5. Open**	Or Select 4. Closed 5. Open	Or Select 4. Open 5. Closed	Or Select 4. Closed 5. Closed	**Factory Defaults** (Field Settable)		**Factory Default Value Level Expected***
		1	2	3	4	LOW	HIGH	
Hydrogen sulfide (H_2S)	ppm	**0 to 100**	0 to 50	0 to 500	0 to 20	10 ppm	15 ppm	20 ppm
Carbon monoxide (CO)	ppm	**0 to 500**	0 to 1000	0 to 100	0 to 50	35 ppm	200 ppm	200 ppm
Combustibles 0-100% LEL (Catalytic or IR)	%LEL	**0 to 100**	N/A	N/A	N/A	10%	20%	50% LEL
Oxygen (O_2)	% by vol.	**0 to 30.0%**	N/A	N/A	N/A	19.5%	18.5%	20.9% ambient/pure air
Sulfur dioxide (SO_2)	ppm	**0 to 100**	0 to 50	0 to 20	0 to 10	2 ppm	5 ppm	20 ppm
Hydrogen cyanide (HCN)	ppm	**0 to 20.0**	N/A	N/A	N/A	4.7 ppm	10 ppm	17 ppm
Chlorine (Cl_2)	ppm	**0 to 5.0**	0 to 10.0	0 to 50.0	0 to 99.9	0.5 ppm	1.0 ppm	3.0 ppm
Chlorine dioxide (ClO_2)	ppm	**0 to 1.00**	0 to 5.00	N/A	N/A	0.20 ppm	0.30 ppm	0.56 ppm
Hydrogen (H_2)	ppm	**0 to 100**	0 to 200	0 to 800	N/A	30 ppm	50 ppm	100 ppm
Hydrogen chloride (HCl)	ppm	**0 to 10.0**	0 to 20.0	0 to 99.9	N/A	0.2 ppm	0.5 ppm	6.6 ppm
Ammonia (NH_3)	ppm	**0 to 50**	0 to 100	0 to 500	0 to 999	25 ppm	50 ppm	50 ppm
Nitrogen dioxide (NO_2)	ppm	**0 to 50.0**	0 to 10.0	0 to 20	0 to 99.9	2 ppm	5 ppm	10 ppm

* BW recommends that the calibration gas factory default values be changed if selecting higher measuring ranges than the factory default measuring range. Refer to Changing the Alarm Setpoints and Sensor Specifications.

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Dip Switch Settings

The dip switches are located on the upper control board. To access the dip switch banks, remove the top of the explosion-proof enclosure, loosen the control board access screw (located just below the buttons), and open the control door which is on slip hinges. The dip switches are clearly labeled.

⚠ Caution: The transmitter must be powered down before removing the outer cover. If it is in a classified area, either remove the transmitter or declassify the area.

Note: *Any latched relay will be released upon one push of the external button.*

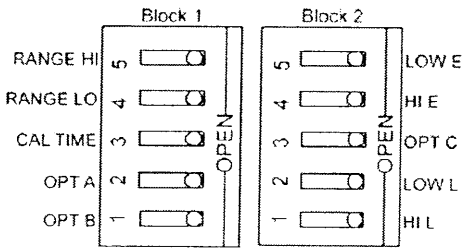


Table 9. Dip Switches

Dip Switch		Function
Block 1: Calibration and Measuring Ranges		
1	OPT B	Not used
2	OPT A	Not used
3	CAL TIME	Calibration wait period Open - 0.5 min. Closed - 6 min.
4	RANGE LO	Set measuring range
5	RANGE HI	Set measuring range
Block 2: Gas Alarm Relay Settings		
1	HI L (High alarm)	Open - Non-latching relay Closed - Latching relay
2	LOW L (Low alarm)	Open - Non-latching relay Closed - Latching relay
3	OPT C	Not used
4	HI E (High alarm)	Open - De-energized relay Closed - Energized relay
5	LOW E (Low alarm)	Open - De-energized relay Closed - Energized relay

13.3

Connecting the Controller and Power Supply

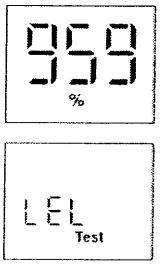
Ensure the transmitter's external cover is in place before applying power. Follow the procedures and recommendations in the control systems manual to complete installation.

Note: *Ensure the transmitter is tied to the controller ground, to the earth ground, and to the negative terminal of the power supply.*

1. Attach wires to the controller and power supply as shown in Figure 5. When power is applied, the transmitter automatically activates.

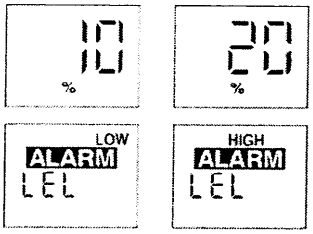
2. The LCD shows all the display elements, and the elements flash twice. Then each icon displays separately and stays lit until all icons are displayed. The LCD backlight then activates.

3. The word **Test** displays on the LCD. The transmitter then begins a 2-minute countdown from **999** to **000**.



During the countdown to normal operation the transmitter communicates with the sensor, determines the sensor type, tests the sensor integrity, tests all the circuitry, and allows the sensor to stabilize before normal operation begins. The transmitter also determines the sensor range. Once initialization is complete, the transmitter enters normal operational mode (in the system loop) providing a signal to the controller of the gas present.

4. After the countdown, the LCD displays the current low alarm and high alarm setpoints. Each alarm setpoint is displayed for 4 seconds. To review them, press and release the external pushbutton after normal operation begins.



5. Upon a successful self-test, the transmitter enters normal operation and displays the ambient gas present. The backlight remains activated for 5 seconds after normal operation begins. If the unit fails the self-test, refer to Fault Alarm Conditions and Advice.

Controller Calibration

Follow the procedures and recommendations in the control system manual to calibrate the control system.

1. Calibrate the control system (see your control manuals). Set the controller as follows:
   - 4 mA = ZERO
   - 20 mA = FULL SCALE
2. Calibrate the transmitter with gas and then refer to Changing the Alarm Setpoints and Calibration Gas Setpoints

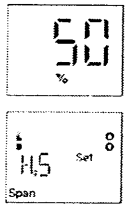
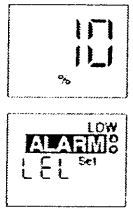
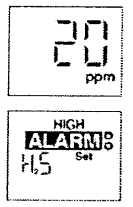
Changing the Alarm Setpoints

The setpoint mode allows the user to change the calibration gas concentration level, the low alarm setpoint, and the high alarm setpoint. Refer to Factory Settings for factory default settings. To change the values:

1. Screw off the enclosure top. (Allows access to edit buttons.)
2. Press the OK button for 2 seconds to access setpoint mode and change factory default settings.

   The transmitter is equipped with two setpoints, low and high. If only one setpoint is required, set one level to zero to deactivate. Set the other setpoint as desired.

   To deactivate both alarm levels, set both setpoints to zero. If both low and high are set to the same value, the transmitter will trigger a high alarm condition if that setpoint is met or exceeded.

Changing setpoint	LCD icons displayed	Display
Changing the Calibration Gas Concentration Level The LCD first displays the current calibration gas value. Press OK to accept the displayed value or proceed to change the value. The factory default value for O_2 is set for 20.9% and cannot be adjusted. 1. Press ▲ to increment the value or ▼ to decrement the value. 2. Press OK to accept the new displayed value and end set calibration gas level.	• Numeric display shows current calibration gas value expected • **Set Span** icon flashes • Set flash • ▲▼ flash	
Changing the Low Alarm Setpoint The next screen displays the current low alarm setpoint. Press OK to accept the current low alarm setpoint or proceed to change the value. 1. Press ▲ to increment the value or ▼ to decrement the value. 2. Press OK to accept the new displayed value and end set low alarm setpoint.	• Numeric display shows current low alarm setpoint • **LOW ALARM set** icon flashes • ▲▼ flash	
Changing the High Alarm Setpoint The next screen displays the current high alarm setpoint. Press OK to accept the current high alarm setpoint or proceed to change the value. 1. Press ▲ to increment the value or ▼ to decrement the value. 2. Press OK to accept the new displayed value and end set high alarm setpoint.	• Numeric display shows current high alarm setpoint • **HIGH ALARM set** icon flashes • ▲▼ flash	

Note: *Oxygen low and/or high gas alarm setpoints can be set to either enrichment and/or deficiency alarms as desired. If the alarm setpoint is set below 20.9% (deficiency alarm), an alarm is triggered if the concentration present is below 20.9%. If the alarm setpoint is set above 20.9% (enrichment alarm), an alarm is triggered if the concentration present exceeds 20.9%. You can choose to set both alarms above or below 20.9%, or one alarm above and one below 20.9%*

3. Test the transmitter using a gas cylinder other than the one used in the calibration steps. The gas concentration should not exceed the sensor's detection range. Confirm that the display shows the expected concentration.

Operation

The transmitter provides continuous monitoring for the target gas. In the event of power failure, the transmitter will automatically reset itself back into the system loop after power is restored. The transmitter has non-volatile memory and will not be affected by a power disruption. All programmed information is protected with total memory retention.





***Note**: BW recommends the transmitter be calibrated before first time use.*

LCD: The LCD diplays the current ppm or % reading of the target gas present.

View Alarm Setpoints: To view the alarm setpoints at any time, press the external pushbutton (for one second) and release. The LCD displays the current low alarm setpoint and then the high alarm setpoint.

Relays:

- **Fault:** The fault relay is always energized under normal operations. The relay will de-energize only if the transmitter is addressing a fault condition or when power is released.
- **Low/High Gas Alarms:** The gas alarm relays connected are energized or de-energized (latching or non-latching) according to the transmitter dip switch settings you have selected.
- **Reset Latched Relay Alarm (Alarm Acknowledge):** If a gas alarm relay has been set to latching mode, acknowledge the alarm condition.

  Press the external pushbutton for one second until the display reads low alarm setpoint, then release the external button. The transmitter releases the latched alarm(s) and displays the current low and high alarm setpoints.

***Note:** If an alarm condition exists, the transmitter will not allow the user to reset a latched alarm or display the alarm setpoints.*

Output: The 4-20 mA loop output is normal (from 4 to 20 mA according to calibrated values) except in a fault condition.

Backlight: The backlight activates in low light conditions. When ambient light conditions return to normal, the backlight automatically deactivates.

Gas Alarm Conditions and Advice

If the current gas concentration meets or exceeds either alarm setpoint, the transmitter gas alarm functions will activate.

Note: *If both or either gas alarm is set to zero, then no gas alarm condition exists for that alarm level.*

The following alarm advice activates in any gas alarm condition (low or high):

- The backlight activates.
- The 4-20 mA loop output is normal (from 4 to 20 mA according to calibrated values).

When the alarm condition no longer exists, the transmitter exits alarm mode and enters normal operation.

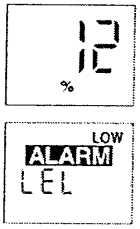
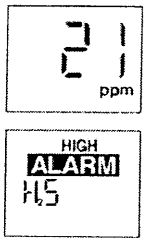
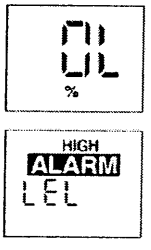
Note: *If a relay is set to the latching position on either low or high gas alarm, the relay remains on until the alarm is reset (acknowledged). Press the external button to reset the relay.*

If the alarms are disabled, then no alarm icons will be displayed.

An oxygen alarm level depends on which alarm setpoints have been set to low and high. The oxygen low and/or high gas alarm setpoints are user selectable for either enrichment and/or deficiency alarms as desired.

⚠ Caution: High off-scale readings may indicate an explosive concentration.

Table 10. Alarms

Alarm condition	Alarm relay	Alarm	Display
LOW GAS ALARM The current gas concentration present meets or exceeds the low alarm the low alarm setpoint	Low alarm relay triggers field interface if the relay is connected and a low alarm setpoint is entered.	• Numeric display will show the gas currently presnet (ppm/%) • **LOW** icon displays • **ALARM** icon flashes	
HIGH GAS ALARM If the current gas concentration present meets or exceeds the high alarm setpoint	High alarm relay triggers a field interface if the relay is connected and a high alarm setpoint is entered.	• Numeric display will show the gas currently present (ppm/%) • **HIGH** icon displays • **ALARM** icon flashes	
OVER RANGE (over level or over range) GAS CONDITION If the gas concentration meets or exceeds the full measuring range		• **OL** icon displays • **HIGH** icon displays	

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Fault Alarm Conditions and Advice

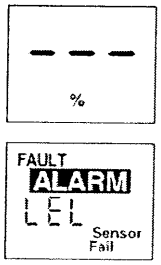
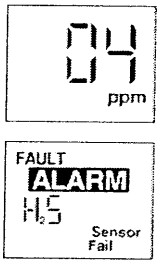
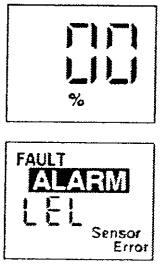
In the event of a fault condition, the fault alarm triggers activating any connected field interface. The transmitter advises which fault condition has occurred.

Under the fault alarm conditions:

- The non-latching fault relay is activated (de-energized) during a fault condition.
- The backlight activates.

When the problem is corrected, the transmitter automatically returns to normal operation.

Table 11. Fault Conditions

Fault Condition	4-20 mA Output	LCD Icons Displayed	Display
Sensor Self-Test Fail (At start-up, the self-test has failed)	2.00 mA	• Three (3) bars flash on the numeric display • **FAULT** icon displays • **ALARM** icon flashes • **Sensor Fail** icon displays	
Sensor Fault	2.00 mA	• Numeric display will read the last value (ppm/%) present before sensor fault occurs • **FAULT** icon displays • **ALARM** flashes • **Sensor Fail** displays	
Sensor Drift	2.00 mA	• Numeric display reads **00** • **FAULT** icon displays • **ALARM** icon flashes • **Sensor Error** icon displays and flashes	

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Calibration

Guidelines

When calibrating the transmitter, adhere to the following guidelines.

- Calibration accuracy is never better than the calibration gas accuracy. BW Technologies recommends a premium-grade calibration gas. Gases with National Institute of Standards and Technology (NIST) traceable accuracy improves the validity of the calibration. Do not use a gas cylinder beyond its expiration date.
- Calibrate a new sensor before use. Allow the sensor to stabilize before starting calibration (approximately 5 minutes).
- Calibrate the transmitter on a regular schedule. (BW recommends once every 90 days (3 months), depending on use and sensor exposure to poisons and contaminants.)
- Calibrate the transmitter if the ambient gas display value varies at start-up.
- It is best to calibrate the sensor before changing the alarm setpoints.
- Calibrate only in a clean atmosphere, which is free of target gas.
- Use teflon or stainless steel hose on all electrochemical sensors.
- Tygon will poison a catalytic combustible sensor over time.

⚠ Warning

Opening the sensor will invalidate the calibration

Table 12. Calibration Diagnostics Protection

If calibration is incomplete, the transmitter automatically returns to normal operation and all prior (former) calibration data is retained. Common cause for the transmitter to refuse calibration or for an incomplete calibration include the following:	
Background interfering gas is present If interfering gas is present during auto zero, the transmitter refuses to auto zero and exits the calibration routine.	Combustible and Toxic sensors: wait for the transmitter to return to normal operation. Then apply pure air (zero gas) and repeat calibration.
Calibration gas cylinder runs empty during calibration	Wait for unit to return to normal operation. Replace the empty gas cylinder with a full cylinder and repeat calibration.
Calibration gas concentration is too low or too high Calibration gas concentration is not within expected parameters—either the concentration of applied gas (ppm or %) is too high or too low. The transmitter refuses to set span if the calibration gas is not within the expected parameters and exits the calibration routine.	Change the value to equal the calibration gas concentration being applied.
Gas applied at the wrong time Gas is applied before requested to do so, or if gas is applied during auto zero, the transmitter refuses to proceed and exits the calibration routine. The prior (former) auto zero value will be retained.	Restart the calibration routine and apply gas only when the gas cylinder icon flashes.

Remote Calibration

The length of time depends on the length of hose the calibration gas must travel. If the wait period is longer than 30 seconds, the CAL TIME dip switch must be set to 6 minutes. To save gas and time, the transmitter begins to span when it senses calibration gas.
Apply the calibration gas for approximately 2 minutes plus the time estimated for the gas to reach the sensor.

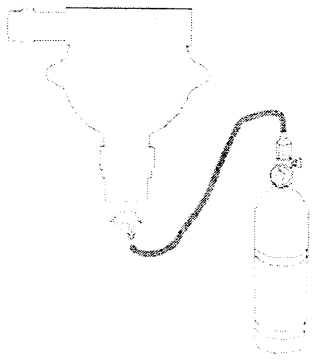
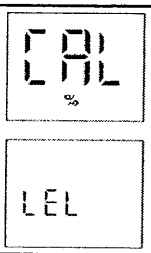
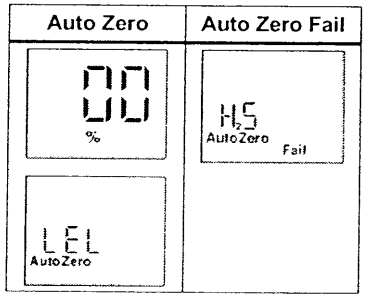
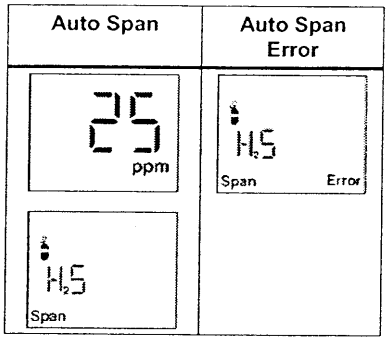


Figure 7. Applying Gas to the Sensor

Calibration Procedure

The transmitter provides continuous monitoring for the target gas. In the event of power failure, the transmitter automatically resets itself back into the system loop after power is restored. The transmitter has non-volatile memory and will not be affected by a power disruption. All programmed information is protected with total memory retention.

For calibration gas concentrations and flowrates for each gas, refer to Table 16.

Calibration steps	LCD icons displayed	Display
START CALIBRATION 1. Press and hold the external button down while the LCD displays the high and low alarm setpoints. Continue to hold the button until the LCD displays **CAL** and the CAL icon lights for 3 seconds. Then release the button. ***Note:*** *The 4-20 mA output will be 3mA throughout calibration. Calibrating the transmitter will not cause false alarms at the controller*	• First, the low and high alarm setpoints are displayed (8 seconds approximately) • Next the **CAL** icon displays for 3 seconds • Backlight is activated	
AUTO ZERO 2. The transmitter then takes a zero level reading. • Combustible and Toxic sensors: If target gas is present, apply zero gas (pure air or 100% nitrogen) to zero the sensor. Restart the calibration sequence. • Oxygen sensor: Gas is not required. Auto zero sequence takes 30 to 60 seconds.	• Numeric display reads **00** • **Auto zero** icon flashes	
AUTO SPAN 3. Insert calibration cap. Refer to Figure 7 and apply gas to the sensor for approximately 2 minutes (5 minutes for ammonia). Refer to Table 16 for gas concentrations and flowrates. 4. When the countdown from **300** to **00** begins, span is complete. Disconnect the gas cylinder. • If Span fails: check the calibration gas cylinder used and the concentration expected. Replace the cylinder and/or change the calibration gas expected, if required. Recalibrate • Oxygen sensor: Use pure air calibration gas (20.9 % O_2) in case of deficient or enriched atmosphere.	• Numeric display shows calibration gas value expected • flashes • **Span** icon displays • Gas type is constantly displayed • After a successful calibration, the transmitter automatically returns to normal operation and displays the current reading (ppm or %) present.	
CALIBRATION FAIL OR ERROR **Auto zero Fail:** If the **Fail** icon displays, the LCD displays a countdown from **300** to **00**, before the transmitter begins normal operation. **Auto Span Error:** If the **Error** icon displays, the LCD displays a countdown from **300** to **00**, before the transmitter enters normal operation. ***Note:****If either fail condition occurs, all previous information values are retained. Retry calibration*	**Auto Zero:** If the target or an interfering gas is present, the transmitter refuses to auto zero. The **Fail** icon displays. The **Fail** icon also displays if the external pushbutton is pressed during auto zero. **Span:** If the calibration gas is not within expected values, the transmitter refuses to span. The **Error** icon displays.	

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Maintenance

To keep the transmitter in good operating condition, perform the following basic maintenance as required:

- Calibrate, test, and inspect the transmitter at regular intervals and after exposure to high concentrations.
- Keep an operations log of all maintenance, calibrations, and alarm events.
- Clean the exterior with a soft, damp cloth. Do not use solvents, soaps, or polishes.
- Do not immerse the transmitter in liquids.

Cleaning a Sensor

The sensors are equipped with a stainless steel sintered or a hastelloy sintered flame arrestor screen (dependent on gas). Clean only with a dry brush being careful not to clog the screen. Replace the sensor if the screen is plugged.

Clearing a Sensor

The sensor has a high degree of resistance to common vapors and gases. The sensor most likely clears itself if you remove the transmitter to a clean environment and wait 10 to 30 minutes. Do not expose a sensor to the fumes of inorganic solvents (such as paint fumes) or organic solvents.

Troubleshooting

With enhanced diagnostics the transmitter provides extensive fault analysis and fault advice, refer to Fault Alarm Conditions and Advice. The troubleshooting chart deals with other factors and is to be used as a guide. Prior to reaching any conclusion that a problem may exist, check the following:

- All terminal blocks are fully seated on the boards.
- Power and signal connections are correct and complete.

Table 13. Troubleshooting Tips

Problem	Possible Cause	Solution
No response to gas	• Sensor screen dirty	• Clean or replace sensor
Apparent false alarm	• Puff of gas	• Monitor is functioning
	• Not properly calibrated	• Recalibrate
	• Solvent fumes or interference from high levels of interfering gas	• Remove source
	• Radio frequency interference	• Check grounds and shielding are correct
No signal at controller	• Maximum distance reached	• Verify loop resistance, change wire AWG, or increase supply
	• Controller does not operate	• Troubleshoot controller

13.3

Servicing the GasPoint

Disassembling: Observe all safety and electrical codes and regulations before removing front cover. Unscrew the thumbscrew and open the service bay door.

Assembling: When reassembling the transmitter, ensure that it is electrically complete. Close the service bay door. Ensure the thumbscrew is aligned and tighten it down. Replace the outside glass cover. Reapply power and reinitialize the transmitter's power-up procedure, refer to Connecting the Controller and Power Supply. Change the alarm setpoints if desired.

Important: Calibrate the transmitter whenever a component is replaced.

Sensor Assembly Replacement

To replace the entire sensor assembly, complete the following steps:

1. Power down the transmitter.
2. Disconnect the wires from the 4-pin plug-in terminal block at J5 on the power board and remove the old sensor.
3. Feed the new wires through the opening. Fully screw in the new sensor. Attach the wires to the plug-in terminal block. Ensure that all colored wires are correctly matched to the board labels from left to right. Refer to Figure 6.

⚠ Caution: Check that all connections are correct. Incorrect wiring may damage the sensor and/or the power board.

4. Refer to Table 8 to select a measuring range if required.

Refer to Replacement Parts and Accessories for part numbers.

Table 14. Sensor Wiring Configuration

	Board Label	Wire Color	Description
1	Pwr 8 Vdc	Red	Power 8 Vdc (left)
2	TX	Grey	Transmission
3	RX	White	Signal
4	GND	Black	Ground (right)

Other Component Replacement

1. Power down the transmitter.
2. Unplug the sensor terminal block from the power board if required.
3. Replace the component, ensuring all wiring connections are complete and reassemble as shown in Figure 8. Refer to Installation
4. Ensure all field selectable options are set (measuring range, etc.).
5. Apply power and reinitialize power-up.
6. Set the alarm setpoints if required.

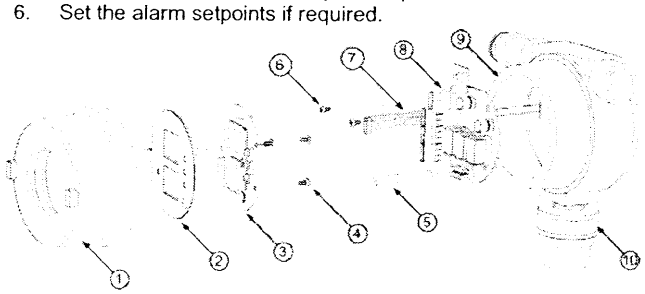


Figure 8. Assembly Drawing

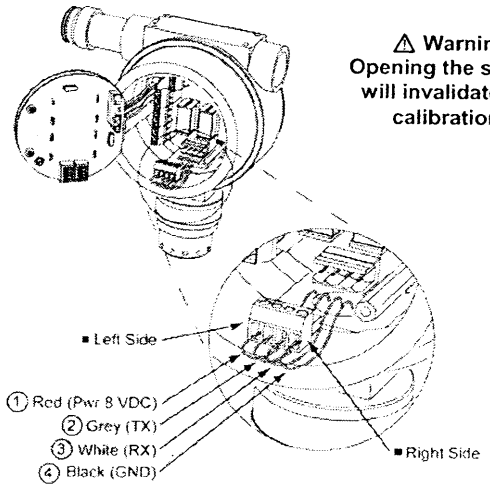


Figure 9. Sensor Wiring Diagram

Table 15. GasPoint Replacement Parts

	Qty	Description Rating/TOL	Part #
1	1	External faceplate window cover	M1147
2	1	Internal hinged door faceplate cover	M2345
3	1	Transmitter main LCD board (PCB)	E2737/2
4	3	#6-32 x ¼ inch machine Phillips screws	M0262
5	1	Threaded stand-off – accepts thumbscrews	M2364
6	2	#6-32 x ¼ inch machine Phillips screws	M0262
7	1	Plug-in ribbon cable	E2800
8	1	Power/relay board (PCB)	E2739/1
9	1	Transmitter housing c/w external switch	M2346K
10	1	Sensor assembly	various

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Specifications

Sensor Specifications

Table 16. Operating and Calibration Specifications

Specifications	IR Combustibles %LEL	Catalytic Combustibles %LEL	Hydrogen sulfide H_2S ppm	Carbon monoxide CO ppm	Sulfur dioxide SO_2 ppm	Ammonia NH_3 ppm	Hydrogen cyanide HCN ppm	Nitrogen dioxide NO_2 ppm	Oxygen O_2 % v/v
Repeatability % of signal	1	1	1	1	1	<10	0.5	2	0.1
Temperature Range °C °F	-40 to +50 -40 to +122	-40 to +90 -40 to +194	-40 to +50 -40 to +122	-20 to +50 -4 to +122	-20 to +50 -4 to +122	-10 to +50 +14 to +122	-20 to +50 -4 to +122	-20 to +50 -4 to +122	-20 to +50 -4 to +122
Relative Humidity Range	0 to 100% Non Condensing	5 to 95% Non-condensing							
Long Term Drift Zero: % of signal loss per month Span:	Nominal <1	Nominal <1	Nominal <2	Nominal <2	Nominal <2	Nominal <2	Nominal <2	Nominal <2	Nominal <1%
LCD Increments	1%	1%	1 ppm	1 ppm	1 ppm	1 ppm	0.1 ppm	0.1 ppm	0.1%
Calibration[1] Flow Rate (min). mls/minute at a % or ppm reading of:	250 50% LEL	250 50% LEL	250 20 ppm	150 200 ppm	250 20 ppm	500 50 ppm	250 15 ppm	1,000 10 ppm	250 20.9 %[2]
Sensor: Replacement Part Numbers	IR-RW03	SS-RW02	SS-RH02	SS-RM02	SS-RS02	SS-RA02	SS-RZ02	SS-RD02	SS-RX02

1: It is recommended that the calibration gas concentration for toxic sensors be 50% of the selected measuring range. (Factory default values are shown.)

Auto span. Values expected by the transmitter for toxic gases can be changed at any time. Refer to Changing the Alarm Setpoints and Calibration Gas Setpoints section.

2: For oxygen use pure air calibration gas

Note: *Performance data is based on conditions at 20°C, 50% RH, 1013 mBar.*

Do not adjust the oxygen sensor span value.

Sensors:

Toxic and Oxygen: Electrochemical
Combustible: Catalytic or Infrared (IR)
Position Sensitivity: None
Operation Pressure Range: 900 to 1100 mBar (atmospheric +/-10%)

Calibration Notes:

For maximum accuracy, calibrate with a mixture in the range most measurements are made. For most purposes a 2 minute exposure is satisfactory. (NH_3, Cl_2, ClO_2, and HCl need a 5 minute exposure.)

Relative Sensitivity of Combustible Gases/Vapors

Recommend: For the most accurate measurements, calibrate using the gas or vapor under investigation. Where this is not possible see the applicable catalytic or infrared relative sensitivity table for combustible gases/vapors. The transmitter catalytic and combustible sensors are calibrated to methane (with 50% methane calibration gas) at the factory prior to shipping.

Table 17. Catalytic Sensor Relative Sensitivity of Common Combustible Gases/Vapors

Gas/Vapor	Relative Sensitivity	Gas/Vapor	Relative Sensitivity
Methane	100	Carbon monoxide	105
Propane	60	Hydrogen	100
n-Butane	60	Ammonia	125
n-Pentane	50	Cyclohexane	50
n-Hexane	40	Ethylene	85
Acetylene	80		
Each sensitivity has been rounded to the nearest 5%			

Table 18. Standard Model IR GasPoint Relative Sensitivity to Applicable Combustible Gases/Vapors

Gas/Vapor	Relative Sensitivity	Gas/Vapor	Relative Sensitivity
Acetone	60	n-Hexane	325
n-Butane	450	Methane	100
iso-Butane	450	n-Pentane	390
Butane-1	450	iso-Pentane	390
cis-Butane-2	450	Propane	410
trans-Butane-2	450	Propanol	230
Ethane	450	Propylene	310
Ethanol	330	o-Xylene	100
Ethylene	80	m-Xylene	100
n-Heptane	325	p-Xylene	100
MEK	365*	Methanol	80*
IPA	410*	Toulene	25*
Ethyl chloride	120*	Mythyl chloride	100*
*The relative sensitivity is just an estimate. This table is intended for guidance only. Always calibrate using the gas or vapor under investigation.			

Catalytic Bead Combustible Sensor
The table shows the variation of the catalytic combustible sensor on exposure to a range of gases and vapors at the same %LEL concentration. The figures are expressed relative to the methane signal (=100).
The results are intended for guidance only. For a more accurate measurement calibrate using the gas or vapor under investigation.

Special Note on the Combustible Sensor
Certain substances have a detrimental effect on all catalytic bead sensors. The GP-WD combustible sensor has a higher degree of poison resistance and will outperform other catalytic bead sensors in poisonous atmospheres. However, catalytic sensors should not be exposed for prolonged periods of time to lead or sulfur containing compounds, silicones, or phosphates. Damage is cumulative and may result in an irreversible decrease in sensitivity. Certain other compounds, such as halogenated hydrocarbons and hydrogen sulfide, may temporarily inhibit the sensor performance, but in most cases it will recover after a period in clean air.

Infrared (IR) Combustible Sensor
The standard model IR Combustible GasPoint is calibrated to methane. The table shows the variation of the IR combustible sensor on exposure to applicable group combustible hydrocarbon gases and vapors at the same %LEL concentration. The figures are expressed relative to the methane signal (=100).
The results are intended for guidance only. For a more accurate measurement, calibrate using the gas or vapor under investigation.

⚠ Caution: IR systems should always be calibrated as soon as you install the system to compensate for any change in pressure.

Note: *If the hydrocarbon desired is not listed, special models are available for other groups of hydrocarbons.*

For IR sensors, use the specified gas to calibrate the system. IR sensors work very well in low or no oxygen conditions. IR sensors monitors the molar concentration of the specific gases by a physical method. No chemical reaction takes places inside the sensor.

Specifications

Monitor:	3-wire, 4-20 mA gas transmitter with advanced micro-controller based circuitry
Power Input:	12 to 32 volts dc
Output Current:	Normal Operation: Isolated linear 4-20 mA output Calibration Mode: Steady 3 mA (automatic reset to normal operation) Fault Mode: 2 mA signal (and less)
Current Consumption:	
	Toxic Versions: 40 mA at 24 Vdc Catalytic Combustible Version: 100 mA at 24 Vdc Infrared Combustible Version: 75 mA at 24 Vdc Relays: 50 mA per relay at 24 Vdc
Sensors:	Plug-in, logic sensors
Self-Test:	Automatic self-test of sensor integrity upon power on
Calibration:	Non-intrusive, via pushbutton Auto Zero and Auto Span
Displays:	Two backlit liquid crystal displays (LCD)
LCD 1:	3 digit continuous readout of the gas present (ppm or %LEL)
LCD 2:	Alphanumeric diagnostic status display
Alarm Setpoints:	Two (2) setpoints - User selectable
Relay Contacts:	Three field retro-fittable SPDT relays; 5 amps @ 250 Vac
Low/High:	Field selectable for normally energized/de-energized and latching/non-latching
Fault:	Normally energized and non-latching
Controls:	
Calibration:	Non-intrusive via external pushbutton
Alarm Setpoints:	Simple up/down pushbuttons with LCD readout of setpoints
Physical:	
Size (w x l x h):	6.8 x 7 x 4.3 in. (17 x 17.8 x 10.8 cm) including sensor
Weight:	4.85 lb. (2.2 kg) approximately
Enclosure:	Explosion-proof, anodized aluminum enclosure c/w mounting flanges
Sensor:	Stainless steel enclosure
Wiring Port:	3/4 inch n.p.t.
Warranty:	
Instrument:	2 years non-prorated
Sensor:	2 years warranty
FCC Statement:	This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules and ICES-003 Canadian EMI requirements. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
Approval:	Approved by CSA to both U.S. and Canadian standards: Class I, Group B, C, D Approved by CSA to both U.S. and Canadian standards: Class II, Group E, F, G for toxic gas transmitter only Approved to Combustible Performance Standards ISA-S12.13 and C22.2 No. 152

13.3

Replacement Parts and Accessories

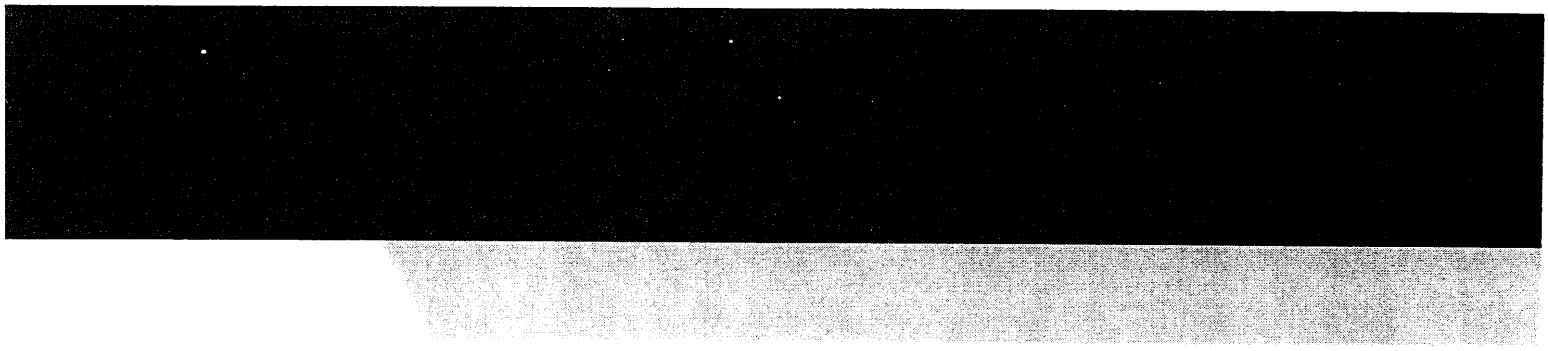
Transmitters c/w Sensor Assemblies and Relays		
Model No.	**Description**	**Qty**
GP-WD	Transmitter c/w combustible sensor	1
GP-IR-WD	Transmitter c/w IR combustible sensor	1
GP-HD	Transmitter c/w hydrogen sulfide sensor	1
GP-MD	Transmitter c/w carbon monoxide sensor	1
GP-SD	Transmitter c/w sulfur dioxide sensor	1
GP-ZD	Transmitter c/w hydrogen cyanide sensor	1
GP-XD	Transmitter c/w oxygen sensor	1
GP-AD	Transmitter c/w ammonia sensor	1
GP-DD	Transmitter c/w nitrogen dioxide sensor	1
GP-CD	Transmitter c/w chlorine sensor	1
GP-VD*	Transmitter c/w chlorine dioxide sensor	1
GP-YD*	Transmitter c/w hydrogen sensor	1
GP-LD*	Transmitter c/w hydrogen chloride sensor	1

Add Suffix "-SS" for optional stainless steel transmitter enclosure
*Contact BW Technologies for sensor availability.
Cl_2 ,ClO_2 and HCl sensors are only certified for ordinary locations.
Sensor Assembly enclosures are stainless steel (standard)

Accessories and Spares

Model No.	Description	Qty
D2DT	Duck mounting kit	1
GP-DUC-K1	Duct mount adapter	1
GP-1	Gas transmitter only c/w LCDs and relays (no sensor)	1
GP-SEP	Sensor separation kit	1
GP-MBUS3	MODBUS communication expansion module	1
GP-MBUS4	MODBUS communication expansion module	1
IR-RW03	IR combustible sensor assembly	1
SS-RA02	Ammonia sensor assembly	1
SS-RC02	Chlorine sensor assembly	1
SS-RD02	Nitrogen dioxide sensor assembly	1
SS-RH02	Hydrogen sulfide sensor assembly	1
SS-RL02	Hydrogen chrloride sensor assembly	1
SS-RM02	Carbon monoxide sensor assembly	1
SS-RS02	Sulfur dioxide sensor assembly	1
SS-RW02	Combustible sensor assembly	1
SS-RX02	Oxygen sensor assembly	1
SS-RZ02	Hydrogen cyanide sensor assembly	1
E0036	Calibration plug	1
GP-CAL-3	Non-conductive remote calibration cup and splash guard	1
GP-SSPLASH4	Stainless Steel splash guard	1
GP-SSCAL4	Stainless steel remote calibration cup and splash guard	1
GPOINT-B	GasPoint pushbutton protective boot	1
GP-FP-MPCB1	PCB – main control board with LCDs and internal faceplate	1
GP-MPCB1	PCB - main control board with LCD	1
GP-PPCB1	PCB – power board with relays	1
GP-HART	Hart communication expansion module (2-wire system)	1
GP-2210	Internal faceplate with hinge and label	1
M1147	Enclosure with glass window	1
GP-POWER1	Power supply 110/220 Vac – 24 Vdc	1
GP-SSPB	Stainless steel process baffle	1
GP-SSPB-2	Stainless steel process baffle with NPT fitting	1
D1374	User manual	1

13.3



J1374/5 (English)
iERP: 122635
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BW Technologies by Honeywell

Corporate Headquarters
Calgary, Alberta

Calibration Flow Rates

123179
GasPoint

The following information has changed in the user manual.

D1374/4 Page 26
D1374/5 Page 20

Operating and Calibration Specifications

Specifications	Hydrogen sulfide H_2S ppm	Carbon monoxide CO ppm	Sulfur dioxide SO_2 ppm	Ammonia NH_3 ppm	Hydrogen cyanide HCN ppm	Nitrogen dioxide NO_2 ppm	Oxygen O_2 % v/v
Calibration[1]:							
Flow rate (min). ml/minute	**250–500**	**250–500**	**250–500**	**500–1000**	**250–500**	**500–1000**	**250–500**
at a % or ppm reading of:	20 ppm	200 ppm	20 ppm	50 ppm	15 ppm	10 ppm	20.9%[2]

1: It is recommended that the calibration gas concentration for toxic sensors be 50% of the selected mesuring range. (Factory default values are shown).

Auto span. Values expected by the transmitter for toxic gases can be changed at any time. Refer to Changing the Alarm Setpoints and Calibration Gas Setpoints in the user manual.

2: For oxygen use pure air calibration gas.

Note: *Performance data is based on conditions at 20°C, 50% RH, 1013 mBar.*

Do not adjust the oxygen sensor span value.

Chapter 14
CONTROL EQUIPMENT

MANUFACTURER/DISTRIBUTOR:

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

14.1 ENCLOSURE , MAIN PLC CABINET.

14.2 SCREW SCREEN AND MAIN PUMP CONSOLE.

14.3 TERMINAL BLOCS.

14.4 MOUNTING RAILS.

14.5 LEGEND PLATE.

14.6 FUSE AND SIDE JUMPER.

14.7 GROUNDING TERMINAL BLOC.

14.8 WIRING DUCT.

14.9 MINIATURE CIRCUIT BREAKER.

14.10 INDUSTRIAL RELAY , CONTACTOR.

14.11 CONTROL RELAY.

14.12 SLC 500 PROGRAMMABLE CONTROLLERS PARTS.

END OF CHAPTER 14

NEMA 12-13 ENCLOSURES — 5500 DDS

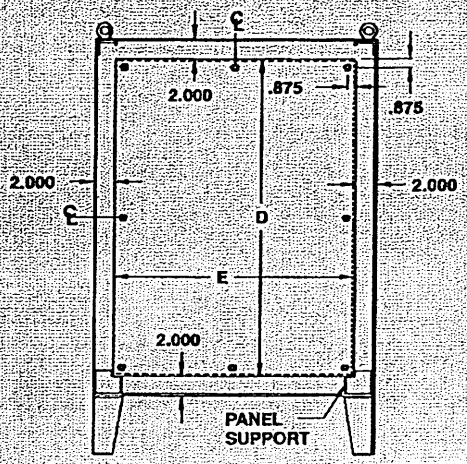
Oil & dust tight double door enclosure

Quick Features:
- Poured gasket
- Seamless welding
- 3-point handle
- Drip shield
- Superior hinging
- 180° door opening
- Panel is included
- Floor stands included
- Powder coated

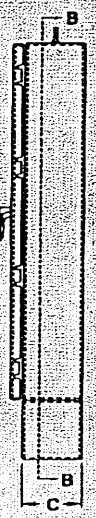
The 5500 DDS floor mounted double door, oil and dust tight enclosures are used indoors for protection against dirt, dust and oil. The box and cover are made from quality 12 GA steel with all seams continuously welded. The opening has a curled lip around all sides and there is no center post.

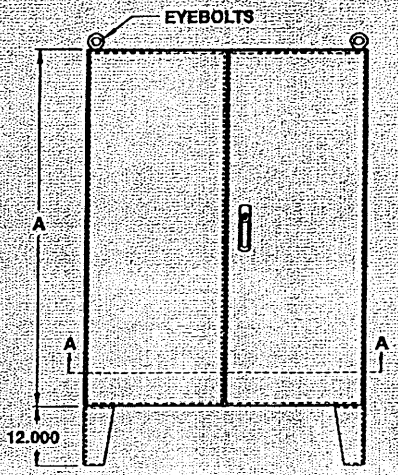
The left hand door is flanged and the 3-point automotive type locking handle is on the right hand door. The ball bearing pins of the concealed hinges can be easily pulled out to remove the door. Floor mounting stands are provided and body stiffeners are installed on larger models. **Each enclosure comes complete with a 11 GA inner panel** which mounts on welded M10 studs. Enclosures and panels are finished with heat fused polyester powder, electrostatically applied on a phosphatized base. Box is ANSI/ASA 61 gray, panel is white.

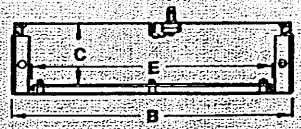
CSA Certified / UL Listed
NEMA 12-13 / IP65



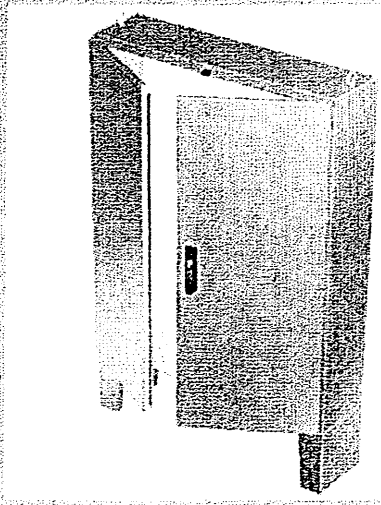
SECTION B-B







SECTION A-A



CATALOG NUMBER	DIMENSIONS A	B	C	D	E	SHIP WGHT LBS.
5500 DDS604808	60	48	8	56	44	422
5500 DDS604810	60	48	10	56	44	433
5500 DDS606010	60	60	10	56	56	520
5500 DDS726010	72	60	10	68	56	608
5500 DDS727210	72	72	10	68	68	716
5500 DDS604812	60	48	12	56	44	463
5500 DDS606012	60	60	12	56	56	530
5500 DDS726012	72	60	12	68	56	633
5500 DDS727212	72	72	12	68	68	751
5500 DDS604816	60	48	16	56	44	523
5500 DDS606016	60	60	16	56	56	650
5500 DDS726016	72	60	16	68	56	740
5500 DDS727216	72	72	16	68	68	841
5500 DDS604820	60	48	20	56	44	589

Visit www.eurobox.com for details

Call us toll free 1-800-363-2423

Data subject to change without notice.

Suggested Accessories

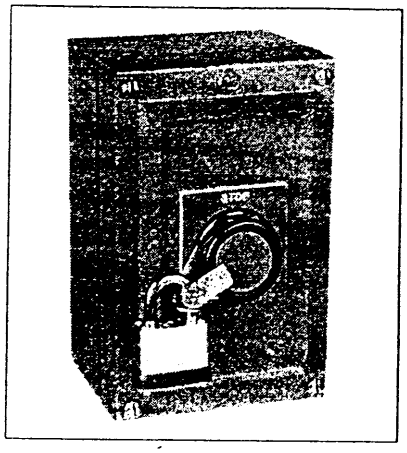


14.1

FOR RAW SEWER-EMERGENCY-STOP
+ SCREW SCREEN LOCAL CONTROL

30.5 mm Push Button Stations Hermetically Sealed for Division 2/Zone 2 Enclosures

Custom Built Stations



Description

The tables on pages 81 and 82 list the most commonly used push button stations. Stations not listed in the tables may be ordered as custom built stations.

Cat. No.

The cat. no. used to identify custom built Bulletin 800R push button stations, which are built at the factory, will be cat. nos. listed for the enclosure only, except letter **W** will be substituted for the letter **Z** and with a station serial number.

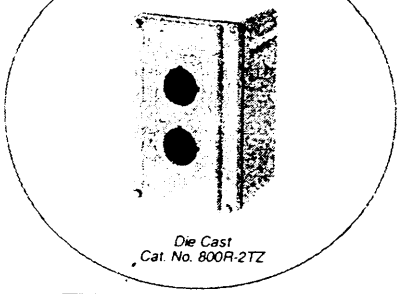
Ordering Information

The following information is required when ordering custom built push button stations.

1. Cat. no. of enclosure.
2. Cat. no. of control units.
3. Legend plate cat. no. and/or marking for each unit.
4. Specify vertical or horizontal mounting.
5. Specify desired operator mounting sequence. Inclusion of a sketch is recommended. If no information is given, standard configuration will be used.

SCREW SCREEN CONTROL
C/W JOG+H/O/A+E-STOP+FOR/REV

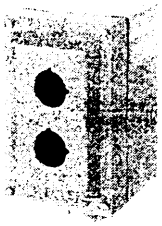
Enclosures Only



Die Cast
Cat. No. 800R-2TZ



Stainless Steel
Cat. No. 800R-2HZ4



Rosite Glass Polyester
Cat. No. 800R-2HZ4R



Fiberglass
Cat. No. 800H-2HZ4Y

Units ❶	Die Cast (Type 4/13) Cat. No.	Stainless Steel (Type 4/4X/13) Cat. No.	Rosite Glass Polyester (Type 4/4X/13) Cat. No.	Fiberglass ❷ (Type 4/4X/12/13) Cat. No.
1	800R-1TZ	800R-1HZ4	800R-1HZ4R	800H-1HZ4Y
2	800R-2TZ	800R-2HZ4	800R-2HZ4R	800H-2HZ4Y
3	800R-3TZ	800R-3HZ4	800R-3HZ4R	800H-3HZ4Y
4	800R-4TZ	800R-4HZ4	800R-4HZ4R	—
5		800R-5HZ4	800R-5HZ4R	—
6	800R-6TZ	800R-6HZ4	800R-6HZ4R	—

❶ Number of units that can be mounted in enclosure.
❷ Extra deep. Accomodates two levels of stackable sealed switch contact blocks.

Note: Enclosure and conduit dimensions are detailed on page 84, except for the fiberglass enclosures which are found on page 78.

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

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

DATE 07/Nov/05 BY QC
EARTH TECH (CANADA) INC.

FIELD SCREW SCREEN LOCAL CONTROL BOX CLASS I DIV 2

E STOP
H-O-A
JOG

14.2

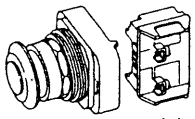
SCREW SCREEN

2-Position Twist Release Units, Non-Illuminated

3. RAW SEWER
3X SCREW-SCREEN

6 AP

800H ___ – FRXT 1 A1
a b c d



a

Finger-Safe Guards	
Code	Description
Blank	No Guards
C	Guards on Terminals

b

Head Type ❶	
Code	Description
FRXT	Twist-to-Release
FRXJT	Jumbo Head with Twist-to-Release ❷

c

Color Cap	
Code	Color
Blank	No Cap
1	Green
2	Black
3	Orange
4	Gray
5	White
6	Red
7	Blue
9	Yellow

d

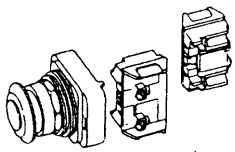
Contact Block(s)			
Code	Operator Position Out	Operator Position In	Description
Blank	—	—	No Contacts on operator
Standard			
D1	O	X	1 N.O.
D2	X	O	1 N.C.
D4	X	O	1 N.C.L.B.
A1	O X	X O	1 N.O. - 1 N.C.L.B.
A5	X X	O O	2 N.C.L.B.
Pen*TUFF* (Low Voltage)			
D1V	O	X	1 N.O.
D2V	X	O	1 N.C.
D4V	X	O	1 N.C.L.B.
AV	O X	X O	1 N.O. - 1 N.C.
Class I, Div. 2/Zone 2			
Logic Reed			
D1R	O	X	1 N.O.
D2R	X	O	1 N.C.
AR	O X	X O	1 N.O. - 1 N.C.

d (cont'd)

Contact Block(s)			
Code	Operator Position Out	Operator Position In	Description
Blank	—	—	No Contacts on operator
Class I, Div. 2/Zone 2			
Sealed Switch			
D1P	O	X	1 N.O.
D2P	X	O	1 N.C.
AP	O X	X O	1 N.O. 1 N.C.
Stackable Sealed Switch			
D1Y	O	X	1 N.O.
D2Y	X	O	1 N.C.
AY	O X	X O	1 N.O. - 1 N.C.
Note: X=Closed/O=Open.			

3-Position Push-Pull Units, Non-Illuminated

800H ___ – FRX M 1 A7
a b c d e



a

Finger-Safe Guards	
Code	Description
Blank	No Guards
C	Guards on Terminals

b

Head Type	
Code	Description
FRX	Mushroom Head
FRXJ	Jumbo Mushroom Head ❷

c

Operator Function			
Code	Operator Position Out	Operator Position Center	Operator Position In
M	Momentary	Maintained	Maintained
N	Momentary	Maintained	Momentary

d

Color Cap	
Code	Color
Blank	No Cap
1	Green
2	Black
3	Orange
4	Gray
5	White
6	Red
7	Blue
9	Yellow

e

Contact Block(s)				
Code	Operator Position			Description
Blank	—	—	—	No Contacts on operator
Standard				
A	O X	O O	X O	1 N.O. - 1 N.C.
A1	O X	O X	X O	1 N.O. - 1 N.C.L.B.
A7	X X	O X	O O	1 N.C. - 1 N.C.L.B.

e (cont'd)

Contact Block(s)				
Code	Operator Position Out	Operator Position Ctr.	Operator Position In	Description
Pen*TUFF* (Low Voltage)				
AV	O X	O O	X O	1 N.O. - 1 N.C.
Class I, Div. 2/Zone 2				
Logic Reed				
AR	O X	O O	X O	1 N.O. - 1 N.C.
Sealed Switch				
AP	O X	O O	X O	1 N.O. - 1 N.C.
Stackable Sealed Switch				
AY	O X	O O	X O	1 N.O. - 1 N.C.
Note: X=Closed/O=Open.				

❶ 2-position push-pull and push-pull/twist-to-release devices with N.C.L.B. contacts meet EN-418 and IEC 60947-5-5 standards for emergency stop applications.

❷ Not valid with color cap option **Blank** (no cap).

Blank and Custom Legend Plates, Continued

Speciality Legend Plates



Cat. No. 800T-X618



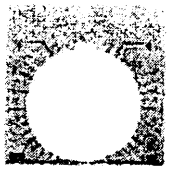
Cat. No. 800T-X647Y



Cat. No. 800T-X646

Type	Start/Stop Legend Plates	Emergency Stop Legend Plates		
	Gray	Yellow	Yellow (Large Size)	Yellow IEC Ring
	Cat. No.	Cat. No.	Cat. No.	Cat. No.
Push-to-Stop / Pull-to-Start — Push-to-Stop / Twist or Pull Release	800T-X618	800T-618Y	800T-X647Y	—
Blank	—	—	800T-X645Y	800T-X646
Custom	—	—	800T-X645YE	—
Emergency Stop	—	—	—	800T-X646EM

Potentiometer Legend Plates



Cat. No. 800T-X609



Cat. No. 800T-X608

Type	Cat. No.
Potentiometer with Graduated Markings	800T-X609 ❶
Speed with Graduated Markings	800T-X608

❶ For graduated markings with a custom text, order 800T-X609E and specify up to two lines of text, 14 characters per line.

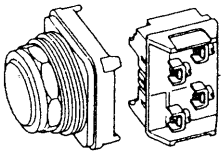
PLATE

Momentary Contact Push Button Units, Non-Illuminated

9 AP

800H ____ **– AR** **1** ____ **A**

a *b* *c* *d* *e*



a

Finger-Safe Guards	
Code	Description
Blank	No Guards
C	Guards on Terminals

b

Operator Type	
Code	Description
AR	Flush Head
BR	Extended Head
DR	Mushroom Head
DRX	Mushroom Head less Color Cap
R	Booted Head ❶
GR	Bootless Guarded Head

c

Color Cap	
Code	Description
Blank	Used only when ordering Operator Type DRX
1	Green
2	Black
3	Orange ❷
4	Gray ❷
5	White ❷
6	Red
7	Blue
9	Yellow

d

Special Mushroom Head	
Code	Description
Blank	No Special Head
J	Jumbo Mushroom Head — Plastic

Note: Special Mushroom Head options only apply to Mushroom Head operator Type Code DR.

e

Contact Block(s)	
Code	Description
Blank	No Contacts on operator
Standard	
D1	1 N.O.
D2	1 N.C.
D3	1 N.O.E.M.
D4	1 N.C.L.B.
D5	1 N.O. (Mini)
D6	1 N.C. (Mini)
A1	1 N.C.L.B. - 1 N.O.
A2 ❸	2 N.O.
A4	2 N.C.
A7	1 N.C.L.B. - 1 N.C.
A	1 N.O. - 1 N.C.
B	2 N.O. - 2 N.C.
H	3 N.O. - 3 N.C.
C	4 N.O. - 4 N.C.
Pen*TUFF* (Low Voltage)	
D1V	1 N.O.
D2V	1 N.C.
D3V	1 N.O.E.M.
D4V	1 N.C.L.B.
AV	1 N.O. - 1 N.C.
BV	2 N.O. - 2 N.C.
HV	3 N.O. - 3 N.C.
CV	4 N.O. - 4 N.C.

e (cont'd)

Contact Block(s)	
Code	Description
Blank	No Contacts on operator
Time Delay	
T	1 N.O. Depress to close, release to initiate delayed opening
S	1 N.C. Depress to open, release to initiate delayed closure
Class I, Div. 2/Zone 2	
Logic Reed	
D1R	1 N.O.
D2R	1 N.C.
A2R❸	2 N.O.
A4R❸	2 N.C.
AR	1 N.O. - 1 N.C.
BR	2 N.O. - 2 N.C.
HR	3 N.O. - 3 N.C.
CR	4 N.O. - 4 N.C.
Sealed Switch	
D1P	1 N.O.
D2P	1 N.C.
A2P	2 N.O.
A4P	2 N.C.
AP	1 N.O. - 1 N.C.
BP	2 N.O. - 2 N.C.
Stackable Sealed Switch	
D1Y	1 N.O.
D2Y	1 N.C.
A2Y	2 N.O.
A4Y	2 N.C.
AY	1 N.O. - 1 N.C.
BY	2 N.O. - 2 N.C.
HY	3 N.O. - 3 N.C.
CY	4 N.O. - 4 N.C.

Time Delay Contacts
Series C field installable kits can only be used with Series T or later operators. Adjustable range of 0.5...15 sec ±25% Maximum continuous current I_{th} 5 A

❶ Green and black operators are flush underneath boots; red operators are extended.
❷ Not available for booted operators.
❸ XA2 and XA2R contact blocks cannot be stacked upon, but they can stack on other contact blocks.

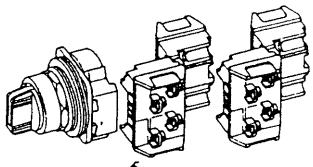
4

800 # HR2 B.P.
#-O-A 800 # JR 2 KB7 B-P

2- and 3-Position Selector Switch Units, Non-Illuminated

800H ___ **– HR** **A** **2** **D1** *(2-Position)*
a b c d e

800H ___ **– JR** ___ **2** **KC1** **H** *(3-Position)*
a b c d e_1 f_1


f_1

a

Finger-Safe Guards	
Code	Description
Blank	No Guards
C	Guards on Terminals

b

Number of Positions	
Code	Description
HR	2-Position
JR	3-Position

c

Knob Insert Colors	
Code	Color
Blank	White
A	Red
B	Green
C	Blue
E	Yellow
F	Orange
X	Packet of Colored Inserts ❶

d

Standard Knob Operators	
Code	Operator Function
2	Maintained
4	Spring Return from Left ❷
5	Spring Return from Right
91 ❸	Spring Return from Both

e

Contact Block(s) (2-Position)			
Code	Description		
	Contact Configuration	2-Position	
Standard (Pen*TUFF*)	Standard (Pen*TUFF*)	⊘	⊘
Blank	No Contacts	—	—
D1 (D1V)	1 N.O. 800T-XD1 or (XD1V) on white side	O	X
D2 (D2V)	1 N.C. 800T-XD2 or (XD2V) on white side	X	O

e (cont'd)

Contact Block(s) (2-Position)			
Code	Description		
	Contact Configuration	2-Position	
Standard (Pen*TUFF*)	Standard (Pen*TUFF*)	⊘	⊘
A (AV)	1 N.O. - 1 N.C. 1-800T-XA or (XAV) on white side	O	X
		X	O
B (BV)	2 N.O. - 2 N.C. 2-800T-XAs or (XAV)s — 1 on white side/ 1 on black side	O	X
		X	O
		O	X
		X	O
H (HV)	3 N.O. - 3 N.C. 3-800T-XAs or (XAV)s — 2 on white side/ 1 on black side	O	X
		X	O
		O	X
		X	O
		O	X
		X	O
C (CV)	4 N.O. - 4 N.C. 4-800T-XAs or (XAV)s — 2 on white side/ 2 on black side	O	X
		X	O
		O	X
		X	O
		O	X
		X	O

e_1

Cam Option (3 Pos.) ❹	
Code	Description
Blank	KB7 Cam (Std.)
KA1	KA1 Cam
KA7	KA7 Cam
KC1	KC1 Cam
KC7	KC7 Cam
KD7	KD7 Cam
KE7	KE7 Cam
KQ1	KQ1 Cam
KR1	KR1 Cam
KR7	KR7 Cam
KT1	KT1 Cam
KT7	KT7 Cam
KU7	KU7 Cam

Note: Associated targets are shown in Table 1.

Contact Blocks (3-Position)	
Code	Description
Standard (Pen*TUFF*)	Standard (Pen*TUFF*)
Blank	No contacts
A (AV)	1 N.O. - 1 N.C. 1-800T-XA or (XAV) on white side
B (BV)	2 N.O. - 2 N.C. 2 -800T-XAs or (XAV)s — 1 on white side/ 1 on black side
H (HV)	3 N.O. - 3 N.C. 3-800T-XAs or (XAV)s — 2 on white side/ 1 on black side
C (CV)	4 N.O. - 4 N.C. 4-800T-XAs or (XAV)s — 2 on white side/ 2 on black side
Class I, Div. 2/Zone 2	
Logic Reed ❺	
AR	1 N.O. - 1 N.C.
BR	2 N.O. - 2 N.C.
HR	3 N.O. - 3 N.C.
CR	4 N.O. - 4 N.C.
Sealed Switch ❺	
AP	1 N.O. - 1 N.C.
BP	2 N.O. - 2 N.C.
Stackable Sealed Switch ❺	
AY	1 N.O. - 1 N.C.
BY	2 N.O. - 2 N.C.
HY	3 N.O. - 3 N.C.
CY	4 N.O. - 4 N.C.

Note: Associated targets are shown in Table 1.

Table 1. 3-Position Cam and Contact Block Functionality Table

Contact Block Suffix Codes	Contact Block Side	Ckts	Cam Codes: KB7 (Std.) ⊘ ① ⊘	KA1 ⊘ ① ⊘	KA7 ⊘ ① ⊘	KC1 ⊘ ① ⊘	KC7 ⊘ ① ⊘	KD7 ⊘ ① ⊘	KE7 ⊘ ① ⊘	KQ1 ⊘ ① ⊘	KQ7 ⊘ ① ⊘	KR1 ⊘ ① ⊘	KR7 ⊘ ① ⊘	KT1 ⊘ ① ⊘	KT7 ⊘ ① ⊘	KU7 ⊘ ① ⊘
A_ B_ H C_	White	A	X O O	X O O	O O X	X O O	O O X	X O O	O O X	X O O	O O X	X O O	O O X	X O O	O O X	X O O
		B	O O X	O X O	O X O	O X O	O X O	O O X	O X O	O X O	O X O	O X O	O X O	O X O	O X O	O O X
	Black	A	X O O	X O O	O O X	X O O	O O X	X O O	O O X	X O O	O O X	X O O	O O X	X O O	O O X	X O O
		B	O O X	O X O	O X O	O X O	O X O	O O X	O X O	O X O	O X O	O X O	O X O	O X O	O X O	O O X
	White	A	X O O	X O O	O O X	X O O	O O X	X O O	O O X	X O O	O O X	X O O	O O X	X O O	O O X	X O O
		B	O O X	O X O	O X O	O X O	O X O	O O X	O X O	O X O	O X O	O X O	O X O	O X O	O X O	O O X
	Black	A	X O O	X O O	O O X	X O O	O O X	X O O	O O X	X O O	O O X	X O O	O O X	X O O	O O X	X O O
		B	O O X	O X O	O X O	O X O	O X O	O O X	O X O	O X O	O X O	O X O	O X O	O X O	O X O	O O X

Note: X=Closed/O=Open

❶ Packet of colored inserts, one of each color except orange.
❷ Target tables for 2-position devices are reversed from those shown.
❸ This option is only available with 3-position devices.
❹ If an overlapping cam is required, consult your local Allen-Bradley Sales Office.
❺ Contact block mounting same as listed for standard and Pen*TUFF* contact blocks.

30.5 mm Push Buttons

Type 4/4X/13, Corrosion-Resistant/Watertight/Oiltight

Modifications and Accessories, Continued

Standard Legend Plates



Gray Legend Plate Type 4/4X



White Legend Plate Type 4/4X

Marking	Gray Type 4/4X Cat. No.	White Type 4/4X Cat. No.	Marking	Gray Type 4/4X Cat. No.	White Type 4/4X Cat. No.
AUTO-OFF-HAND	800H-W154	800H-W554	LOWER	800H-W115	800H-W515
AUTO-MAN-HAND	800H-W059	800H-W459	MAN-AUTO	800H-W031	800H-W431
CLOSE	800H-W101	800H-W501	MAN-OFF-AUTO	800H-W062	800H-W462
CYCLE START	800H-W006	800H-W406	MOTOR RUN	800H-W008	800H-W408
CYCLE STOP (Red)	800H-W376	—	MOTOR STOP (Red)	800H-W375	—
DECREASE	800H-W002	800H-W402	OFF	800H-W116	800H-W516
DOWN	800H-W102	800H-W502	OFF-COOLANT-ON	800H-W052	800H-W452
EMERG. STOP (Red) ❷	800H-W372	—	OFF-LOC-REMOTE	800H-W061	—
EMERGENCY STOP (Red) ❷	800H-W373	—	OFF-MAN-AUTO	800H-W060	800H-W460
FAST	800H-W104	800H-W504	OFF-ON	800H-W133	800H-W533
FEED START	800H-W007	—	ON	800H-W117	800H-W517
FEED STOP (Red)	800H-W377	—	OPEN	800H-W118	800H-W518
FOR.-REV.	800H-W132	800H-W532	OPEN-CLOSE	800H-W134	800H-W534
FOR.-OFF-REV.	800H-W152	800H-W552	OPEN-OFF-CLOSE	800H-W153	800H-W553
FORWARD	800H-W105	800H-W505	OUT	800H-W119	800H-W519
FOURTH SPEED	800H-W010	—	POWER ON	800H-W001	800H-W401
FULL SPEED	800H-W106	800H-W506	PULL-TO-START	800H-W198	—
HAND-AUTO	800H-W131	800H-W531	PUSH-TO-STOP (Red)	800H-W378	—
HAND-OFF-AUTO	800H-W151	800H-W551	RAISE	800H-W120	800H-W520
HIGH	800H-W107	800H-W507	RAISE-LOWER	800H-W034	—
HIGH-LOW	800H-W030	—	RAISE-OFF-LOWER	800H-W156	800H-W556
HIGH-LOW-OFF	800H-W058	—	RESET	800H-W121	800H-W521
HIGH-OFF-LOW	800H-W155	800H-W555	REVERSE	800H-W122	800H-W522
IN	800H-W108	800H-W508	RIGHT	800H-W005	800H-W405
INCH	800H-W109	800H-W509	RUN	800H-W123	800H-W523
INCREASE	800H-W003	—	RUN-INCH	800H-W037	—
JOG	800H-W110	800H-W510	RUN-JOG	800H-W032	—
JOG FOR.	800H-W111	800H-W511	SAFE-RUN	800H-W033	—
JOG REV.	800H-W112	800H-W512	SECOND SPEED	800H-W124	800H-W524
JOG RUN	800H-W135	800H-W535	SLOW	800H-W125	800H-W525
JOG-SAFE-RUN	800H-W051	—	SLOW-FAST	800H-W136	800H-W536
JOG-STOP-RUN	800H-W057	—	SLOW-OFF-FAST	800H-W157	800H-W557
LEFT	800H-W004	800H-W404	SPEED ❶	800H-W081	800H-W481
LEFT-RIGHT	800H-W036	—	SPEED ❶	800H-W182	—
LOC-OFF-REMOTE	800H-W055	800H-W455	START	800H-W126	800H-W526
LOW	800H-W113	800H-W513	START-JOG	800H-W138	800H-W538
LOW-HIGH	800H-W035	—	START-JOG-STOP	800H-W158	800H-W558
LOW-OFF-HIGH	800H-W056	—	START-RUN-STOP	800H-W054	—
LOW SPEED	800H-W114	800H-W514	START-STOP	800H-W137	800H-W537

❶ Potentiometer type with graduated markings.

❷ These legend plates do not comply with E-Stop standards that specify a yellow background, such as IEC 60947-5-5 and NFPA 79.

LEGEND PLATE.

Bulletin 800R

30.5 mm Push Buttons Hermetically Sealed for Division 2

Type 4/13 and 4/4X/13 for Hazardous Locations

Specifications ❶

Electrical Ratings		
Contact Ratings		Refer to the Contact Ratings tables below.
Dielectric Strength		2200V for one minute, 1300V for one minute (Logic Reed)
Electrical Design Life Cycles		1,000,000 at maximum rated load, 200,000 at maximum rated load (Logic Reed)
Mechanical Ratings		
Vibration		10,..2000 Hz 1.52mm displacement (peak-to-peak) Max./10 G Max. (except Logic Reed)
Shock		1/2 cycle sine wave for 11 milliseconds ≥ 25 G (contact fragility) and no damage at 1 00G
Degree of Protection		Type 4/4X/13, 4/13; Watertight/Corrosion-Resistant IEC 529 IP66/65
Mechanical Design Life Cycles		
Push Buttons	(Momentary, Non-Illuminated)	10,000,000 min.
	(Momentary, Illuminated)	250,000 min.
	(Push-Pull/Twist-to-Release)	250,000 min.
Selector Switches	(Non-Illuminated)	1,000,000 min.
	(Illuminated)	200,000 min.
All other devices		200,000 min.
Contact Operation		Logic Reed and Sealed Switch Contact Blocks: Single break magnetic
Typical Operating Forces		
Operators without contact blocks		Flush, Extended, Standard Mushroom, Jumbo Plastic Mushroom: 2 lbs max Maintained Selector Switch: 3.6 in.-lbs maximum
Spring Return Selector Switches		3.6 in.-lbs to stop 0.2 in.-lbs to return
Illuminated Push Buttons and Push-to-Test Pilot Lights		5 lbs maximum
3-Position Push-Pull		8 lbs maximum push to in position or pull to center position (15 lbs maximum pull to out position)
Push-Pull and Push-Pull/Twist		9 lbs maximum push or pull 30 in.-oz. maximum twist, 6 in.-oz. minimum return
Contact Blocks	Logic Reed	1 lb. maximum
	Sealed Switch	3 lbs maximum at 0.205" plunger travel
	Stackable Sealed Switch	1 lb. maximum
Environment		
Temperature Range	Operating	–40...+131°F (–40...+55°C)
	Storage	–40...+185°F (–40...+85°C)
Note: Operating temperatures below freezing are based on the absence of moisture and liquids. Contact your local Allen-Bradley sales office for use in lower temperature applications.		
Humidity		50% at +104°F (+40°C)

❶ Performance Data — See publication A113, page Important-2.

Control Stations

Bulletin 800R control stations are designed for Division 2 hazardous locations. They consist of Bulletin 800H (Type 4/4X/13) or Bulletin 800T (Type 4/13) operators with sealed contact blocks. Bulletin 800R units are available as factory assembled stations or as components for field assembly.

Hazardous Locations

Since the contacts are enclosed in a hermetically sealed chamber, the contact block is suitable for use in **Class I and II, Division 2/Zone 2 Groups A, B, C, D, F and G hazardous locations and is listed by Underwriters Laboratories** for this class of service. Complete stations as shown on page 119 can be used for **Class I and II Division 2** applications. The individual components shown in the 800T and 800H sections are also suitable for **Class I and II Division 2/Zone 2** locations providing they are suitably mounted by the customer in an enclosure as required for the application and by applicable codes and laws.

Class I Zone 2 protection method Ex nW IIc Temp. Code T3/T6, Demko 97.Y.122018 U applies to operators and contacts.

Per National Electrical Code: **Zone 2**. In Class I, Zone 2 locations, all wiring methods permitted for Class I, Division 2, Class I, Division 1 or Division 2, and Class I, Zone 0 or Zone 1 locations, including requirements for sealing, shall be permitted.

Note: Allen-Bradley Logic Reed contact blocks are also **listed by Underwriters Laboratories** for the **Division 2/Zone 2 hazardous locations** listed above.

> ⚠ **CAUTION:**
> The complete stations and individual components listed herein **are not suitable for use in Class I and II Division 1 hazardous locations**. For Class I and II Division 1 hazardous locations, order Bulletin 800H Type 7 & 9 stations and units.

Sealed Switch Contact Ratings

Maximum continuous current I_{th} 5 A. Bulletin 800T and 800H units have control circuit ratings with sealed switch contact blocks as follows.

Max. Opertnl. Volts Ue	Utilization Category IEC	NEMA	Rated Operational Currents Volts Ue	Make	Break
AC 600	AC-15	B600	120...600 0...120	3600 VA 30 A	360 VA 3 A
DC 300	DC-13	P300	24...300 0...24	138 VA 5.0 A	

Stackable Sealed Switch Contact Ratings

Maximum continuous current I_{th} 2.5 A. Bulletin 800T and 800H units have control circuit ratings with sealed switch contact blocks as follows.

Max. Opertnl. Volts Ue	Utilization Category IEC	NEMA	Rated Operational Currents Volts Ue	Make	Break
AC 300	AC-15	C300	120...300 0...120	1800 VA 15 A	180 VA 1.5 A
DC 150	DC-13	Q150	24...150 0...24	69 VA 2.5 A	

Logic Reed Contact Ratings

Maximum DC: 30V, 0.06 A Maximum AC: 150V, 0.15 A
Should only be used with resistive loads.

Approvals

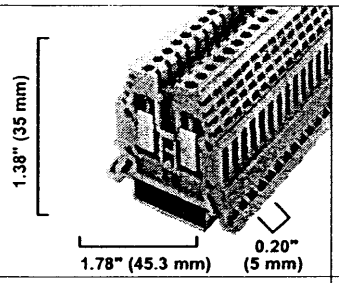
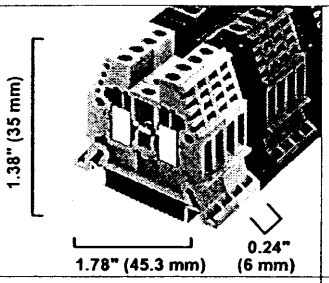
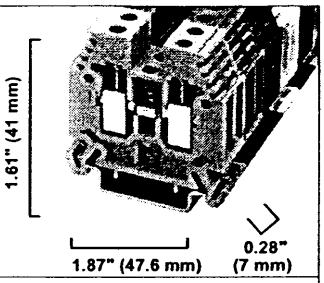
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Guide: NOIV
CSA Certified: LR11924
IEC Compliance Demko 97.Y.122018 U

FOR ALL CONTROL PANEL 17275

Bulletin 1492

IEC Terminal Blocks

Standard Feed-Through Blocks

	1492-W3				1492-W4				1492-W6			
Dimensions are not intended to be used for manufacturing purposes. **Note:** Height dimension is measured from top of rail to top of terminal block.												
Specifications	*Single-circuit terminal block.*				*Single-circuit terminal block.*				*Single-circuit terminal block.*			
Approvals	cULus	EEx e II	CSA	IEC	cULus	EEx e II	CSA	IEC	cULus	EEx e II	CSA	IEC
Voltage Rating	600V AC/DC	550V	600V AC/DC	800V AC/DC	600V AC/DC	550V	600V AC/DC	800V AC/DC	600V AC/DC	550V	600V AC/DC	800V AC/DC
Maximum Current	20 A	24 A	20 A	24 A	30 A	32 A	30 A	32 A	40 A	41 A	40 A	41 A
Wire Range (Rated Cross Section)	#30-#14 AWG	2.5 mm²	#22-#14 AWG	0.5-2.5 mm²	#22-#10 AWG	4.0 mm²	#22-#10 AWG	0.5-4 mm²	#22-#10 AWG	6.0 mm²	#22-#10 AWG	0.5-6 mm²
Wire Strip Length	0.39" (10 mm)				0.35" (9 mm)				0.47" (12 mm)			
Recommended Tightening Torque	5.0...5.6 lb-in. (0.6 Nm)				5.0...5.6 lb-in. (0.6 Nm)				5.6...6.8 lb-in. (0.7 Nm)			
Density	61 pcs./ft (200/m)				50 pcs./ft (166/m)				43 pcs./ft (142/m)			
Insulation Temperature Range	–40...+195°F (–40...+90°C)				–40...+195°F (–40...+90°C)				–40...+195°F (–40...+90°C)			
Terminal Blocks	**Cat. No.**			**Pcs./ Pkg.**	**Cat. No.**			**Pcs./ Pkg.**	**Cat. No.**			**Pcs./ Pkg.**
Color: Gray	1492-W3			50	1492-W4			50	1492-W6			50
Red	1492-W3-RE			50	1492-W4-RE			50	1492-W6-RE			50
Blue	1492-W3-B			50	1492-W4-B			50	1492-W6-B			50
Black	1492-W3-BL			50	1492-W4-BL			50	1492-W6-BL			50
Green	1492-W3-G			50	1492-W4-G			50	1492-W6-G			50
Yellow	1492-W3-Y			50	1492-W4-Y			50	1492-W6-Y			50
Orange	1492-W3-OR			50	1492-W4-OR			50	1492-W6-OR			50
White	1492-W3-W			50	1492-W4-W			50	1492-W6-W			50
Brown	1492-W3-BR			50	1492-W4-BR			50	1492-W5-BR			50
Accessories (page 185)	**Cat. No.**			**Pcs./ Pkg.**	**Cat. No.**			**Pcs./ Pkg.**	**Cat. No.**			**Pcs./ Pkg.**
Mounting Rails: 1 m Symmetrical DIN (Steel)	199-DR1			10	199-DR1			10	199-DR1			10
1 m Symmetrical DIN (Aluminum)	1492-DR5			10	1492-DR5			10	1492-DR5			10
1 m Hi-Rise Sym. DIN (Aluminum)	1492-DR6			2	1492-DR6			2	1492-DR6			2
1 m Angled Hi-Rise Sym. DIN (Steel)	1492-DR7			2	1492-DR7			2	1492-DR7			2
End Barrier	1492-EB3			50	1492-EB3			50	1492-EB10			50
End Anchors: DIN Rail — Normal Duty	1492-EA35			50	1492-EA35			50	1492-EA35			50
DIN Rail — Heavy Duty	1492-EAH35			10	1492-EAH35			10	1492-EAH35			10
Jumpers: Insulated Side Jumper	1492-SJ5-10 (10-pole)			10	1492-N42 (2-pole) 1492-SJ6-10 (10-pole)			50 10	—			—
Center Jumper — 50-pole	1492-CJ5-50			5	1492-CJ6-50			5	—			—
Center Jumper — 40-pole	—			—	—			—	1492-CJ7-40			5
Center Jumper — 10-pole	1492-CJ5-10			10	1492-CJ6-10			10	1492-CJ7-10			10
Center Jumper — 3-pole	1492-CJ5-3			10	1492-CJ6-3			10	1492-CJ7-3			10
Center Jumper — 2-pole	1492-CJ5-2			10	1492-CJ6-2			10	1492-CJ7-2			10
Center Jumper Link	1492-CJL5			10	1492-CJL6			10	1492-CJL7			10
Center Jumper Cover – White ❶	1492-CJCW5			20	1492-CJCW6			20	1492-CJCW6			20
Other Accessories: Partition Plate	1492-PP3			50	1492-PP3			50	1492-PP10			50
Separation Plate	1492-SP3			50	1492-SP3			50	—			—
Test Plug	—			—	1492-TP28			10	1492-TP28			10
Test Plug Adapter	1492-TA285			10	1492-TA40			10	1492-TA40			10
Electrical Warning Plate (4-pole)	1492-EWP5-4			10	1492-EWP7-4			10	1492-EWP7-4			10
Group Marking Carrier	1492-GM35			10	1492-GM35			10	1492-GM35			10
Marking Systems: Snap-in Marker Cards	1492-SM5X9 1492-SM5X12			5	1492-SM6X9 1492-SM6X12			5	1492-SM6X12			5
Individual Marker Tabs (single char.)	1492-MP5 ❷			5	1492-MP5 ❷			5	1492-MP ❷			5

❶ May only be used as a marking surface. Cannot be installed over a center jumper.

❷ Cat. no. is not complete. See page 186.

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

☑ NO EXCEPTIONS TAKEN

☐ MAKE NOTED CORRECTIONS

☐ REVISE & RESUBMIT

☐ REJECTED

DATE July 21/05 BY DC

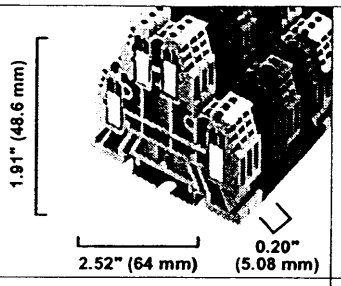
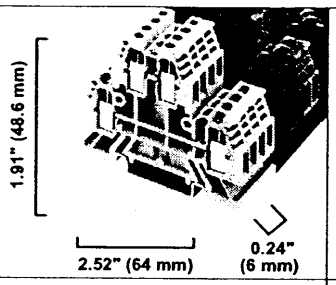
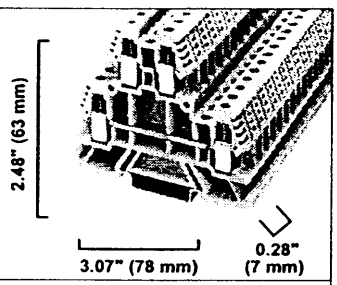
EARTH TECH (CANADA) INC.

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

(1)

14.3

USED FOR ANALOG
TOP POWER
BOT SIG

	1492-WD3				1492-WD4				1492-WD6		
Dimensions are not intended to be used for manufacturing purposes. **Note:** Height dimension is measured from top of rail to top of terminal block.											
Specifications	*Two-circuit terminal block.*				*Two-circuit terminal block.*				*Two-circuit terminal block.*		
Approvals	cULus	EEx e II	CSA	IEC	cULus	EEx e II	CSA	IEC	cULus	CSA	IEC
Voltage Rating	300V AC/DC	420V	300V AC/DC	500V AC/DC	300V AC/DC	420V	300V AC/DC	500V AC/DC	300V AC/DC	300V AC/DC	500V AC/DC
Maximum Current	15 A	24 A	15 A	24 A	20 A	24 A	20 A	32 A	50 A	55 A	41 A
Wire Range (Rated Cross Section)	#30... #14 AWG	2.5 mm²	#22... #14 AWG	0.5... 2.5 mm²	#22... #12 AWG	4 mm²	#22... #12 AWG	0.5... 4 mm²	#18... #8 AWG	#18... #8 AWG	0.5... 6 mm²
Wire Strip Length	0.39" (10 mm)				0.39" (10 mm)				0.35" (9 mm)		
Recommended Tightening Torque	5.0...5.6 lb-in. (0.6 Nm)				5.0...5.6 lb-in. (0.6 Nm)				6.2 lb-in. (0.7 Nm)		
Density	60 pcs./ft (197/m)				50 pcs./ft (166/m)				43 pcs./ft (142/m)		
Insulation Temperature Range	–40...+195°F (–40...+90°C)				–40...+195°F (–40...+90°C)				–40...+195°F (–40...+90°C)		

Terminal Blocks	**Cat. No.**	**Pcs./ Pkg.**	**Cat. No.**	**Pcs./ Pkg.**	**Cat. No.**	**Pcs./Pkg.**
Color: Gray	1492-WD3	50	1492-WD4	50	1492-WD6	20
Red	1492-WD3-RE	50	1492-WD4-RE	50	—	—
Blue	1492-WD3-B	50	1492-WD4-B	50	—	—
Black	1492-WD3-BL	50	1492-WD4-BL	50	—	—
Green	1492-WD3-G	50	1492-WD4-G	50	—	—
Yellow	1492-WD3-Y	50	1492-WD4-Y	50	—	—
Orange	1492-WD3-OR	50	1492-WD4-OR	50	—	—
Brown	1492-WD3-BR	50	1492-WD4-BR	50	—	—
White	1492-WD3-W	50	1492-WD4-BR	50	—	—

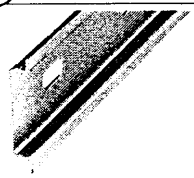
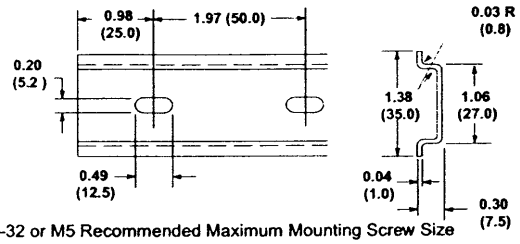
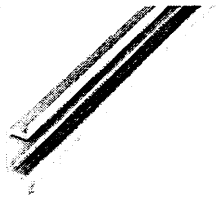
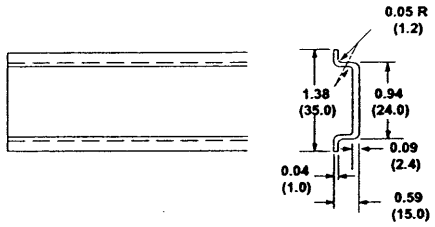
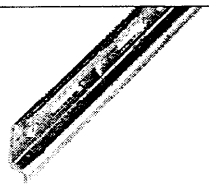
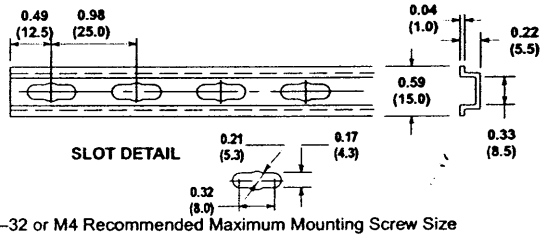
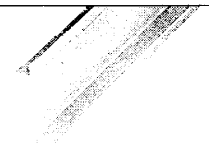
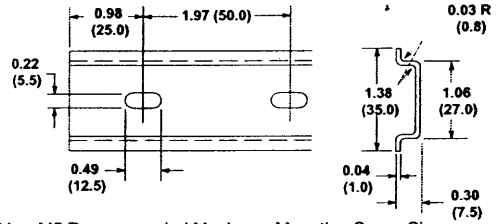
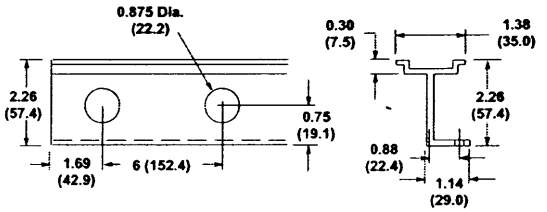
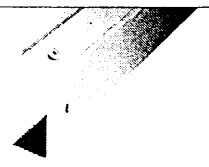
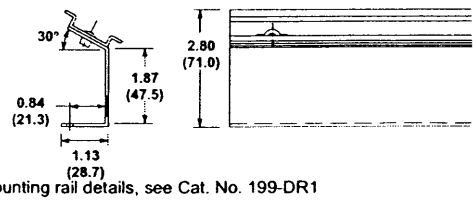
Accessories (page 185)	**Cat. No.**	**Pcs./ Pkg.**	**Cat. No.**	**Pcs./ Pkg.**	**Cat. No.**	**Pcs./Pkg.**
Mounting Rails: 1 m Symmetrical DIN (Steel)	199-DR1	10	199-DR1	10	199-DR1	10
1 m Symmetrical DIN (Aluminum)	1492-DR5	10	1492-DR5	10	1492-DR5	10
1 m Hi-Rise Sym. DIN (Aluminum)	1492-DR6	2	1492-DR6	2	1492-DR6	2
1 m Angled Hi-Rise Sym. DIN (Steel)	1492-DR7	2	1492-DR7	2	1492-DR7	2
End Barrier	1492-EBD3	50	1492-EBD3	50	1492-EBD6	50
End Anchor: DIN Rail - Normal Duty	1492-EA35	50	1492-EA35	50	1492-EA35	50
DIN Rail — Heavy Duty	1492-EAH35	10	1492-EAH35	10	1492-EAH35	10
Jumpers: Insulated Side Jumper	1492-SJ5-10 (10-pole)	10	1492-N42 (2-pole) 1492-SJ6-10 (10-pole)	50 10	—	—
Center Jumper — 50-pole	1492-CJD5-50	5	1492-CJD6-50	5	—	—
Center Jumper — 40-pole	—	—	—	—	1492-CJ7-40	5
Center Jumper — 10-pole	1492-CJD5-10	10	1492-CJD6-10	10	1492-CJ7-10	10
Center Jumper — 3-pole	1492-CJD5-3	10	1492-CJD6-3	10	1492-CJ7-3	10
Center Jumper — 2-pole	1492-CJD5-2	10	1492-CJD6-2	10	1492-CJ7-2	10
Center Jumper Link	1492-CJL5	10	1492-CJDL6	10	1492-CJL7	10
Other Accessories: Partition Plate	1492-PPD3	50	1492-PPD3	50	1492-PPD6	50
Separation Plate	1492-SPD3	50	1492-SPD3	50	—	—
Test Plug	—	—	1492-TP28	10	1492-TP28	10
Test Plug Adapter	1492-TA285	10	1492-TA40	10	1492-TA40	10
Electrical Warning Plate (4-pole)	1492-EWP5-4	10	1492-EWP6-4	10	1492-EWP7-4	10
Group Marking Carrier	1492-GM35	10	1492-GM35	10	1492-GM35	5
Marking Systems: Snap-in Marker Card	1492-SM5X9	5	1492-SM6X9	5	1492-SM6X12	5
Individual Marker Tabs (single char.)	1492-MP5 ❶	10	1492-MP ❶	10	1492-MP ❶	10

❶ Cat. no. is not complete. See page 186.

(2)

14.3

DIN Mounting Rails

Item	Description	Pcs./Pkg.	Dimensions ❶
199-DR1 	Symmetrical Rail 35 mm x 7.5 mm 3.28' (1 m) long Zinc-Plated, Yellow Chromated Steel EN50022 **DIN #3**	10	
199-DR2	Same as 199-DR1, but length = 2 m	100	#10–32 or M5 Recommended Maximum Mounting Screw Size
199-DR4 	Heavy Duty Symmetrical Rail 35 mm x 15 mm 3.28' (1 m) long Zinc-Plated, Yellow Chromated Steel EN50022 **DIN #3**	5	
1492-DR3 	Mini 15 mm x 5.5 mm Rail 3.28' (1 m) long Zinc-Plated, Yellow Chromated Steel EN50045 **DIN #2**	5	 #8–32 or M4 Recommended Maximum Mounting Screw Size
1492-DR5 	Symmetrical Rail 35 mm x 7.5 mm 3.28' (1 m) long Copper-Free Aluminum EN50022 For 1492 Terminal Blocks Only **DIN #3**	10	 #12–24 or M5 Recommended Maximum Mounting Screw Size
1492-DR6 ❷ 	Symmetrical Rail 35 mm x 7.5 mm 2.26" (57.4 mm) high 3.28' (1 m) long Copper-Free Aluminum For 1492 Terminal Blocks Only **DIN #3**	2	 Wire insulator plug for wire access through rail — use Heyco UB875
1492-DR7 ❷ 	Symmetrical Rail 35 mm x 7.5 mm 2.80" (71.0 mm) high 3.28' (1 m) long Angled 30° Zinc-Plated, Chromated Steel **DIN #3**	2	 For mounting rail details, see Cat. No. 199-DR1

❶ Dimensions shown in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

❷ 0.218" (5.5 mm) x 0.50" (12.7 mm) slotted mounting holes every 3" (76.2 mm) starting 1.69" (42.9 mm) from end.

MAIN FLC CABINET

VERTICAL BLOC

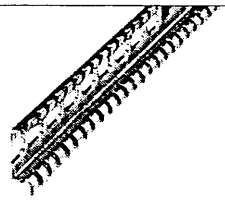
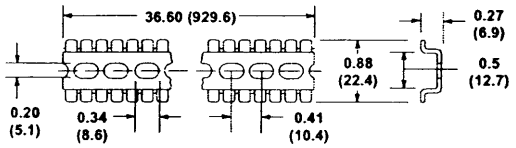
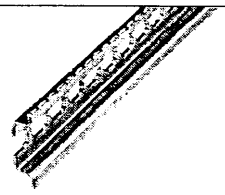
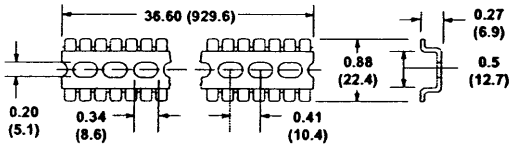
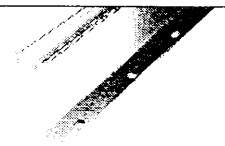
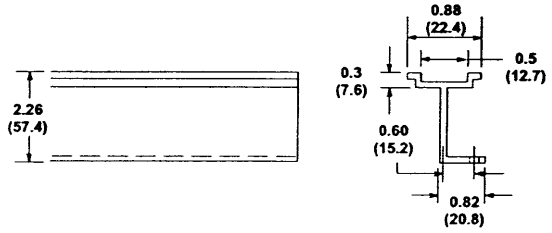
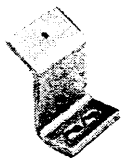
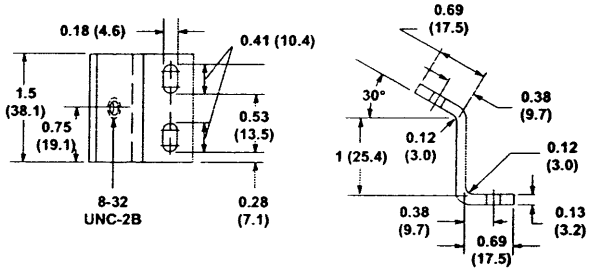
(1)

Accessories

Mounting Rails, Continued

Allen-Bradley Mounting Rails

NEMA/EEMAC Mounting Rails

Item	Description	Pcs./Pkg.	Dimensions ❶
1492-N1 	Breakaway Mounting Rail 3' (0.91 m) long Scored every 0.203" (5.2 mm) so it will break off to the desired length	20	 #8–32 or M4 Recommended Mounting Screw Size
1492-N22 	Rigid Mounting Rail 3' (0.91 m) long	20	 #8–32 or M4 Recommended Mounting Screw Size
1492-N44 ❷ 	2.26" (57.4 mm) High Rise Mounting Rail 3' (0.91 m) long Aluminum	2	
1492-N25 	Mounting Rail Standoff Brackets Used with 1492-N22 Rigid Mounting Rail	2	

❶ Dimensions shown in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.
❷ 0.19" (4.8 mm) x 0.4" (10.2 mm) slotted mounting holes every 3" (76.2 mm) starting 1.5" (38.1 mm) from end.

(2)

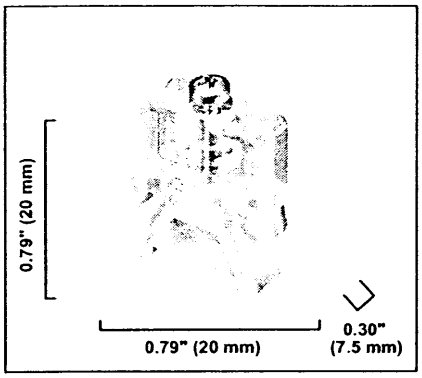
14.4

Accessories

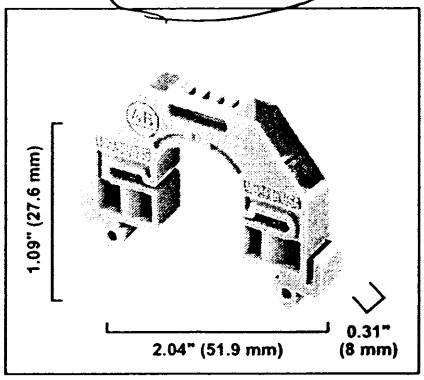
End Anchors

EC

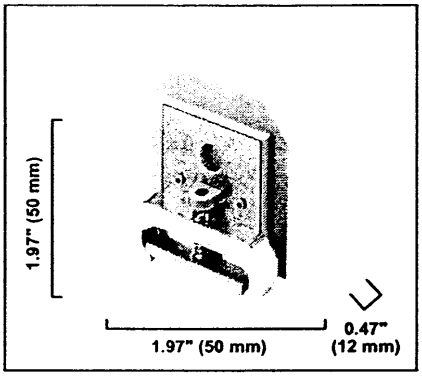
1492-EA15



1492-EA35

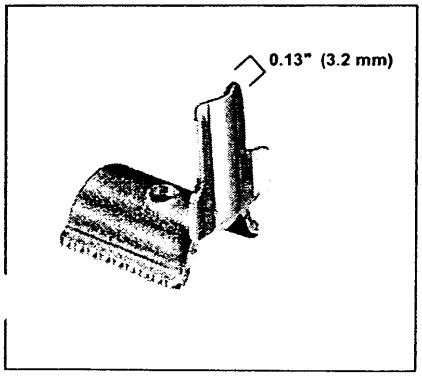


1492-EAH35

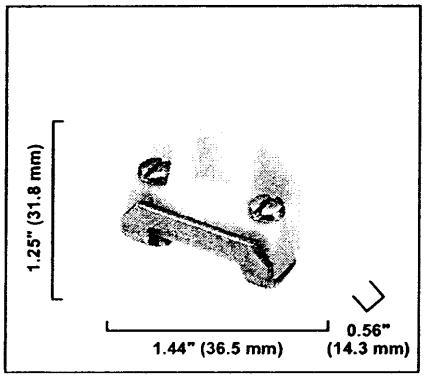


NEMA/EEMAC

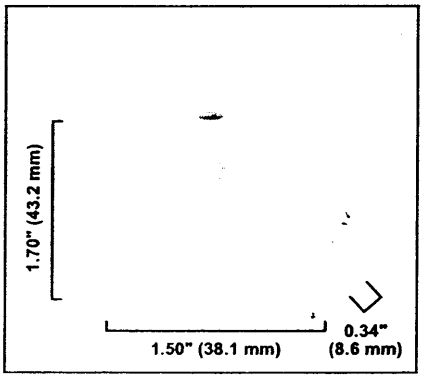
1492-N2



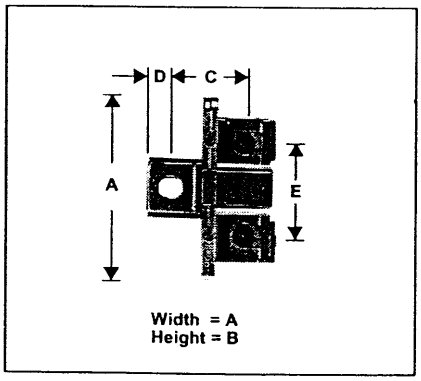
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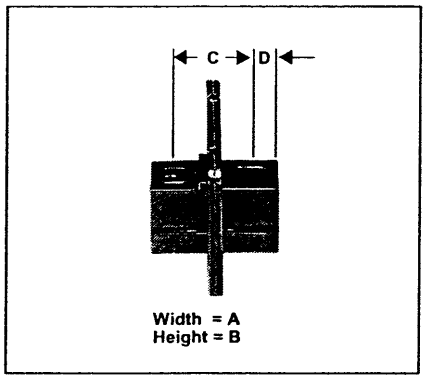
1492-N47



1492-15A, 1492-25A



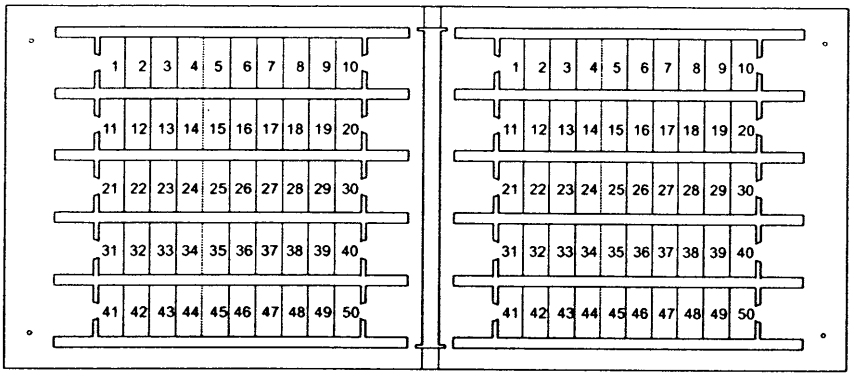
1492-15E, 1492-25E



Cat. No.	A	B	C	D	E
1492-15A	1.5" (38.1 mm)	1.03" (26.2 mm)	0.594" (15.1 mm)	0.234" (5.9 mm)	0.75" (19.1 mm)
1492-15E	1.5" (38.1 mm)	1.03" (26.2 mm)	0.594" (15.1 mm)	0.234" (5.9 mm)	—
1492-25A	1.88" (47.8 mm)	1.19" (30.2 mm)	0.688" (17.5 mm)	0.203" (5.2 mm)	0.97" (24.6 mm)
1492-25E	1.88" (47.8 mm)	1.19" (30.2 mm)	0.688" (17.5 mm)	0.234" (5.9 mm)	—

Standard Pre-Printed Marker Cards, 50 Numbers in Series (Minimum Order of 1 Card)

HORIZONTAL
(Shown approx. 50% of actual size.)



Catalog Number Explanation

1492 – SM 6X9 H 1–50

Bulletin Number

Marker Type	
SM	Snap-in Marker

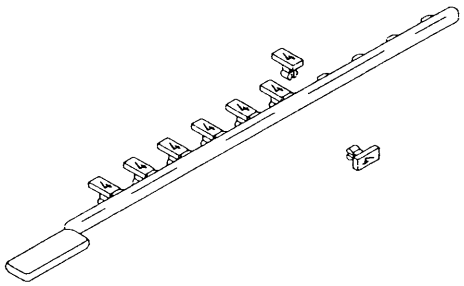
Orientation	
Code	**Direction**
H	Horizontal
V	Vertical

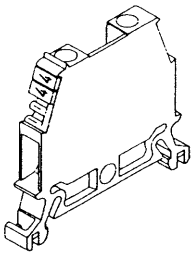
Marker Code		
Code	**Width (mm)**	**Height (mm)**
5X5	5	5
5X9	5	9
5X12	5	12
6X9	6	9
6X12	6	12
8X9	8	9
8X12	8	12
N81	6	10
N83	10	10

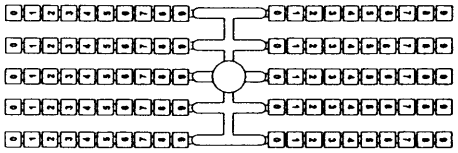
Printing	
Code	**Numbers Printed**
1–50	Printed "1–50"
51–100	Printed "51–100"
101–150	Printed "101–150"
. . .	. . .
351–400	Printed "351–400"
401–450	Printed "401–450"
451–500	Printed "451–500"

6 mm Single Digit Pre-Printed Marker Tabs

Note: 10 labels per piece. For use with any 1492-W product that is compatible with 1492-SM5X9 and 1492-SM5X12 Marker Cards, refer to page 207. Also for use with 1492-W10 terminal blocks.







Numbers		
Printing	Cat. No.	Pcs./Pkg.
0	1492-MP-0	10
1	1492-MP-1	10
2	1492-MP-2	10
3	1492-MP-3	10
4	1492-MP-4	10
5	1492-MP-5	10
6	1492-MP-6	10
7	1492-MP-7	10
8	1492-MP-8	10
9	1492-MP-9	10

Number Series		
Printing	Cat. No.	Pcs./Pkg.
0...9	1492-MP	10

Blank		
Printing	Cat. No.	Pcs./Pkg.
Blank	1492-MP-BLANK	10

Letters		
Printing	Cat. No.	Pcs./Pkg.
A	1492-MP-A	10
B	1492-MP-B	10
C	1492-MP-C	10
D	1492-MP-D	10
E	1492-MP-E	10
F	1492-MP-F	10
G	1492-MP-G	10
H	1492-MP-H	10
I	1492-MP-I	10
J	1492-MP-J	10
K	1492-MP-K	10
L	1492-MP-L	10
M	1492-MP-M	10
N	1492-MP-N	10
P	1492-MP-P	10
Q	1492-MP-Q	10
R	1492-MP-R	10
S	1492-MP-S	10

Letters (continued)		
Printing	Cat. No.	Pcs./Pkg.
T	1492-MP-T	10
U	1492-MP-U	10
V	1492-MP-V	10
W	1492-MP-W	10
X	1492-MP-X	10
Y	1492-MP-Y	10
Z	1492-MP-Z	10

Special Symbols		
Printing	Cat. No.	Pcs./Pkg.
+	1492-MP-POS	10
⏚	1492-MP-GND	10
–	1492-MP-NEG	5
~	1492-MP-AC	10
=	1492-MP-DC	10

5 mm Single Digit Pre-Printed Marker Tabs

Note: 100 labels per card. For use with any 1492-W product that is compatible with 1492-SM5X9 and 1492-SM5X12 Marker Cards, refer to page 0-207.

Numbers		
Printing	Cat. No.	Pcs./Pkg.
0	1492-MP5-0	5
1	1492-MP5-1	5
2	1492-MP5-2	5
3	1492-MP5-3	5
4	1492-MP5-4	5
5	1492-MP5-5	5
6	1492-MP5-6	5
7	1492-MP5-7	5
8	1492-MP5-8	5
9	1492-MP5-9	5

Number Series		
Printing	Cat. No.	Pcs./Pkg.
0...9	1492-MP5-10	5
A...Z	1492-MP5-AZ	5

Blank		
Printing	Cat. No.	Pcs./Pkg.
Blank	1492-MP5-BLANK	5

Letters		
Printing	Cat. No.	Pcs./Pkg.
A	1492-MP5-A	5
B	1492-MP5-B	5
C	1492-MP5-C	5
D	1492-MP5-D	5
E	1492-MP5-E	5
F	1492-MP5-F	5
G	1492-MP5-G	5
H	1492-MP5-H	5
I	1492-MP5-I	5
J	1492-MP5-J	5
K	1492-MP5-K	5
L	1492-MP5-L	5
M	1492-MP5-M	5
N	1492-MP5-N	5
P	1492-MP5-P	5
Q	1492-MP5-Q	5
R	1492-MP5-R	5
S	1492-MP5-S	5

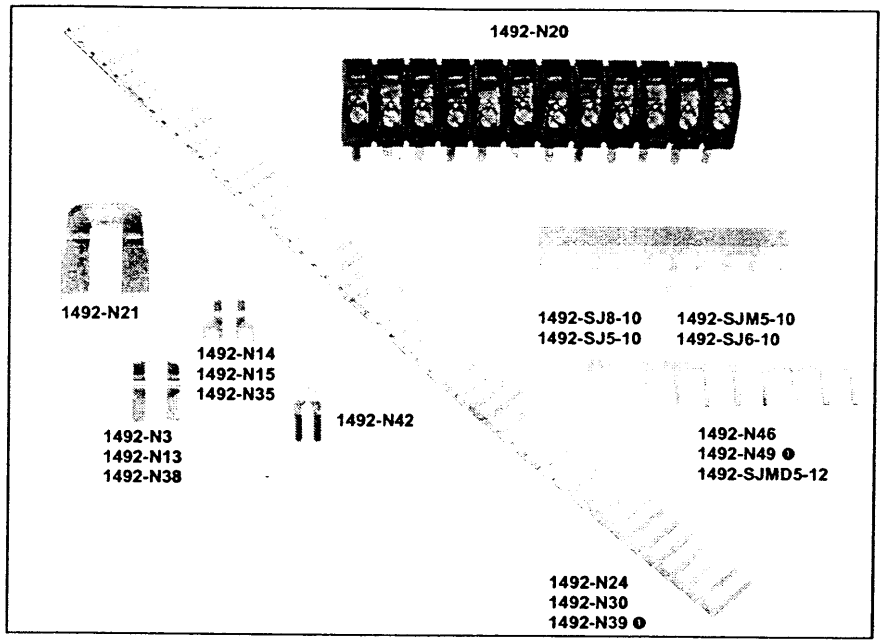
Letters (continued)		
Printing	Cat. No.	Pcs./Pkg.
T	1492-MP5-T	5
U	1492-MP5-U	5
V	1492-MP5-V	5
W	1492-MP5-W	5
X	1492-MP5-X	5
Y	1492-MP5-Y	5
Z	1492-MP5-Z	5

Special Symbols		
Printing	Cat. No.	Pcs./Pkg.
+	1492-MP5-POS	5
⏚	1492-MP5-GND	5
–	1492-MP5-NEG	5
~	1492-MP5-AC	5
=	1492-MP5-DC	5

Accessories

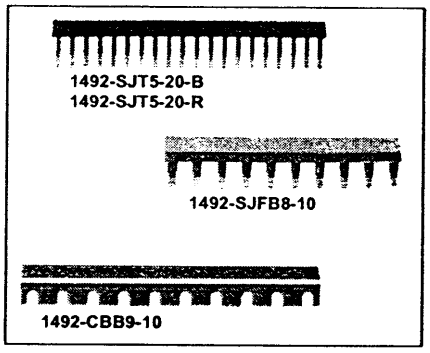
Jumpers/Fanning Strips/Fuse Holder

Side Jumpers/Fanning Strip/Installation Accessories

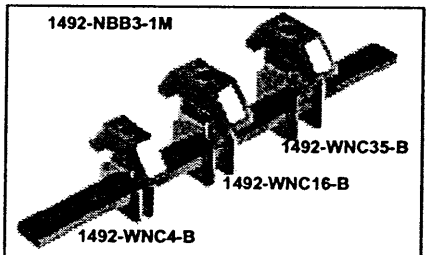


❶ The 1492-SJS Insulating Sleeve reduces exposure to live parts on the 1492-N39 and 1492-N49. The 1492-SJS used with the 1492-N39 and 1492-H1 or 1492-HM1 provides IEC 947 IP2X finger protection.

Side Jumpers

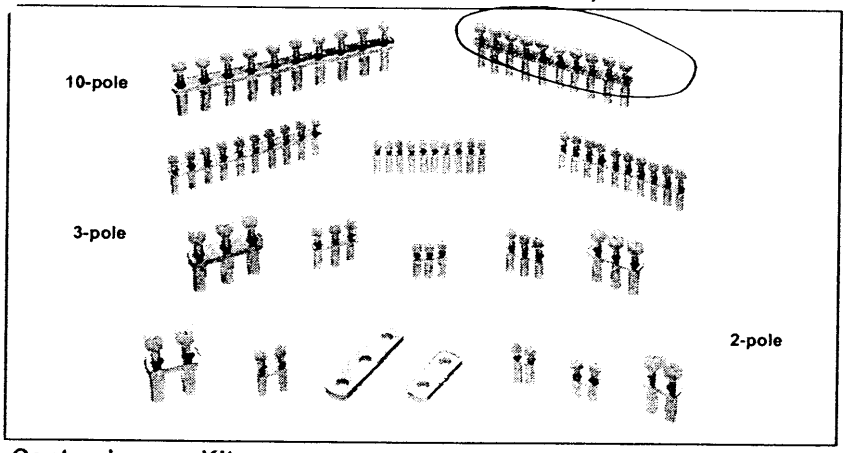


Neutral Disconnect Busbar and Busbar Terminals

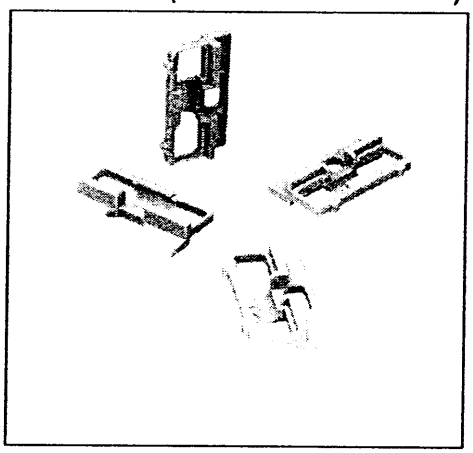


Note: All terminals shown with Cat. No. 1492-SM6X9 markers installed

Center Jumper Bars – IEC (Cat. No. 1492-CJ...)



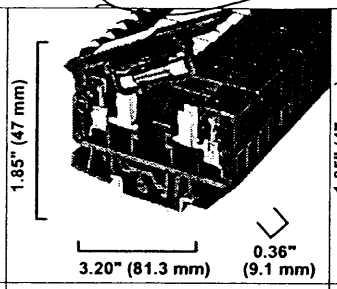
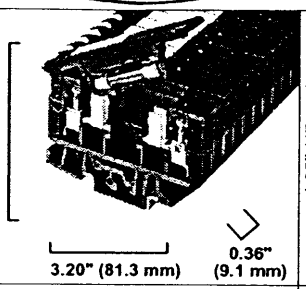
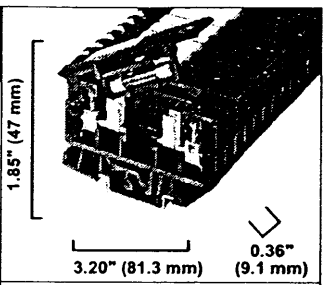
Fuse Holder (Cat. No. 1492-IFMFH1)

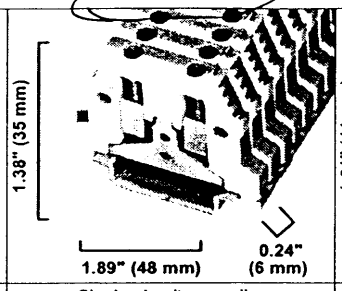
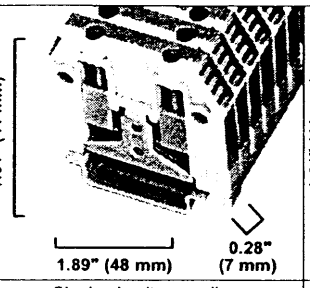
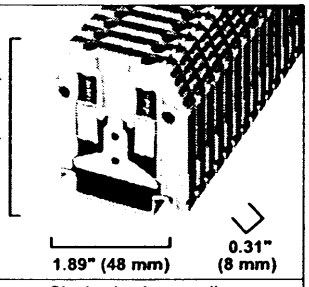


Center Jumper Kits

Cat. No.	Description	Used with Cat. Nos.	Pcs./Pkg.	Cat. No.	Description	Pcs./ Pkg.
1492-CJ5SF	Capped Screw/Ferrule	1492-W3, -W3TW	850	1492-CJ5B	Busbar	10
1492-CJT5SF	Capped Screw/Ferrule	1492-WTS3, WTF3	1500			
1492-CJD5SF	Capped Screw/Ferrule	1492-WD3, -WR3	1000			
1492-CJ6SF	Capped Screw/Ferrule	1492-W4	700	1492-CJ6B	Busbar	10
1492-CJ7SF	Capped Screw/Ferrule	1492-W6, -WD6	700	1492-CJ7B	Busbar	10
1492-CJ8SF	Capped Screw/Ferrule	1492-W10	325	1492-CJ8B	Busbar	10
1492-CJD6SF	Capped Screw/Ferrule	1492-WD4, -WM4, -WD4P, -WDG4P	1000	1492-CJD6B	Busbar	10

POWER ANALOG

	1492-H4			1492-H5			1492-H6		
Dimensions are not intended to be used for manufacturing purposes. **Note:** Height dimension is measured from top of rail to top of terminal block.									
Specifications	*Single circuit fusible terminal block with neon blown fuse indicator.*			*Single circuit fusible terminal block with LED blown fuse indicator.*			*Single circuit fusible terminal block without a blown fuse indicator.*		
Approvals		CSA	IEC		CSA	IEC		CSA	IEC
Voltage Rating	300V AC/DC	300V AC/DC	500V AC/DC	300V AC/DC	300V AC/DC	500V AC/DC	300V AC/DC	300V AC/DC	500V AC/DC
Maximum Current	12 A	12 A	12 A	12 A	12 A	12 A	12 A	12 A	12 A
Wire Range (Rated Cross Section)	#30... #12 AWG	#30... #12 AWG	0.05... 4 mm²	#30... #12 AWG	#30... #12 AWG	0.05... 4 mm²	#30... #12 AWG	#30... #12 AWG	0.05... 4 mm²
Indicator Type	Neon			LED			Non-Indicating		
Leakage Current	2 mA @ 300V			2 mA @ 24V			—		
Working Voltage	100...300V AC			10...57V AC/DC			Per Fuse Rating		
Fuse Size (Not Supplied)	1/4" x 1-1/4"			1/4" x 1-1/4"			1/4" x 1-1/4"		
Wire Strip Length	0.38" (9.7 mm)			0.38" (9.7 mm)			0.38" (9.7 mm)		
Recommended Tightening Torque	3...7 lb-in. (0.3...0.8 Nm)			3...7 lb-in. (0.3...0.8 Nm)			3...7 lb-in. (0.3...0.8 Nm)		
Density	33 pcs./ft (109/m)			33 pcs./ft (109/m)			33 pcs./ft (109/m)		
Insulation Temperature Range	–40...+221°F (–40...+105°C)			–40...+221°F (–40...+105°C)			–40...+221°F (–40...+105°C)		
Terminal Blocks	**Cat. No.**		**Pcs./ Pkg.**	**Cat. No.**		**Pcs./ Pkg.**	**Cat. No.**		**Pcs./ Pkg.**
Terminal Block	1492-H4		25	1492-H5		25	1492-H6		25
Accessories (page 185)	**Cat. No.**		**Pcs./ Pkg.**	**Cat. No.**		**Pcs./ Pkg.**	**Cat. No.**		**Pcs./ Pkg.**
Mounting Rails: 3' Scored A-B Rail	1492-N1		20	1492-N1		20	1492-N1		20
3' Rigid A-B Rail	1492-N22		20	1492-N22		20	1492-N22		20
3' High Rise A-B Rail	1492-N44		2	1492-N44		2	1492-N44		2
Standoff Brackets (Use Every 12")	1492-N25		2	1492-N25		2	1492-N25		2
1 m Symmetrical DIN	199-DR1		10	199-DR1		10	199-DR1		10
1 m Symmetrical DIN (Alumin.)	1492-DR5		10	1492-DR5		10	1492-DR5		10
1 m Hi-Rise Symmetrical DIN	1492-DR6		2	1492-DR6		2	1492-DR6		2
1 m Angled Hi-Rise Sym. DIN	1492-DR7		2	1492-DR7		2	1492-DR7		2
End Barrier	1492-N37		50	1492-N37		50	1492-N37		50
End Anchors: A-B Rail — Heavy Duty	1492-N23		10	1492-N23		10	1492-N23		10
A-B Rail — Normal Duty	1492-N47		50	1492-N47		50	1492-N47		50
DIN Rail — Normal Duty	1492-EA35		50	1492-EA35		50	1492-EA35		50
DIN Rail — Heavy Duty	1492-EAH35		50	1492-EAH35		50	1492-EAH35		50
Side Jumpers: 10-pole Uninsulated	1492-N49		10	1492-N49		10	1492-N49		10
Side Jumper Insulating Sleeve	1492-SJS		10	1492-SJS		10	1492-SJS		10
Marking Systems	1492-SM8X12		5	1492-SM8X12		5	1492-SM8X12		5

Dimensions are not intended to be used for manufacturing purposes. **Note:** Height dimension is measured from top of rail to top of terminal block. GREEN + YELLOW	1492-WG4  				1492-WG6  				1492-WG10S  		
Specifications	*Single-circuit grounding terminal block.*				*Single-circuit grounding terminal block.*				*Single-circuit grounding terminal block.*		
Approvals		EEx e II	CSA	IEC		EEx e II	CSA	IEC		CSA	IEC
Voltage Rating	—	—	—	—	—	—	—	—	—	—	—
Maximum Current	Grounding				Grounding				Grounding		
Wire Range (Rated Cross Section)	#22... #12 AWG	4 mm²	#22... #12 AWG	4 mm²	#22... #10 AWG	6 mm²	#22... #10 AWG	6 mm²	#22... #8 AWG	#22... #8 AWG	10 mm²
Wire Strip Length	0.43" (11 mm)				0.47" (12 mm)				0.43" (11 mm)		
Recommended Tightening Torque	5.6...6.8 lb-in. (0.7 Nm)				5.6...6.8 lb-in. (0.7 Nm)				7.1 lb-in. (0.8 Nm)		
Density	50 pcs./ft (166/m)				43 pcs./ft (142/m)				38 pcs./ft (125/m)		
Insulation Temperature Range	–40...+195°F (–40...+90°C)				–40...+195°F (–40...+90°C)				–40...+195°F (–40...+90°C)		
Terminal Blocks	**Cat. No.**			**Pcs./ Pkg.**	**Cat. No.**			**Pcs./ Pkg.**	**Cat. No.**		**Pcs./ Pkg.**
Terminal Block:	1492-WG4			50	1492-WG6			50	1492-WG10S		10
Accessories (page 185)	**Cat. No.**			**Pcs./ Pkg.**	**Cat. No.**			**Pcs./ Pkg.**	**Cat. No.**		**Pcs./ Pkg.**
Mounting Rails: 1 m Symmetrical DIN (Steel)	199-DR1			10	199-DR1			10	199-DR1		10
1 m Symmetrical DIN (Aluminum)	1492-DR5			10	1492-DR5			10	1492-DR5		10
1 m Hi-Rise Sym. DIN (Aluminum)	1492-DR6			2	1492-DR6			2	1492-DR6		2
1 m Angled Hi-Rise Sym. DIN (Steel)	1492-DR7			2	1492-DR7			2	1492-DR7		2
End Barrier	1492-EB3-Y			50	1492-EB10-Y			50	1492-EB10-Y		50
End Anchors DIN Rail — Normal Duty	1492-EA35			50	1492-EA35			50	1492-EA35		—
DIN Rail — Heavy Duty	1492-EAH35			10	1492-EAH35			10	1492-EAH35		—
Other Accessories: Group Marking Carrier	1492-GM35			10	1492-GM35			10	1492-GM35		10
Marking Systems: Snap-in Marker Card	1492-SM6X12			5	1492-SM6X12			5	1492-SM8X12		5
Individual Marker Tabs (single char.)	1492-MP ❶			10	1492-MP ❶			10	—		—

❶ Cat. no. is not complete. See page 186.

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

(1)

14.7

Taylor® Wiring Duct

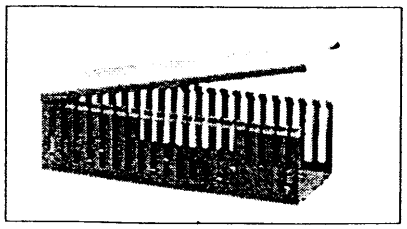
Wiring Duct and Accessories

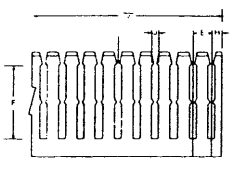
Narrow Slot Flush Profile Duct – Vinyl

Cat. No. Vinyl Duct	Cover Cat. No.	Nom. Size W	Nom. Size H	Dimensions (in.) A	B	C	D	E	F	G	H	I
T.5 X .5HD+	T.5C+	.5	.5	.68	.72	.68	.78	.39	.38	on ctr.	.20	.158
T.5 X 1HD+		.5	1	.68	1.1	.68	1.16	.39	.68	on ctr.	.20	.158
T.75 X .75HD+	T.75C+	.75	.75	.79	.75	.79	.81	.39	.375	on ctr.	.20	.158
T.75 X 1.5HD+		.75	1.5	.79	1.49	.79	1.60	.39	1.03	on ctr.	.20	.158
T1 X 1 HD+		1	1	.98	1.13	.98	1.2	.39	.70	on ctr.	.20	.158
T1 X 1.5HD+		1	1.5	.98	1.52	.98	1.6	.39	1.07	on ctr.	.20	.158
T1 X 2HD+	T1C+	1	2.25	.98	2.0	.98	2.1	.39	1.25	on ctr.	.20	.158
T1 X 3HD+		1	3	.98	3.0	.98	3.1	.39	2.50	on ctr.	.20	.158
T1 X 4HD+		1	4	.98	3.85	.98	3.9	.39	3.26	on ctr.	.20	.158
T1.5 X 1HD+		1.5	1	1.57	1.13	1.57	1.2	.39	.70	on ctr.	.20	.158
T1.5 X 1.5HD+		1.5	1.5	1.57	1.52	1.57	1.6	.39	1.07	on ctr.	.20	.158
T1.5 X 2HD+	T1.5C+	1.5	2.25	1.57	2.0	1.57	2.1	.39	1.25	on ctr.	.20	.158
T1.5 X 3HD+		1.5	3	1.57	3.0	1.57	3.1	.39	2.50	on ctr.	.20	.158
T1.5 X 4HD+		1.5	4	1.57	3.85	1.57	3.9	.39	3.26	on ctr.	.20	.158
T2 X 1HD+		2	1	1.97	1.13	1.97	1.2	.39	.70	.5	.20	.158
T2 X 1.5HD+		2	1.5	1.97	1.52	1.97	1.6	.39	1.07	.5	.20	.158
T2 X 2HD+		2	2.25	1.97	2.0	1.97	2.1	.39	1.25	.5	.20	.158
T2 X 3HD+	T2C+	2	3	1.97	3.0	1.97	3.1	.39	2.50	.5	.20	.158
T2 X 4HD+		2	4	1.97	3.85	1.97	3.9	.39	3.26	.5	.20	.158
T2 X 5HD+		2	5	1.97	5.04	1.97	5.10	.39	4.38	.5	.20	.158
T2.25 X 1.5HD+		2.25	1.5	2.36	1.52	2.36	1.6	.39	1.07	.5	.20	.158
T2.25 X 2HD+	T2.25C+	2.25	2.25	2.36	2.0	2.36	2.1	.39	1.25	.5	.20	.158
T2.25 X 3HD+		2.25	3	2.36	3.0	2.36	3.1	.39	2.50	.5	.20	.158
T2.25 X 4HD+		2.25	4	2.36	3.85	2.36	3.9	.39	3.26	.5	.20	.158
T3 X 1HD+		3	1	2.95	1.13	2.95	1.2	.39	.70	1	.20	.158
T3 X 2HD+		3	2.25	2.95	2.0	2.95	2.1	.39	1.25	1	.20	.158
T3 X 3HD+	T3C+	3	3	2.95	3.0	2.95	3.1	.39	2.50	1	.20	.158
T3 X 4HD+		3	4	2.95	3.85	2.95	3.9	.39	3.26	1	.20	.158
T3 X 5HD+		3	5	2.95	5.04	2.95	5.1	.39	4.38	1	.20	.158
T3.15 X 2HD+		3.15	2.25	3.15	2.0	3.15	2.1	.39	1.25	1	.20	.158
T3.15 X 3HD+	T3.15C+	3.15	3	3.15	3.0	3.15	3.1	.39	2.50	1	.20	.158
T3.15 X 4HD+		3.15	4	3.15	3.85	3.15	3.9	.39	3.26	1	.20	.158
T4 X 2HD+		4	2.25	3.94	2.0	3.94	2.1	.39	1.25	1.5	.20	.158
T4 X 3HD+	T4C+	4	3	3.94	3.0	3.94	3.1	.39	2.50	1.5	.20	.158
T4 X 4HD+		4	4	3.94	3.85	3.94	3.9	.39	3.26	1.5	.20	.158
T4 X 5HD+			5	3.94	5.04	3.94	5.10	.39	4.38	1.5	.20	.158
T6 X 4HD+	T6C+	6	4	5.91	3.85	5.91	3.9	.39	3.26	2.5	.20	.158

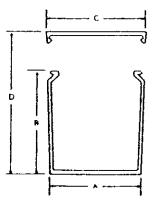
+ Catalogue number must be completed by adding suffix G for Grey, W for White, B for Blue.
Example: T2 x 2HD is a 2" x 2" gray duct.
Standard lengths are 6 feet
*To order adhesive-backed duct, add suffix **A** to catalogue number.*
Example: T2 x 2HDGA is a 2" x 2" gray duct with adhesive backing.
Shelf life for adhesive is 1 year.

Vinyl duct is UL Recognized ᵁᴸ,
CSA Certified and meets the JIC requirements.
Noryl® duct available upon request (oyster white only).
Contact Customer Service for details.

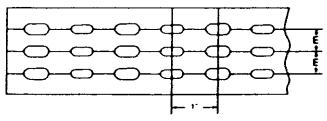




Typical Side View



Overall Height Cover Installed



Bottom Mounting Holes, ½ x 7/16 (in.)

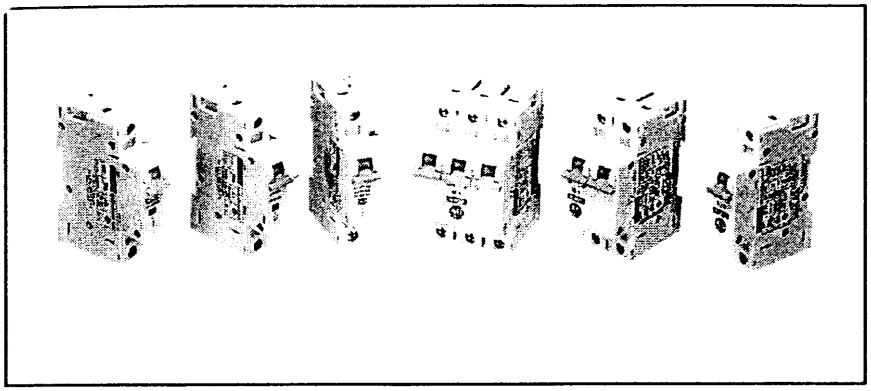
14.8

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

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

REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT. ANY ACTION INDICATED IS SUBJECT TO THESE REQUIREMENTS.
☑ NO EXCEPTION TAKEN
☐ MAKE NOTED CORRECTIONS
☐ REVISE & RESUBMIT
☐ REJECTED
DATE Jan 21/14 BY DC
EARTH TECH (CANADA) INC.

492-CB



Description

Bulletin 1492 Energy Limiting Miniature Circuit Breakers are thermal magnetic type **supplementary** overcurrent protective devices. Bulletin 1492-CB Miniature Circuit Breakers are available in 1-, 2-, and 3-pole units rated from 0.5...50 A. AC units are rated 65V DC as standard. 2- and 3- pole devices are connected internally and at the handle for simultaneous operation.
Wire termination is achieved by a clamping style, self-lifting box lug on all Bulletin 1492-CB units. Both line and load side termination points will accept #16...6 AWG (1.5...16 mm²) copper wires.

Features

- Energy Limiting Design — protects downstream components better than conventional breakers during short circuits
- Field-mountable options for selective applications
- True IP2X Finger-Safe design (top and sides)
- International approvals — CE Marked, meets UL, CSA, and IEC (VDE) standards for worldwide acceptance
- Ratings to 480V AC and 10,000 A Interrupt Capacity (refer to page 1-109)
- AC and DC voltage ratings — in one convenient device
- A positively trip-free mechanism (breaker operation cannot be defeated by holding the handle in the ON position)
- 3 trip curves: F, G, and H
- Time delay (H characteristic) for high inrush currents during inductive start-ups such as transformers and power supplies
- Superior shock and vibration resistance capabilities — helps to prevent nuisance tripping
- Mounts on DIN Rail or optional through door brackets
- On standard AC/DC versions (F, G, H) line and load connections may be reversed

Trip Curves

1492-CB Trip Curves are available in publication 1492-2.5.

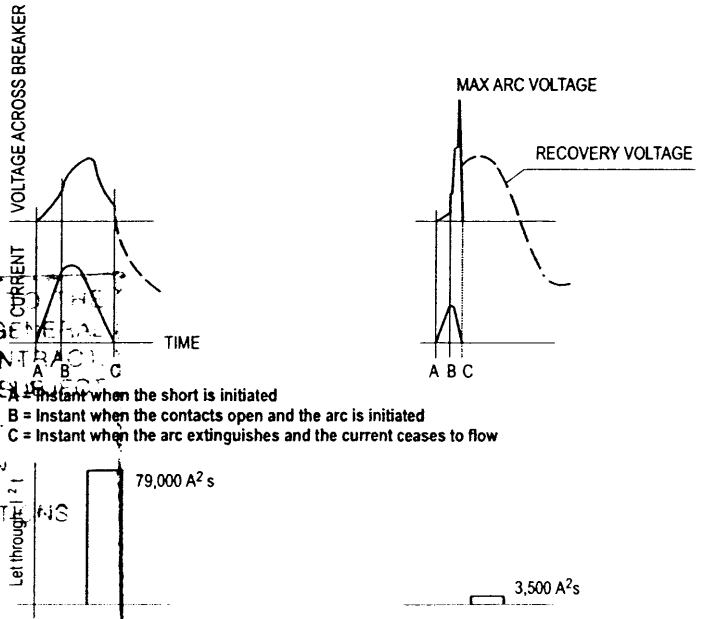
The Benefits of Limiting Let-Through-Energy

1492-CB vs. Conventional Breakers

The 1492-CB line features the unique ability to achieve short circuit interruptions far more effectively than conventional breakers.
In *conventional circuit breakers*, short circuit interruption time required is approximately one or two half cycles of an AC sine wave. When the contacts open, the resulting arc continues to burn until the current level passes through zero. The arc may re-ignite because of the insufficient width of the contact gap. The current that flows until the arc is extinguished produces a heating effect proportional to the I^2t value *(let-through-energy)* of the fault current. The 1492-CB Energy Limiting Miniature Circuit Breaker is designed to substantially reduce the amount of *let-through-current* and the resulting *let-through-energy* that can damage protected components. The 1492-CB has the ability to interrupt short circuit current within the first half cycle of the fault.

Short Circuit Interruption Diagrams

Short Circuit Interruption 10 kA — 120 Volts AC
Instant of initiation: 15° after voltage zero



REVIEWED ACCORDING TO THE
REQUIREMENTS OF THE GENERAL
CONDITIONS OF THE CONTRACT.
ANY ACTION INDICATED IS SUBJECT
TO THESE REQUIREMENTS.
[X] NO EXCEPTIONS TAKEN
[ ] MAKE NOTED CORRECTIONS
[ ] REVISE & RESUBMIT
[ ] REJECTED
DATE July 21/05 BY DC
EARTH TECH (CANADA) INC.

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

1492-CB, Continued

The Benefits of Limiting Let-Through-Energy (Continued)

Limiting let-through-energy will protect against the harmful effects of overcurrent and is focused primarily on avoiding the following:

- Excessive Heat
- Mechanical Damage

Both of these factors are proportional to the square of the current. Thermal energy is proportional to the square of the RMS value and magnetic forces are proportional to the square of the peak value. The most effective way to provide protection is to substantially limit *let-through-energy*. This provides the following advantages:

- Far less damage at the location of the short circuit.
- Fast electric separation of a faulty unit from the system, especially power supplies connected in parallel that are switched off when the voltage of the power bus drops below a certain level.
- Far less wear on the miniature circuit breaker itself. This means more safe interruptions.
- Better protection of all components in the short circuit path.
- Far wider range of selective action when used with an upstream protective device. (No nuisance shut downs from feeder line interruptions, causing a blackout in all connected branches.)

Applications

Bulletin 1492-CB Energy Limiting Miniature Circuit Breakers have a wide range of trip characteristics for a wide range of applications.

- F trip characteristic (3...5 x *In*) ❶ for low fault tolerant loads, such as PLC outputs, solid state control equipment, and also for selective action with an upstream fault device
- G trip characteristic (6...10 x *In*) ❶ for standard duty loads, such as relay coils, control circuitry, and test equipment
- H trip characteristic (12...20 x *In*) ❶ for high inrush loads, such as power supplies, heaters, and transformer primaries

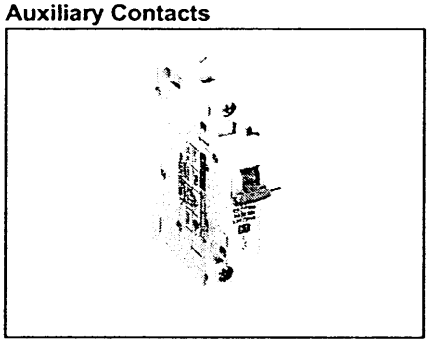
A type F has a fault level inrush current interruption approximately half that of type G. The type H has a fault level interruption approximately twice that of type G.

Accessories

Accessory Notes

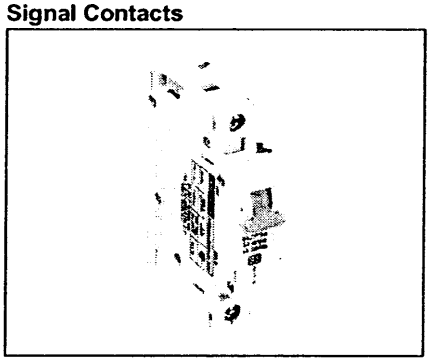
Note: Maximum of two accessories per device.

Auxiliary Contacts



Refer to Specifications on page 1-108 for ratings. Each auxiliary contact module contains one (1) contact, either Normally Open or Normally Closed. Actuation of the contact is determined by the handle position of the adjacent poles.

Signal Contacts

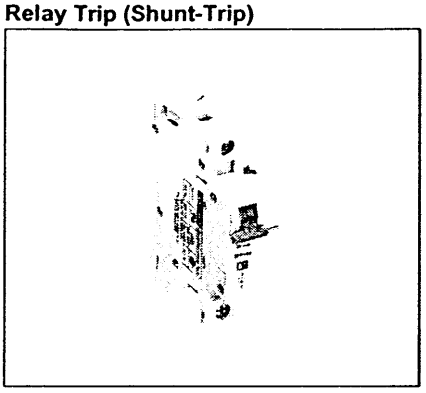


Refer to Specifications on page 1-108 for ratings. Each contact module contains one contact that will be linked internally with the adjacent poles, but not through the handle. Contacts are actuated by a fault condition on the protected poles, not by the manual operation of them.

Note: The difference between an auxiliary contact and a signal contact is the protected poles adjacent to the signal contact may be manually shut off without affecting the status of the signal contact, whereas the auxiliary contact is activated either by manual (possibly to service a panel) or automatic operation (fault) of the protected poles. Manual operation of the protected poles does not alter the contact state of the signal contact (which may be connected to an alarm circuit for fault indication only).

❶ *In* = rated current. The time/current trip characteristic k1...k2 x *In* is defined such that inrush current k1 x *In* has a time delay that exceeds 10 ms, and k2 x *In* has a time delay that is less than 10 ms.

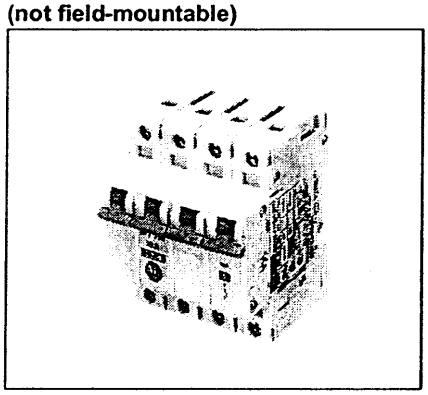
Relay Trip (Shunt-Trip)



Refer to the table below for ratings. The Relay trip module can be used to trip the adjacent current carrying poles from a remote location by applying a voltage (pick-up voltage) to the Relay trip terminals. Contacts operate between 8 and 16 milliseconds after the pick-up voltage has been applied.

Type	Pick-Up Voltage Range	Impedance
A1	5...15 V AC/DC	1.1 Ω
A2	10...24V AC/DC	4.7 Ω
A3	20...48V AC/DC	16 Ω
A4	40...110V AC/DC	63 Ω
A5	90...240V AC/DC	395 Ω

Switched Neutral Module (not field-mountable)



Refer to Specifications on page 1-108 for ratings. This module is used to open the neutral line of the circuit as a result of the condition of the protected poles. It is used as a safety measure (required by some standards) for the protection of networks with a grounded neutral system. The switched neutral pole opens after and closes before the adjacent protected pole (i.e., early make, late break). Automatic actuation is a result of the adjacent pole trip mechanism and manual actuation is by the linked handles.

(2)

14.9

'492-CB, Continued

How to Order 1492-CB

The following information must be known to select the proper miniature circuit breaker:

- What is the full load amperage that will be available in the system?
- Is it a 1-, 2-, or 3-phase system?
- What are the start-up or inrush properties of the load?
- Will the system require additional shaping options (e.g., auxiliary contacts, signal contacts)?

After defining these few parameters, the selection can be done by following the chart below. All options are field-mountable except the neutral switch, which comes installed from the factory.

Selection Information

You can order a basic 1-, 2-, or 3-pole miniature circuit breaker from the following tables and add an accessory module to meet your specific application requirements.

1492 – CB 3 G 200 – N ❶ ❹

Bulletin Number

Energy Limiting Miniature Circuit Breaker	
CB	Screw Terminal

Switched Neutral Module	
N ❶	277V 65 A

Number of Poles		Rated Voltage ❷ By Trip Characteristic	
		F, G, H	DF, DG, DH
1	1 pole	277V AC 65V DC	120V DC
2	2 poles	480V AC 65V DC	240V DC
3	3 poles	480V AC 65V DC	360V DC

Trip Characteristic	
Code	Magnetic Trip Range
F	3...5 x *In*
G	6...10 x *In*
H	12...20 x *In*
DF ❸❹	4.5...8 x *In*
DG ❸❹	9...16 x *In*
DH ❸❹	18...32 x *In*

In = Rated Current

UL1077, CSA C22.2 #235 — In North America, miniature circuit breakers are recognized as supplementary protectors and are intended for use as overcurrent protection within an appliance or other electrical equipment where branch circuit protection is already provided or not required. Internationally, these products are rated to IEC standards as miniature circuit breakers or circuit breakers for equipment.

FEW + BOILER CP

Trip Char.	Current Rating Code (Standard Trip Characteristic is Type G)																		
F	005	010	015	020	030	040	050	060	070	100	120	150 ❸	160 ❸	200 ❸	250 ❸	300 ❸	320 ❸	400 ❸	500 ❸
G	005	010	015	020	030	040	050	060	070	100	120	150	160	200	250	300	320	400	500
H	005	010	015	020	030	040	050	060	070	100	120	150	160	200	250	300	320	400	500
DF ❸❹	005	010	015	020	030	040	050	060	070	100	120	150	160	200	250	300	320	400	—
DG ❸❹	005	010	015	020	030	040	050	060	070	100	120	150	160	200	250	300	320	400	—
DH ❸❹	—	—	—	—	—	—	—	060	070	100	120	150	160	200	250	300	320	400	—
Amp Rating	0.5	1	1.5	2	3	4	5	6	7	10	12	15	16	20	25	30	32	40	50

MAIN PLC CABINET

❶ This alphanumeric character is for the optional neutral module.
❷ Rated volts are UL Recognized.
❸ Minimum order of 10 breakers required.
Attention: Do not use these DC versions in AC networks. Polarity markings must be observed with the DC versions.

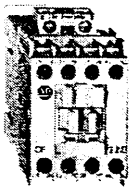
POWER RELAY

17275

Bulletin 700-CF

Industrial Relays

Overview/Product Selection



Bulletin 700-CF

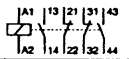
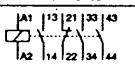
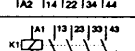
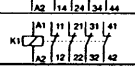
- IEC Industrial Relays (Finger Safe Design
- Positively-Guided/Mechanically-Linked Contacts per IEC 947-5-1 Annex L on Main and Auxiliary Contacts
- Solid-State and Pneumatic Timing Modules
- 4...12 Poles
- 12...600V Coils

REVIEWED ACCORDING TO
REQUIREMENTS OF THE
CONDITIONS OF THE
ANY ACTION INDICATED IS
TO THESE REQUIREMENTS
☑ NO EXCEPTIONS TAKEN
☐ MAKE
☐ REVISE &
☐ REJECTED
DATE July 21/05 DC
BY

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Approximate Dimensions 196

~ 4-Pole AC Coil Voltage

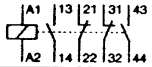
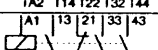
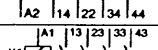
AC-12 I_{th} [A]		AC-15 I_{th} [A]							Connection Diagrams	Contacts N.O.	Contacts N.C.	Standard Contacts Cat. No. ❶	Gold Bifurcated Contacts Cat. No. ❶
40°C	60°C	24/48V	120V	240V	400V	500V	600V	690V					
25	20	16	14	10	5	2.5	1.8	1		2	2	700-CF220⊗	700-CFB220⊗
										3	1	700-CF310⊗	700-CFB310⊗
										4	0	700-CF400⊗	700-CFB400⊗
										0	4	700-CF040⊗	700-CFB040⊗

⊗ Voltage Suffix Code

The Cat. No. as listed is incomplete. Select a Voltage Suffix Code from the table below to complete the Cat. No. Example: **Cat. No. 700-CF220⊗** becomes **Cat. No. 700-CF220F**

Voltage	12	24	32	36	42	48	100	100-110	110	120	127	200	200-220	208	208-240	220-230	230	230-240	240	277	347	380	380-400	400	400-415	440	480	500	550	600
50 Hz	R	K	V	W	X	Y	KP	—	D	P	S	KG	—	—	—	F	—	VA	T	—	—	—	N	—	G	B	—	M	C	—
60 Hz	Q	J	—	V	—	X	—	KP	—	D	—	—	KG	H	L	—	—	—	A	T	I	E	—	—	—	N	B	—	—	C
50/60 Hz	—	KJ	—	—	—	KY	KP	—	KD	L	—	KG	—	—	—	—	KF	—	KA	—	—	—	—	KN	—	KB	—	—	—	—

4-Pole DC Coil Voltages

AC-12 I_{th} [A]		AC-15 I_{th} [A]							Connection Diagrams	Contacts N.O.	Contacts N.C.	Standard Contacts Cat. No.❶	Gold Bifurcated Contacts Cat. No.❶
40°C	60°C	24/48V	120V	240V	400V	500V	600V	690V					
25	20	16	14	10	5	2.5	1.8	1		2	2	700-CF220⊗	700-CFB220⊗
										3	1	700-CF310⊗	700-CFB310⊗
										4	0	700-CF400⊗	700-CFB400⊗

⊗ Voltage Suffix Code ❷

The Cat. No. as listed is incomplete. Select a Voltage Suffix Code from the table below to complete the Cat. No. Example: **Cat. No. 700-CF220Z⊗** becomes **Cat. No. 700-CF220ZJ for 24V DC**

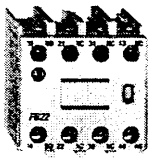
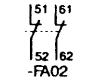
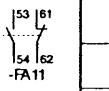
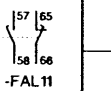
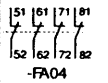
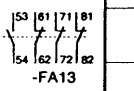
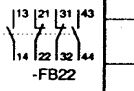
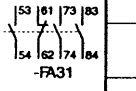
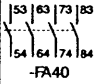
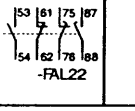
Voltage	9	12	24	36	48	60	64	72	80	110	115	125	220	230	250
Standard	ZR	ZQ	ZJ	ZW	ZY	ZZ	ZB	ZG	ZE	ZD	ZP	ZS	ZA	ZF	ZT
With diode suppressor			DJ												

❶ All Cat. Nos. are factory-stocked.
❷ When ordering DJ coil with built-in surge suppression, the DJ is not polarity sensitive. Drop out time: 14...20 ms.

(1)

Power Relay

Auxiliary Contacts

	Description	N.O.	N.C.	Connection Diagrams	For Use With	Cat. No. ❺
 	**Auxiliary Contact Blocks for Front Mounting ❶❷** • 2- and 4-pole • Quick and easy mounting without tools • Mutual positive guidance to the main contactor poles (except for L types) • Models with equal function with several terminal numbering choices L = Late break/Early make	0	2	 -FA02	700-CF	100-FA02
		1	1	 -FA11	700-CF	100-FA11
		2	0	 -FA20	700-CF	100-FA20
		1L	1L	 -FAL11	700-CF	100-FAL11
		0	4	 -FA04	700-CF	100-FA04
		1	3	 -FA13	700-CF	100-FA13
		2	2	 -FA22	700-CF	100-FA22
		3	1	 -FB22	700-CF	100-FA31
		4	0	 -FA31	700-CF	100-FA40
		1+1L	1+1L	 -FA40	700-CF	100-FAL22
				 -FAL22		

	Description	N.O.	N.C.	Connection Diagrams	For Use With	Cat. No. ❺
 	**Auxiliary Contact Blocks for Side Mounting without Sequence Terminal Designations ❷❸** • 1- and 2-pole • Two-way numbering for right or left mounting on the contactor • Quick and easy mounting without tools • Mutual positive guidance and to the main relay poles (except for L types) L = Late break/Early make	0	1	 -SA01	700-CF	100-SA01
		1	0	 -SA10	700-CF	100-SA10
		0	2	 -SA02	700-CF	100-SA02
		1	1	 -SA11	700-CF	100-SA11
		2	0	 -SA20	700-CF	100-SA20
		L1	L1	 -SAL11	700-CF	100-SAL11

❶ Control Relay and Auxiliary Contact

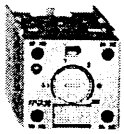
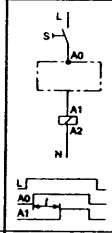
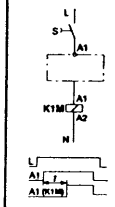
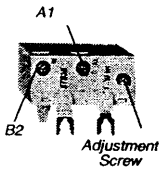
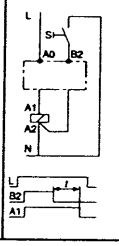
700CF (AC and DC coils), vertical mounting, 60°C					
Cat. No. 700... ❺	Max. N.O. Side Aux.	Max. N.C. Side Aux.	Max. N.O. Front + Side Aux.	Max. N.C. Front + Side Aux.	Max. N.O. + N.C. Front + Side Aux.
CF400	2	4	6	6	6
CF310	2	4	6	6	6
CF220	2	4	6	6	6
CF040 ❹	2	2	4	4	4

700CF (AC and DC coils), vertical mounting, 40°C					
Cat. No. 700... ❺	Max. N.O. Side Aux.	Max. N.C. Side Aux.	Max. N.O. Front + Side Aux.	Max. N.C. Front + Side Aux.	Max. N.O. + N.C. Front + Side Aux.
CF400	2	4	6	7	7
CF310	2	4	6	7	7
CF220	2	4	6	7	7
CF040 ❹	2	3	4	5	5

❷ Up to 8 auxiliary contacts may be mounted (a maximum of 4 N.C. contacts on the front of the contactor and a maximum of 2 N.O. contacts on each side).
❸ Maximum No. of Contacts: Refer to the following tables
❹ AC coils only.
❺ All Cat. Nos. are factory stocked.

(2)

Control Modules

	Description		Connection Diagrams	Reset Time	Repeat Accuracy	For Use With	Cat. No. ❷
 *Cat. No. 100-FPTA30 Mount on front of 700-CF Relay*	**Pneumatic Timing Module — ON Delay (1 N.O. + 1 N.C.)** Timed contact operates after the time delay. Relay contact operates instantaneously. • Continuous adjustment range	**ON-Delay** 0.3...30 s Range 1.8...180 s Range		25...90 ms for AC Coils 47...85 ms for DC coils	+/-10%	700-CF AC Coils DC Coils ❶	100-FPTA30 100-FPTA180
	Pneumatic Timing Module — OFF Delay (1 N.O + 1 N.C.) Timed contact will remain in operation until the end of the time delay. Relay contact operates instantaneously. • Continuous adjustment range	**OFF-Delay** 0.3...30 s Range 1.8...180 s Range				700-CF All	100-FPTB30 100-FPTB180
 *Cat. No. 100-ETA30*	**Solid-state Timing Module** Changes all contacts on Bulletin 100-C contactors and Bulletin 700-CF control relays into timed contacts. **100-ETA** The contactor is switched on after the end of the delay time.	**ON-Delay** 0.1...3 s Range 1...30 s Range 10...180 s Range		100 ms min. 100 ms max.	+/-1%	700-CF 110...240V 50/60 Hz 110...250VDC	100-ETA3 100-ETA30 100-ETA180
		ON-Delay 0.1...3 s 1...30 s 10...180 s Range				700-CF with DC coils 24V DC and 48V DC	100-ETAZJ3 100-ETAZJ30 100-ETAZJ180
 *Cat. No. 100-ETB30*	**100-ETB** After interruption of the control signal, the contactor is switched off after the end of the set delay time. • Continuous adjustment range	**OFF-Delay** 0.3...3 s 1...30 s 10...180 s Range				700-CF 110...240V AC coils, 50/ 60 Hz	100-ETB3 100-ETB30 100-ETB180
						700-CF 24V AC coils	100-ETBKJ3 100-ETBKJ30 100-ETBKJ180

❶ Cannot be used with side-mounted auxiliary contacts.
❷ All Cat. Nos. are factory stocked.

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

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14.10

CONTROL RELAY
1/10

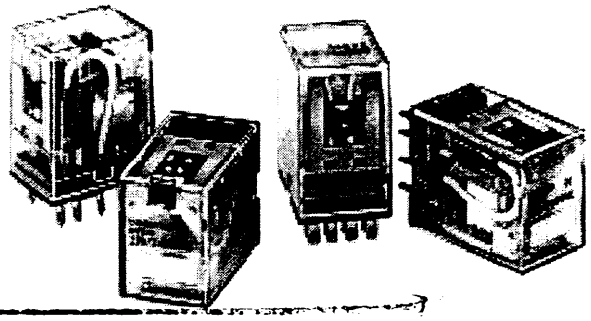
OMRON®

General-purpose Relay

MY

Versatile, Multi-featured, Two-and Four-Pole Miniature Power Relays for Sequence Control and Power Switching Applications

- Increased reliability through automated production
- Multiple features available, including LED indicator, test button, bifurcated contacts, built-in diode and CR (surge suppression)
- Max. switching current: two-pole/10 A, four-pole/5 A
- Environment-friendly cadmium-free contacts
- Built-in operation indicator and name-plate is standard



REVIEWED ACCORDING TO
REQUIREMENTS OF THE
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DATE July 21/05 DC
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Ordering Information

■ RELAYS

Standard Coil Polarity

Type	Contact form	Part number		
		Plug-in socket/Solder terminals		
		Standard with LED indicator	With LED indicator and test button	Without LED indicator
Standard	DPDT	**MY2N**	**MY2IN**	**MY2**
	4PDT	**MY4N**	**MY4IN** AC120	**MY4**
	4PDT (bifurcated)	**MY4ZN**	**MY4ZIN**	**MY4Z**
With built-in diode (DC only)	DPDT	**MY2N-D2**	**MY2IN-D2**	---
	4PDT	**MY4N-D2**	**MY4IN-D2**	---
	4PDT (bifurcated)	**MY4ZN-D2**	**MY4ZIN-D2**	---
With built-in CR (220/240 VAC, 110/120 VAC only)	DPDT	**MY2N-CR**	**MY2IN-CR**	---
	4PDT	**MY4N-CR**	**MY4IN-CR**	---
	4PDT (bifurcated)	**MY4ZN-CR**	**MY4ZIN-CR**	---

Note: 1. When ordering, add the rated coil voltage to the model number. Rated coil voltages are given in the coil ratings table.
Example: MY2 AC6(S)
↑
Rated coil voltage

2. Arc barrier standard on all four-pole relays.
3. Other models also available, such as, three-pole versions, flangemount, PCB, etc. Contact your Omron Representative for details.

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

(1)

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Ordering Information - continued from previous page

Reverse Coil Polarity

Type	Contact form	Part number	
		Plug-in socket/Solder terminals	
		With LED indicator	With LED indicator and test button
Standard (DC only)	DPDT	**MY2N1**	**MY2IN1**
	4PDT	**MY4N1**	**MY4IN1**
	4PDT (bifurcated)	**MY4ZN1**	**MY4ZIN1**
With built-in diode (DC only)	DPDT	**MY2N1-D2**	**MY2IN1-D2**
	4PDT	**MY4N1-D2**	**MY4IN1-D2**
	4PDT (bifurcated)	**MY4ZN1-D2**	**MY4ZIN1-D2**

Note: 1. When ordering, add the rated coil voltage to the model number. Rated coil voltages are given in the coil ratings table.
Example: MY2 AC6(S)
↑
Rated coil voltage

2. Arc barrier standard on all four-pole relays.

Specifications

■ COIL RATINGS

Rated voltage		Rated current		Coil resistance	Inductance (reference value)		Must operate	Must release	Max. voltage	Power consumption (approx.)
		50 Hz	60 Hz		Arm. OFF	Arm. ON	% of rated voltage			
AC	6 V*	214.1 mA	183 mA	12.2 Ω	0.04 H	0.08 H	80% max.	30% min.	110%	1.0 to 1.2 VA (60 Hz)
	12 V	106.5 mA	91 mA	46 Ω	0.17 H	0.33 H				
	24 V	53.8 mA	46 mA	180 Ω	0.69 H	1.30 H				
	48 V*	25.7 mA	22 mA	788 Ω	3.22 H	5.66 H				
	110/120 V	9.9/10.8 mA	8.4/9.2 mA	4,430 Ω	19.20 H	32.1 H				0.9 to 1.1 VA (60 Hz)
	220/240 V	4.8/5.3 mA	4.2/4.6 mA	18,790 Ω	83.50 H	136.4 H				
DC	6 V*	151 mA		39.8 Ω	0.17 H	0.33 H		10% min.		0.9 W
	12 V	75 mA		160 Ω	0.73 H	1.37 H				
	24 V	37.7 mA		636 Ω	3.20 H	5.72 H				
	48 V*	18.8 mA		2,560 Ω	10.60 H	21.0 H				
	100/110 V	9.0/9.9 mA		11,100 Ω	45.60 H	86.2 H				

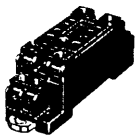
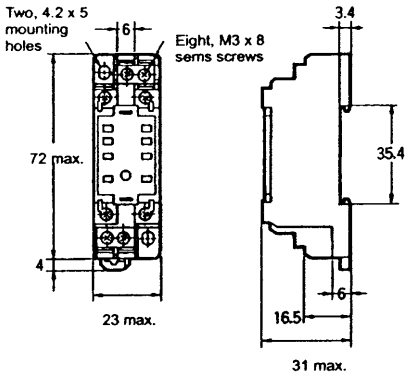
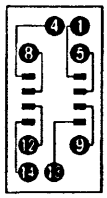
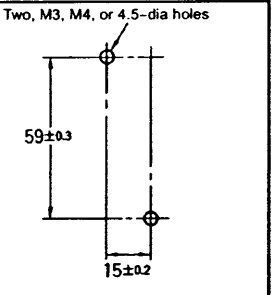
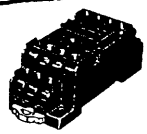
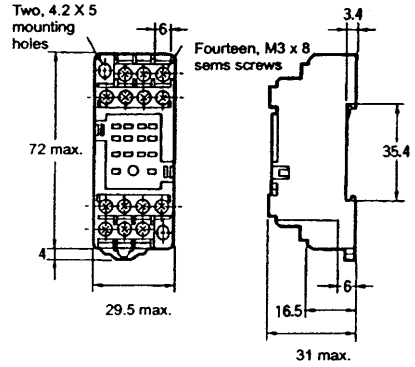
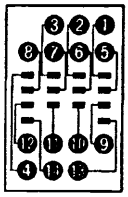
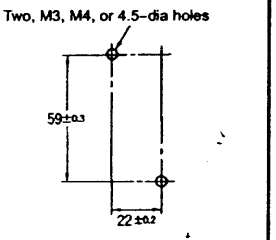
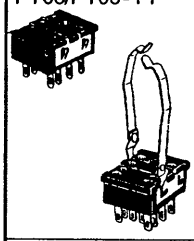
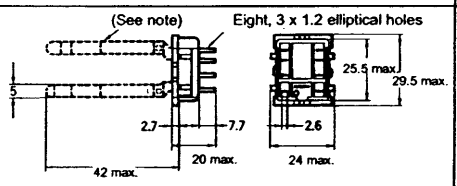
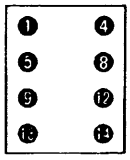
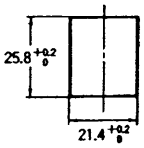
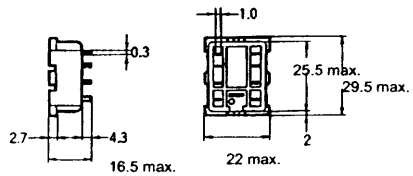
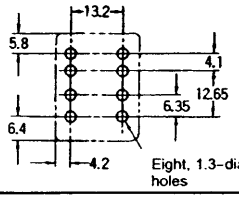
Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of +15%/-20% for rated currents and ±15% for DC coil resistance.
2. Performance characteristic data are measured at a coil temperature of 23°C.
3. AC coil resistance and impedance are provided as reference values (at 60 Hz).
4. Power consumption drop was measured for the above data. When driving transistors, check leakage current and connect a bleeder resistor if required.
5. Rated voltage denoted by "*" will be manufactured upon request. Ask your OMRON representative.

(2)

14.11

Dimensions

Unit: mm (inch)

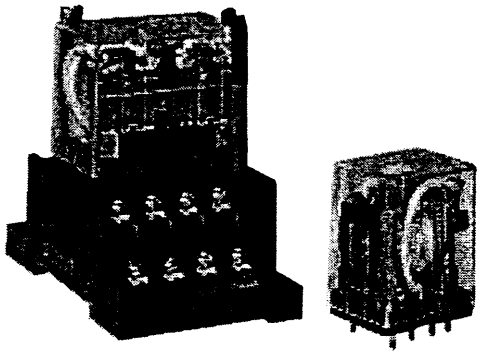
Socket	Dimensions	Terminal arrangement/Internal connections (top view)	Mounting holes
PYF08A-E 			 (TOP VIEW) **Note:** Track mounting is also possible. Refer to page NO TAG for supporting tracks.
PYF14A-E 			 (TOP VIEW) **Note:** Track mounting is also possible. Refer to page NO TAG for supporting tracks.
PY08/PY08-Y1 	 **Note:** The PY08-Y1 includes sections indicated by dotted lines.		
PY08-02 			

4 LY4 i4N

OMRON

General Purpose Relay — LY

- Arc barrier equipped
- High dielectric strength (2,000 VAC)
- Long dependable service life assured by AgCdO contacts
- Choose models with single or bifurcated contacts, LED indicator, diode surge suppression, push-to-test button, or RC circuit
- All models meet UL and CSA approvals; VDE, LR, and SEV approved versions are available



Ordering Information

To Order: Select the part number and add the desired coil voltage rating (e.g., LY1-*DC6*).

Type	Terminal	Contact form	Part number					
			Single contact			Bifurcated contact		
			Standard bracket mounting	Upper mounting bracket	Lower mounting bracket	Standard bracket mounting	Upper mounting bracket	Lower mounting bracket
Standard	Plug-in/solder	SPDT	**LY1**	**LY1F**	**LY1S**	—	—	—
		DPDT	**LY2**	**LY2F**	**LY2S**	**LY2Z**	**LY2ZF**	**LY2ZS**
		3PDT	**LY3**	**LY3F**	**LY3S**	—	—	—
		4PDT	**LY4**	**LY4F**	**LY4S**	—	—	—
	PCB	SPDT	**LY1-0**	—	—	—	—	—
		DPDT	**LY2-0**	—	—	**LY2Z-0**	—	—
		3PDT	**LY3-0**	—	—	—	—	—
		4PDT	**LY4-0**	—	—	—	—	—
LED indicator	Plug-in/solder	SPDT	**LY1N**	—	—	—	—	—
		DPDT	**LY2N**	—	—	**LY2ZN**	—	—
		3PDT	**LY3N**	—	—	—	—	—
		4PDT	**LY4N**	—	—	—	—	—
Diode surge suppression		SPDT	**LY1-D**	—	—	—	—	—
		DPDT	**LY2-D**	—	—	**LY2Z-D**	—	—
		3PDT	**LY3-D**	—	—	—	—	—
		4PDT	**LY4-D**	—	—	—	—	—
LED indicator and diode surge suppression		SPDT	**LY1N-D2**	—	—	—	—	—
		DPDT	**LY2N-D2**	—	—	**LY2ZN-D2**	—	—
		4PDT	**LY4N-D2**	—	—	—	—	—
RC circuit		SPDT	**LY1-CR**	—	—	—	—	—
		DPDT	**LY2-CR**	—	—	**LY2Z-CR**	—	—
LED indicator and RC circuit		SPDT	**LY1N-CR**	—	—	—	—	—
		DPDT	**LY2N-CR**	—	—	**LY2ZN-CR**	—	—

Note: 1. Types with specifications other than those listed are available. Contact your OMRON Sales representative.
2. To order connecting sockets and mounting tracks, see "Accessories" section.

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Ordering Information, continued

Type	Terminal	Contact form	Part number					
			Single contact			Bifurcated contact		
			Standard bracket mounting	Upper mounting bracket	Lower mounting bracket	Standard bracket mounting	Upper mounting bracket	Lower mounting bracket
Push-to-test button	Plug-in/solder	SPDT	**LY1I4**	—	—	—	—	—
		DPDT	**LY2I4**	—	—	**LY2ZI2**	—	—
		3PDT	**LY3I4**	—	—	—	—	—
		4PDT	**LY4I4**	—	—	—	—	—
LED indicator and push-to-test button	Plug-in/solder	DPDT	**LY2I4N**	—	—	**LY2ZI2N**	—	—
		4PDT	**LY4I4N** AC120	—	—	—	—	—

Note: 1. Types with specifications other than those listed are available. Contact your OMRON Sales representative.
2. To order connecting sockets and mounting tracks, see "Accessories" section.

■ ACCESSORIES

Connecting Sockets

To Order: Select the appropriate part numbers for sockets, clips, and mounting tracks (if required) from the following charts.

Track mounted sockets

Relay	Socket*	Relay hold-down clip		Mounting track
		Standard	RC circuit	
SPDT DPDT	**PTF08A-E**	**PYC-A1**	**Y92H-3**	**PFP-100N/PFP-50N &** **PFP-M** or **PFP-100N2** **PFP-S** (Option spacer)
3PDT	**PTF11A**			
4PDT	**PTF14A-E**			

* Track mounted socket can be used as a front connecting socket.

Back connecting sockets

Relay	Solder terminal socket	Wire wrap terminal socket	Relay hold-down clip				Socket Mounting Plate			
			Standard	Push-to-test	RC circuit	Mtg. plate	1	10	12	18
SPDT DPDT	**PT08**	**PT08QN**	**PYC-P**	**PYC-P2**	**PYC-1**	**PYC-S**	**PYP-1**	–	–	**PYP-18**
3PDT	**PT11**	**PT11QN**					**PTP-1-3**	–	**PTP-12**	–
4PDT	**PT14**	**PT14QN**					**PTP-1**	**PTP-10**	–	–

Note: Types PYP-18, PTP-12 and PTP-10 may be cut to any desired length.

Relay	PC terminal socket	Relay hold-down clip		
		Standard	Push-to-test	RC circuit
SPDT DPDT	**PT08-0**	**PYC-P**	**PYC-P2**	**PYC-1**
3PDT	**PT11-0**			
4PDT	**PT14-0**			

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14.11

Specifications

■ CONTACT DATA

Load	Single contact				Bifurcated contact	
	SPDT		DPDT, 3PDT, 4PDT		DPDT	
	Resistive load (p.f. = 1)	Inductive load (p.f. = 0.4) (L/R = 7 ms)	Resistive load (p.f. = 1)	Inductive load (p.f. = 0.4) (L/R = 7 ms)	Resistive load (p.f. = 1)	Inductive load (p.f. = 0.4) (L/R = 7 ms)
Rated load	15 A at 110 VAC 15 A at 24 VDC	10 A at 110 VAC 7 A at 24 VDC	10 A at 110 VAC 10 A at 24 VDC	7.5 A at 110 VAC 5 A at 24 VDC	5 A at 110 VAC 5 A at 24 VDC	4 A at 110 VAC 4 A at 24 VDC
Contact material	AgCdO					
Carry current	15 A		10 A		7 A	
Max. operating voltage	250 VAC 125 VDC					
Max. operating current	15 A		10 A		7 A	
Max. switching capacity	1,700 VA 360 W	1,100 VA 170 W	1,100 VA 240 W	830 VA 120 W	550 VA 120 W	440 VA 100 W
Min. permissible load	100 mA, 5 VDC				10 mA, 5 VDC	

■ COIL DATA

1- and 2-pole types – AC

Rated voltage (V)	Rated current (mA)		Coil resistance (Ω)	Coil inductance (ref. value) (H)		Pick-up voltage	Dropout voltage	Maximum voltage	Power consumption (VA, W)
	50 Hz	60 Hz		Armature OFF	Armature ON	(% of rated voltage)			
6	214.10	183	12.20	0.04	0.08	80% max.	30% min.	110%	Approx. 1.00 to 1.20 (60 Hz)
12	106.50	91	46	0.17	0.33				
24	53.80	46	180	0.69	1.30				
50	25.70	22	788	3.22	5.66				
100/110	11.70/12.90	10/11	3,750	14.54	24.60				Approx. 0.90 to 1.10 (60 Hz)
110/120	9.90/10.80	8.40/9.20	4,430	19.20	32.10				
200/220	6.20/6.80	5.30/5.80	12,950	54.75	94.07				
220/240	4.80/5.30	4.20/4.60	18,790	83.50	136.40				

1- and 2-pole types – DC

Rated voltage (V)	Rated current (mA)	Coil resistance (Ω)	Coil inductance (ref. value) (H)		Pick-up voltage	Dropout voltage	Maximum voltage	Power consumption (VA, W)
			Armature OFF	Armature ON	(% of rated voltage)			
6	150	40	0.16	0.33	80% max.	10% min.	110%	Approx. 0.90
12	75	160	0.73	1.37				
24	36.90	650	3.20	5.72				
48	18.50	2,600	10.60	21				
100/110	9.10/10	11,000	45.60	86.20				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C (73°F) with tolerances of +15%, -20% for AC rated current, and ±15% for DC rated coil resistance.
2. The AC coil resistance and inductance are reference values at 60 Hz.
3. The performance characteristics are measured at a coil temperature of 23°C (73°F).
4. Class B coil insulation is available.

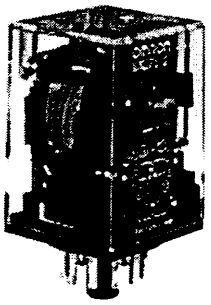
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14.11

OMRON

General Purpose Relay
MK

- Exceptionally reliable general purpose relay.
- Long life (minimum 100,000 electrical operations) assured by silver contacts.
- Built-in operation indicator (mechanical, LED), diode surge suppression, Varistor surge suppression.
- The contact operation can be easily checked by mechanical indicator and/or push-to-test button options.
- Conforms to CENELEC standards.
- VDE approved versions available.



Ordering Information

To Order: Select the part number and add the desired coil voltage rating (e.g., MK3P5-S-*AC120*).

Type	Terminal	Coil	Contact form	Model	
				Mechanical indicator	Mechanical indicator & push-to-test button
Standard	Plug-in	AC/DC	DPDT	**MK2P-I**	**MK2P-S**
			3PDT	**MK3P-5-I**	**MK3P-5-S**
ED indicator			DPDT	**MK2PN-I**	**MK2PN-S**
			3PDT	**MK3PN-5-I**	**MK3PN-5-S**
LED indicator and diode		DC	DPDT	**MK2PND-I**	**MK2PND-S** 24VDC
			3PDT	**MK3PND-5-I**	**MK3PND-5-S**
LED indicator and varistor		AC	DPDT	**MK2PNV-I**	**MK2PNV-S**
			3PDT	**MK3PNV-5-I**	**MK3PNV-5-S** 120VAC
Diode		DC	DPDT	**MK2PD-I**	**MK2PD-S**
			3PDT	**MK3PD-5-I**	**MK3PD-5-S**
Varistor		AC	DPDT	**MK2PV-I**	**MK2PV-S**
			3PDT	**MK3PV-5-I**	**MK3PV-5-S**

Note: 1. Reverse polarity versions available on DC coil types. Consult your OMRON representative for further information.
2. VDE approved versions are available. Consult your OMRON representative for further information.

■ Accessories (Order separately)

To Order: Select the appropriate part numbers for sockets, clips, and mounting tracks (if required) from the available types chart.

Track Mounted Sockets

Relay type	Model		
	Socket	Relay hold-down clip	Mounting track/end plate
SPDT DPDT	**PF083A-E**	**PFC-A1**	**PFP-100N** or **PFP-50N** and **PFP-M** (end plate)
3PDT	**PF113A-E**	**PFC-A1**	**PFP-100N** or **PFP-50N** and **PFP-M** (end plate)

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■ Accessories (continued)

Back Connecting Sockets

Relay type	Model	
	Socket	Relay hold-down clip
SPDT	PL08	PLC-E
DPDT	PLE08-0	PLC-10
	PL08-Q	PLC-E
3PDT	PL11	PLC-E
	PLE11-0	PLC-10
	PL11-Q	PLC-E

Specifications

■ Contact Data

Load	Resistive load (p.f. = 1)		Inductive load (p.f. = 0.4)
	2 Pole	3 Pole	
Rated load	10 A at 250 VAC 10 A at 28 VDC	10 A at 120 VAC 10 A at 28 VDC 10 A at 250 VAC	7 A at 250 VAC
Contact material	Ag		
Carry current	10 A		
Max. operating voltage	250 VAC, 250 VDC		
Max. operating current	10 A		
Max. switching capacity	2,500 VA 280 W	2,500 VA/1,250 VA (NO/NC contacts) 280 W	1,750 VA
Min. permissible load	10 mA at 1 VDC		

■ Coil Data

AC

Rated voltage (VAC)	Rated current (mA) (at 60 Hz)	Coil resistance (Ω)	Coil inductance (Ref. value) (H)		Pick-up voltage	Dropout voltage	Maximum voltage	Power consumption (mW)
			Armature OFF	Armature ON	% of rated voltage			
6	360	3.9	0.0423	0.0201	80% max. Approx. 2.7 VA	30% min. (at 60 Hz) 25% min. (at 50 Hz)	110% max.	Approx. 2.3 VA (at 60 Hz) Approx. 2.7 VA (at 50 Hz)
12	180	16.3	0.3270	0.1666				
24	88.0	68.0	0.6940	0.3760				
50	39.0	338	3.195	1.530				
110	21.0	1240	13.45	7.32				
120	18.0	1578	15.04	7.19				
220	11.0	5090	49.73	27.02				
240	9.2	6737	58.62	32.07				

DC

Rated voltage (VDC)	Rated current (mA) (at 60 Hz)	Coil resistance (Ω)	Coil inductance (Ref. value) (H)		Pick-up voltage	Dropout voltage	Maximum voltage	Power consumption (mW)
			Armature OFF	Armature ON	% of rated voltage			
6	255	23.5	0.206	0.106	80% max. Approx. 2.7 VA	15% min.	110% max.	Approx. 1.5 W
12	126	95	0.963	0.449				
24	56	430	4.915	2.478				
48	29.5	1630	16.685	10.487				
110	15.1	7300	80.2	42.6				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C (73°F) with a tolerance of ±15% for DC rated current and +15%, -20% for AC rated current.

2. The rated current is reference value.

3. Performance characteristic data are measured at a coil temperature of 23°C (73°F).

4. For models with the LED indicator built-in, add an LED current of approximately 0 thru 5 mA to the rated current.

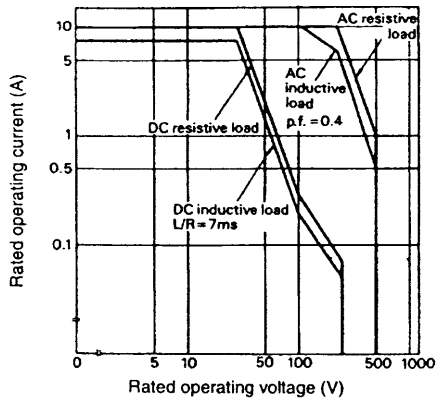
■ Characteristics

Contact resistance		50 mΩ max.
Operate time		AC: 20 ms max. DC: 30 ms max.
Release time		20 ms max.
Operating frequency	Mechanical	18,000 operations/hour
	Electrical	1,800 operations/hour (under rated load)
Insulation resistance		100 MΩ min. (at 500 VDC)
Dielectric strength		2,500 VAC, 50/60 Hz for 1 minute between coil and contacts 1,000 VAC, 50/60 Hz for 1 minute between contacts of same poles, between terminals of the same polarity 2,500 VAC, 50/60 Hz for 1 minute between current-carrying parts, noncurrent-carrying parts, and terminals of opposite polarity
Vibration	Mechanical durability	10 to 55 Hz, 1.50 mm (0.06 in) double amplitude
	Malfunction durability	10 to 55 Hz, 1.00 mm (0.04 in) double amplitude
Shock	Mechanical durability	1,000 m/s² (approx. 100 G)
	Malfunction durability	100 m/s² (approx. 10 G)
Ambient temperature		Operation: -10° to 40°C (14° to 104°F)
Humidity		35 to 85% RH
Service Life	Mechanical	10 million operations min. (at operating frequency of 18,000 operations/hour)
	Electrical	100,000 operations at rated load (at operating frequency of 1,800 operations/hour)
Weight		Approx. 0.85 g (3.0 oz)

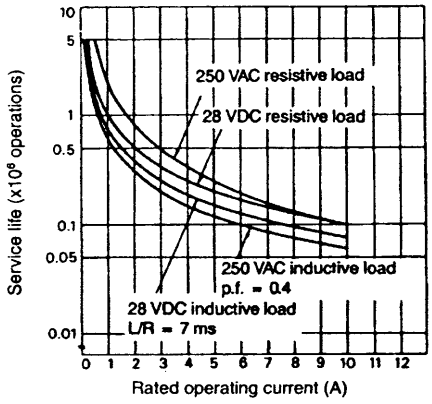
Note: Data shown are of initial value.

■ Characteristic Data

Maximum switching capacity
MK2P-S

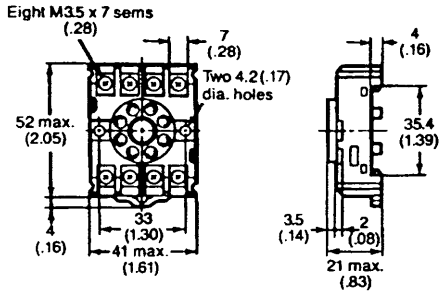


Electrical service life
MK2P-S, MK3P5-S

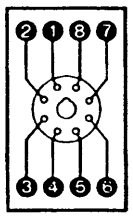


Accessories

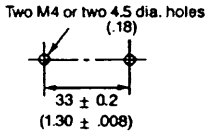
Track mounted socket
PF083A-E (conforming to DIN EN 50022)



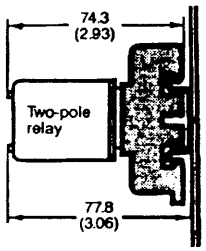
Terminal arrangement



Mounting holes

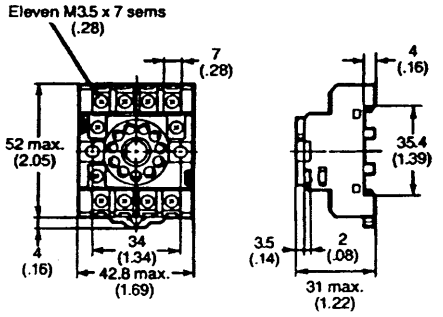


Mounting dimensions of relay with socket

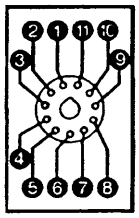


Note: Model PF083A-E can be used as a front connecting socket.

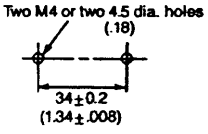
Track mounted socket
PF113A-E (conforming to DIN EN 50022)



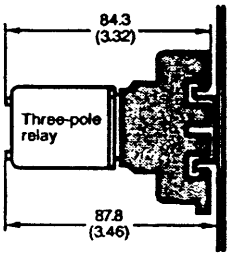
Terminal arrangement



Mounting holes



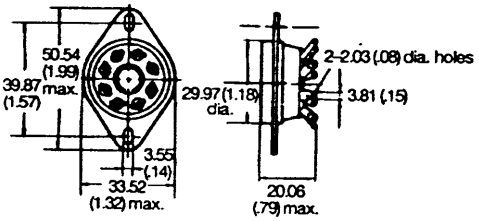
Mounting dimensions of relay with socket



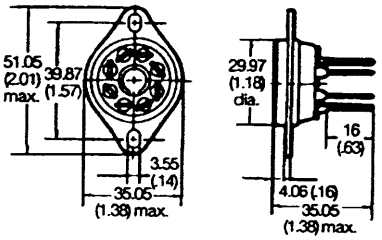
Note: Model PF113A-E can be used as a front connecting socket.

Back connecting socket
MK2 sockets (8 pin)

PL08 (UL File No. E87929)
Solder terminals

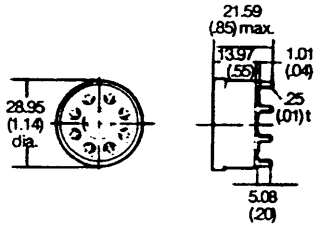


PL08-Q
Wire wrap terminals

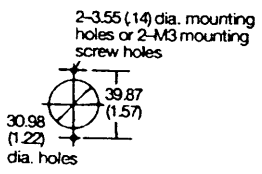


Printed circuit board socket

PLE08-0

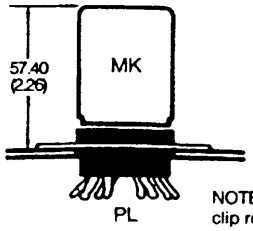


Mounting holes
PL08



Mounting holes and panel cut-out applies to PL08 and PL08-Q

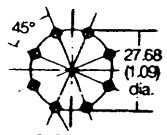
PL08 type sockets and MK2 relay
Total height dimension





NOTE: Hold down clip recommended.

Recommended PCB layout
PLE08-0



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

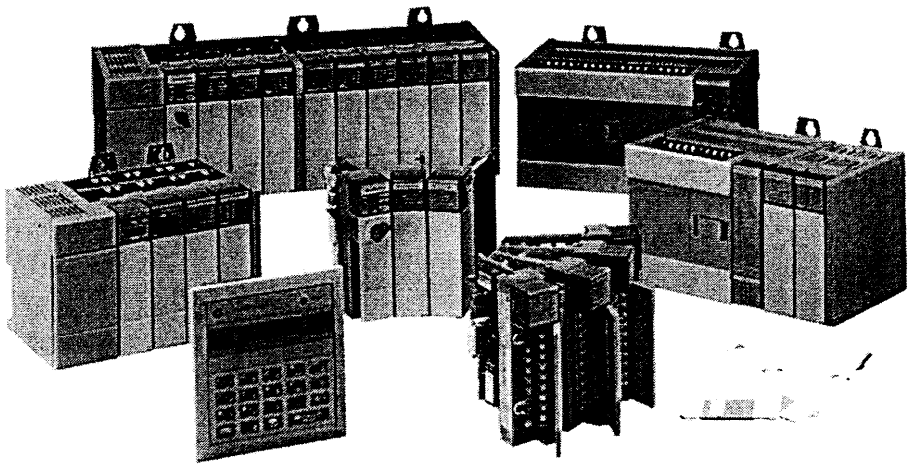
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Rockwell Automation

SLC 500™ Programmable Controllers

Selection Guide—Bulletin 1746/1747



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What's New

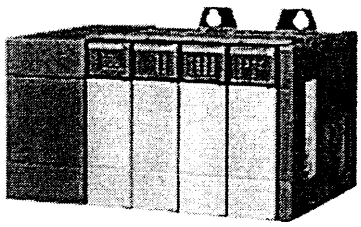
New Products	Available	For ordering information, see page
SLC 5/03, 5/04, 5/05 Upgrade Kits - OS upgrade kits provide access to eight new instructions: RIO Block Transfers (BTW, BTR); Ramp (RMP); Time Stamp (RHC, TDF); Encoding (ENC); File Bit Comparison (FBC); and Diagnostic Detect (DDT).	Now	6
1747-PSD Program Storage Device - This new program storage device provides one-program upload and download capability for SLC 5/03, 5/04, 5/05, and MicroLogix 1000, 1200, and 1500. The 1747-PSD connects to the RS-232 port running DF1 Full-Duplex communication protocol.	Now	7
1746-NI16I and 1746-NI16V Analog Input Modules - These software-configurable, high-density analog input modules provide high accuracy and fast analog signal conversion for demanding process control applications. The modules also feature 14- to 16-bit resolution and the ability to interface to current (NI16I) and voltage (NI16V) signals from a variety of process sensors.	Now	9
1746-NR8 RTD Input Module - The new RTD module, available in Spring 2000, provides on-board RTD temperature scaling in degrees Celsius or Fahrenheit, or resistance scaling in ohms. With eight input channels, the module supports connections from two- or three-wire RTD sensors. The input channels are individually configurable using ladder logic.	Now	10
1746-BAS-T BASIC Module - The BASIC-T module uses the same BASIC Development Software (1747-PBASE) and offers the same BASIC language set and hardware specifications as the 1746-BASIC module, with a response speed that is four times faster.	Now	11
1747-BSN Backup Scanner Module - In addition to all the features of a remote I/O scanner, the backup module provides continuous redundant backup operation for SLC 5/02 and higher processors. A pair of 1747-BSN modules is required, with one in the primary system, and the other in the backup system. The modules communicate over a high speed serial link to continuously update the secondary processor. In the event of a fault in the primary system, the secondary processor is ready to assume control.	Now	13
1747-SCNR ControlNet Scanner Module - The ControlNet scanner provides scheduled message capability, allowing SLC processors to control I/O events in real time over ControlNet. The module can exchange data simultaneously with the SLC backplane and the ControlNet network. The module connects to the ControlNet network via the standard BNC connectors.	Now	13
1747-ACN15 and 1747-ACNR15 ControlNet Adapter Modules - Each ControlNet Adapter can control up to 30 slots of 1746 remote I/O on the ControlNet network. Up to 64 connections per adapter are possible, with 255 words per connection. The modules feature high speed data transfer, diagnostic messages, and local network communication access. In addition, the 1747-ACNR15 features redundant media.	Now	13

(2)

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***New or changed since previous issue.**

Overview



Modular Hardware Style - You select the processor, power supply, and I/O modules to fit your application. Modular style chassis are available in 4-, 7-, 10-, and 13-slot versions.

SLC 500 I/O modules are available with 4, 8, 16, or 32 points. Combination modules with
2 inputs/2 outputs, 4 inputs/4 outputs, and 6 inputs/6 outputs are also available. A wide variety of I/O voltages (including AC, DC, and TTL), analog I/O, and specialty modules are available to help you create a close fit for your application.

Programming - Familiar ladder diagram programming makes the SLC 500 family easy to program using a personal computer. In addition, the SLC 5/01 and SLC 5/02 controllers can be programmed with a Hand-Held Terminal.

Tested Design - All SLC 500 devices are UL Listed, CSA Certified, and CE compliant for all applicable directives when product or packaging is marked. All SLC 500 devices are also certified for Class I Division 2, Groups A, B, C, and D hazardous locations.

Modular Processors

Specification	SLC 5/01	SLC 5/02	SLC 5/03	SLC 5/04	SLC 5/05
Catalogue Number	1747-L511 1747-L514	1747-L524	1747-L531 1747-L532	1747-L541 1747-L542 1747-L543	1747-L551 1747-L552 1747-L553
Memory Size (Words)	1747-L511: 1K 1747-L514: 4K	1747-L524: 4K	1747-L531: 8K 1747-L532: 16K	1747-L541: 16K 1747-L542: 32K 1747-L543: 64K	1747-L551: 16K 1747-L552: 32K 1747-L553: 64K
Power Supply Loading	350 mA at 5V dc 105 mA at 24V dc	350 mA at 5V dc 105 mA at 24V dc	500 mA at 5V dc 175 mA at 24V dc	1000 mA at 5V dc 200 mA at 24V dc	1000 mA at 5V dc 200 mA at 24V dc
Max. I/0 Capacity	3940 discrete inputs 3940 discrete outputs	4096 discrete inputs 4096 discrete outputs	4096 discrete inputs 4096 discrete outputs	4096 discrete inputs 4096 discrete outputs	4096 discrete inputs 4096 discrete outputs
Max. Local Chassis Slots	3/30	3/30	3/30	3/30	3/30
On-board Communications	DH-485 Slave	DH-485	DH-485 and RS-232	DH+ and RS-232	Ethernet and RS-232
Optional Memory Module	EEPROM and UVPROM	EEPROM and UVPROM	flash EEPROM	flash EEPROM	flash EEPROM
Programming	Hand-Held Terminal RSLogix 500 SLC 500 A.I. Series Advanced Programming Software	Hand-Held Terminal RSLogix 500 SLC 500 A.I. Series Advanced Programming Software	RSLogix 500 SLC 500 A.I. Series	RSLogix 500 SLC 500 A.I. Series	RSLogix 500 SLC 500 A.I. Series
Programming Instructions	52	71	107	107	107
Typical Scan Time[1]	8 ms/K	4.8 ms/K	1 ms/K	0.9 ms/K	0.9 ms/K
Program Scan Hold-up Time after Loss of Power	20 ms to 3 s (dependent on power supply loading)				
Bit Execution (XIC)	4 µs	2.4 µs	0.44 µs	0.37 µs	0.37 µs
Clock/Calendar Accuracy	not applicable	not applicable	±54 seconds/month at +25°C (+77°F) ±81 seconds/month at +60°C (+140°F)		

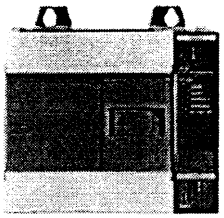
(1) The scan times are typical for a 1K ladder logic program consisting of simple ladder logic and communication servicing. Actual scan times depend on your program size, instructions used, and the communication protocol.

***New or changed since previous issue.**

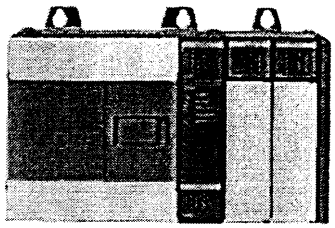
Fixed Hardware Style

There are 24 fixed hardware style processors available in the following versions:

- (11) 20 I/O 12 inputs/8 outputs
- (6) 30 I/O 18 inputs/12 outputs
- (7) 40 I/O 24 inputs/16 outputs



20 I/O Configuration



20 I/O with 2-Slot Expansion

120/240V ac Ratings

- Voltage: 85-265V ac
- Frequency: 47-63 Hz
- Inrush: 20A maximum

24V dc Ratings

- Voltage: 24V dc (±10%)
- Inrush: 20A maximum

2-Slot Expansion Chassis - The 20, 30, and 40 I/O fixed hardware style units accept a 2-slot expansion chassis. The expansion chassis mounts on the right side of the processor without mounting hardware. Expansion chassis have a mounting tab at the top and bottom that accepts #10 hardware.

NOTE: The 1746-A2 Expansion Chassis supports only specific combinations of modules based on module current draw. For information on module compatibility in the expansion chassis, refer to the Technical Support Knowledge Base, **www.ab.com/support**, and search for document 12519.

Catalogue Numbers

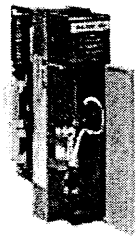
Description			Line Power	Catalogue Number
Total I/O	Inputs	Outputs		
20	(12) 120V ac	(8) Relay	120/240V ac	**1747-L20A**
	(12) 120V ac	(8) Triac	120/240V ac	**1747-L20B**
	(12) DC Sink	(8) Relay	120/240V ac	**1747-L20C**
	(12) DC Sink	(8) Triac	120/240V ac	**1747-L20D**
	(12) DC Sink	(8) DC Source	120/240V ac	**1747-L20E**
	(12) DC Sink	(8) Relay	24V dc	**1747-L20F**
	(12) DC Sink	(8) DC Source	24V dc	**1747-L20G**
	(12) DC Source	(8) DC Sink	120/240V ac	**1747-L20L**
	(12) DC Source	(8) DC Sink	24V dc	**1747-L20N**
	(12) 240V ac	(8) Triac	120/240V ac	**1747-L20P**
	(12) 240V ac	(8) Relay	120/240V ac	**1747-L20R**
30	(18) 120V ac	(12) Relay	120/240V ac	**1747-L30A**
	(18) 120V ac	(12) Triac	120/240V ac	**1747-L30B**
	(18) DC Sink	(12) Relay	120/240V ac	**1747-L30C**
	(18) DC Sink	(12) Triac	120/240V ac	**1747-L30D**
	(18) DC Source	(12) DC Sink	120/240V ac	**1747-L30L**
	(18) 240V ac	(12) Triac	120/240V ac	**1747-L30P**
40	(24) 120V ac	(16) Relay	120/240V ac	**1747-L40A**
	(24) 120V ac	(16) Triac	120/240V ac	**1747-L40B**
	(24) DC Sink	(16) Relay	120/240V ac	**1747-L40C**
	(24) DC Sink	(16) DC Source	120/240V ac	**1747-L40E**
	(24) DC Sink	(16) Relay	24V dc	**1747-L40F**
	(24) DC Source	(16) DC Sink	120/240V ac	**1747-L40L**
	(24) 240V ac	(16) Triac	120/240V ac	**1747-L40P**
2-Slot Expansion Chassis (can only be used with fixed hardware style configurations)				**1746-A2**

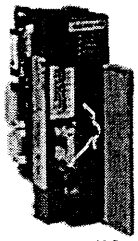
***New or changed since previous issue.**

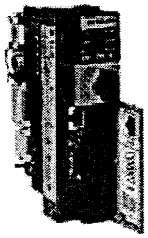
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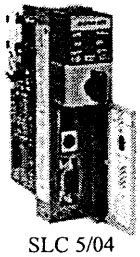
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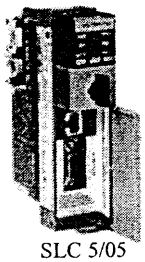
Modular Hardware Style


SLC 5/01


SLC 5/02


SLC 5/03


SLC 5/04


SLC 5/05

SLC 5/01 - This processor offers a basic set of 51 instructions with the choice of 1K or 4K of memory in a modular hardware configuration. Modular I/O systems that include an SLC 5/01 processor can be configured with a maximum of three chassis (30 total slots) and from 4 I/O points to a maximum of 3940 I/O points.

SLC 5/02 - This processor offers additional complex instructions, enhanced communications, faster scan times, and extensive diagnostics that allow it to function in more complex applications. Modular I/O systems can be configured with a maximum of 3 chassis (30 total slots) and from 4 I/O points to a maximum of 4096 I/O points.

SLC 5/03 - This processor introduces improved throughput times and provides 8K or 16K of memory. Modular I/O systems can be configured with a maximum of 3 chassis (30 total slots) and from 4 I/O points to a maximum of 4096 I/O points.

SLC 5/04 - The standard DH-485 port has been replaced with a DH+™ port, providing high-speed SLC 5/04-to-SLC 5/04 communications and direct connection to PLC-5®s. Modular I/O systems can be configured with a maximum of 3 chassis (30 total slots) and from 4 I/O points to a maximum of 4096 I/O points. The available memory options are 16K, 32K, or 64K. Designed specifically for the Plastics Industry, the SLC 5/04P contains ERC2 algorithms for Plastics Machinery Control.

SLC 5/05 -The SLC 5/05 processor provides the same functionality as the SLC 5/04 processor with standard Ethernet communications rather than DH+ communications. Ethernet communication takes place at 10 Mbps, providing you with a high performance network for program upload/download, online editing, and peer-to-peer messaging. Modular I/O systems can be configured with a maximum of 3 chassis (30 total slots) and from 4 I/O points to a maximum of 4096 I/O points. Designed specifically for the Plastics Industry, the SLC 5/05P contains ERC2 algorithms for Plastics Machinery Control.

Catalogue Numbers

Description	Memory Size	Power Supply Loading (Amperes)		Catalogue Number
		5V dc	24V dc	
SLC 5/01 Processor	1K	0.350	0.105	**1747-L511**
SLC 5/01 Processor	4K	0.350	0.105	**1747-L514**
SLC 5/02 Processor	4K	0.350	0.105	**1747-L524**
SLC 5/03 Processor	8K	0.500	0.175	**1747-L531**
SLC 5/03 Processor	16K	0.500	0.175	**1747-L532**
SLC 5/04 Processor	16K	1.0	0.200	**1747-L541**
SLC 5/04 Processor	32K	1.0	0.200	**1747-L542**
SLC 5/04 Processor	64K	1.0	0.200	**1747-L543**
SLC 5/04P Processor	32K	1.0	0.200	**1747-L542P**
SLC 5/04P Processor	64K	1.0	0.200	**1747-L543P**
SLC 5/05 Processor	16K	1.0	0.200	**1747-L551**
SLC 5/05 Processor	32K	1.0	0.200	**1747-L552**
SLC 5/05 Processor	64K	1.0	0.200	**1747-L553**
SLC 5/05P Processor	64K	1.0	0.200	**1747-L553P**

14,12,5

***New or changed since previous issue.**

Upgrade Kits - Series C (OS302, OS401, DU501) upgrade kits feature eight new instructions: RIO Block Transfers (BTR, BTW); Ramp (RMP); Time Stamp (RHC, TDF); Encoding (ENC); File Bit Comparison (FBC); and Diagnostic Detect (DDT).

Catalogue Numbers

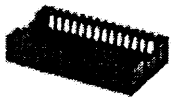
Description	Catalogue Number
SLC 5/03 Upgrade Kit	**1747-OS302***
SLC 5/04 Upgrade Kit	**1747-OS401***
SLC 5/05 Flash Upgrade Kit – contains (2) diskettes and instructions for upgrading the SLC 5/05 processors	**1747-DU501***
SLC 5/03 Upgrade Kit Labels	**1747-RL302***
SLC 5/04 Upgrade Kit Labels	**1747-RL401***
SLC 5/05 Upgrade Kit Labels	**1747-RL501***

Accessories

Memory Modules - These optional memory modules provide non-volatile memory in convenient modular form. The modules plug into a socket on the processor.



1747-M1 EEPROM



Adapter Socket

Adapter Sockets (1747-M5, -M15) - Adapter sockets are required when using commercial PROM programmers to program and erase memory modules. The memory module fits into the adapter socket, and then the adapter socket fits into the zero insertion force (ZIF) socket on the PROM burner.

Modular Card Slot Fillers - Use these fillers in empty chassis slots to protect equipment from dust or debris.

SLC 500 Demonstration Units - Learn how to program with these useful demonstration and practice units.

Catalogue Numbers

Description	Catalogue Number
SLC 5/01 and SLC 5/02 EEPROM Memory Module, 1K User Memory Backup	**1747-M1**
SLC 5/01 and SLC 5/02 EEPROM Memory Module, 4K User Memory Backup	**1747-M2**
SLC 5/01 and SLC 5/02 UVPROM Memory Module, 1K User Memory Backup	**1747-M3**(SP-7/01/01)
SLC 5/01 and SLC 5/02 UVPROM Memory Module, 4K User Memory Backup	**1747-M4**(SP-7/01/01)
SLC 5/01 and SLC 5/02 Adapter Socket (Five sockets per package. Order must be for five sockets or multiples of five.)	**1747-M5**
SLC 5/03, 5/04, and 5/05 Memory Module with 32K User Memory Backup	**1747-M11**(SP-04/01/01)
SLC 5/03, 5/04, and 5/05 Memory Module with 64K User Memory Backup	**1747-M12**
SLC 5/03, 5/04, and 5/05 Memory Module Adapter for 1747-M11 and 1747-M12	**1747-M15**
Modular Card Slot Fillers (Orders must be for two or multiples of two.)	**1746-N2**
Modular hardware style demonstration unit with Modular Processor (Catalogue Number 1747-L524), AC I/O (Catalogue Numbers, 1746-A4, -IA8, -IA4, and -OW8) and chassis-mount power supply (Catalogue Number 1746-P1). Demo unit plugs into 120V ac grounded outlet. Includes: • 6 selector switches • 6 momentary contact push buttons • 8 pilot lights	**1747-DEMO-3**
Modular hardware style demonstration unit with Modular Processor (Catalogue Number 1747-L524), DC I/O (Catalogue Numbers, 1746-A4, -IB8 (2), and -OV8) and chassis-mount power supply (Catalogue Number 1746-P1). Demo unit uses 120V or 240V AC input power. Includes: • 6 selector switches • 6 momentary contact push buttons • 8 pilot lights	**1747-DEMO-4**
Modular hardware style demonstration unit with AC I/O (Catalogue Numbers, 1746-A4, -IA8, -IA4, and -OW8) and chassis-mount power supply (Catalogue Number 1746-P1). Demo unit plugs into 120V ac grounded outlet. Includes: • 6 selector switches • 6 momentary contact push buttons **Note:** This Demonstration Unit *does not* include an HHT or a processor. The user selects their own processor. • 8 pilot lights	**1747-DEMO-7**
Battery Jumper for SLC 5/01 Programmable Controllers (set of 4)	**1747-BAJMPR/A**

SP — Silver Series Product. Date shown is the last that the product may be ordered.

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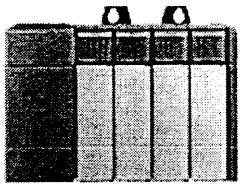
***New or changed since previous issue.**

Program Storage Device - The 1747-PSD is a hand-held program transfer device that provides one-program storage and retrieval for SLC 5/03, SLC 5/04, SLC 5/05 and MicroLogix 1000, 1200, and 1500 controllers. The device connects to the RS-232 port running DF1 Full-Duplex communication protocol using a 1747-CP3 cable (SLC) or 1761-CBL-PM02 (MicroLogix).

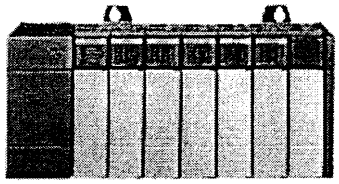
Catalogue Number

Description	Catalogue Number
Program Storage Device	1747-PSD*

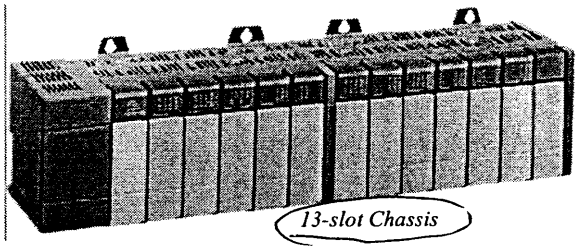
Chassis



4-Slot Chassis



7-Slot Chassis



13-slot Chassis

The chassis houses the processor and the I/O modules. The power supply mounts on the left side of the chassis. Each chassis requires a separate power supply. Chassis do not include interconnect cables. If an interconnect cable is required, refer to the chassis interconnect cables in the table below.

Catalogue Numbers

Description	Catalogue Number
4-Slot Chassis	1746-A4
7-Slot Chassis	1746-A7
10-Slot Chassis	1746-A10
13-Slot Chassis	1746-A13
Chassis Interconnect Cable - This ribbon cable is used when linking modular hardware style chassis up to 152.4 mm (6 in.) apart in an enclosure.	1746-C7
Chassis Interconnect Cable - This cable is used when linking modular hardware style chassis from 152.4 mm (6 in.) up to 914.4 mm (36 in.) apart in an enclosure.	1746-C9
Chassis Interconnect Cable - This cable is used when linking modular hardware style chassis from 0.914m (36 in.) up to 1.27m (50 in.) apart in an enclosure.	1746-C16

Power Supplies

Important: The power supply mounts on the left side of the chassis with two screws. For AC power supplies, 120/240 volt selection is made by a jumper. Place the jumper to match the input voltage. Consider future system expansion when purchasing power supplies.

Catalogue Numbers

Line Voltage	Internal Current Capacity		User Current Capacity	Maximum Inrush Current	Catalogue Number
	at 5V dc	at 24V dc			
85-132/170-265V ac, 47/63 Hz	2A	0.46A	0.2A at 24V dc	20A	1746-P1
85-132/170-265V ac, 47/63 Hz	5A	0.96A	0.2A at 24V dc	20A	1746-P2
19.2 to 28.8V dc	3.6A	0.87A	–	20A	1746-P3
85 to 132/170-265V ac, 47/63 Hz	10A(1)	2.88A(1)	1A at 24V dc(1)	45A	1746-P4
90 to 146V dc	5A	0.96A	0.2A at 24V dc	20A	1746-P5
30 to 60V dc	5A	0.96A	0.2A at 24V dc	20A	1746-P6
10 to 30V dc, isolated	12V dc input: 2A 24V dc input: 3.6A	12V dc input: 0.46A 24V dc input: 0.87A	–	20A	1746-P7*
Ambient Operating Temperature Rating: 0°C to +60°C (+32°F to +140°F) (Current capacity derated by 5% above 55°C for P1, P2, P3, P5, P6 and P7; no derating for P4)					All
Humidity Rating: 5-95% (non-condensing)					All
Wiring: #14 AWG (2mm²)					All

(1) Total of all output power (5 volt backplane, 24 volt backplane, and 24 volt user source) must not exceed 70 W.

14, 12. 7

***New or changed since previous issue.**

Discrete I/O Modules

Terminals on the 4-, 8-, 12-, and 16-point modules have self-lifting pressure plates that accept two 14 AWG ($2mm^2$) wires. LED indicators on the front of each module display the status of each I/O point.

32-point I/O modules are equipped with a 40-pin, MIL-C-83503 type header and a removable wiring connector (1746-N3). The connector can be assembled with the wire type and length of your choice.

Wiring the 16- and 32-point modules can also be done with a Catalogue 1492 Interface module and pre-wired cable. All 16-point I/O modules, Catalogue Numbers 1746-OX8, -OBP8, -OAP12, and 1746-IO12, are equipped with colour-coded removable terminal blocks.

High current solid-state output modules, Catalogue No. 1746-OBP16, -OVP16, and -OAP12, have fused commons with a blown fuse LED. The 1746-OB16E, -OB6EI, and -OB32E modules provide electronic protection from short circuit and overload conditions.

NOTE: For compatibility in an 1746-A2 expansion chassis, see Technical Support Knowledge Base, **www.ab.com/support**, and search for document 12519.

Catalogue Numbers

DC Modules						
Module Description	Voltage Category	Input/ Output	Number of I/O	Power Supply Loading (A)		Catalogue Number
				5V dc	24V dc	
Current Sinking DC Input Module	24V dc	Input	8	0.050	0	1746-IB8
Current Sinking DC Input Module	24V dc	Input	16	0.085	0	1746-IB16
Current Sinking DC Input Module	24V dc	Input	32	0.050(1)	0	1746-IB32
Fast Response DC Sinking Input Module	24V dc	Input	16	0.085	0	1746-ITB16
Current Sourcing DC Input Module	24V dc	Input	8	0.050	0	1746-IV8
Current Sourcing DC Input Module	24V dc	Input	16	0.085	0	1746-IV16
Current Sourcing DC Input Module	24V dc	Input	32	0.050(1)	0	1746-IV32
Fast Response DC Sourcing Input Module	24V dc	Input	16	0.085	0	1746-ITV16
48V Current Sinking DC Input Module	48V dc	Input	16	0.085	0	1746-IC16
Current Sourcing TTL Input Module	5V dc/TTL	Input	16	0.140	0	1746-IG16
125V Current Sinking Sinking DC Input Module	125V dc	Input	16	0.085	0	1746-IH16
Current Sourcing DC Output Module	24V dc	Output	8	0.135	0	1746-OB8
Current Sourcing DC Output Module	24V dc	Output	16	0.280	0	1746-OB16
Current Sourcing DC Output Module	24V dc	Output	32	0.190(1)	0	1746-OB32
Electronically Protected Isolated Sourcing DC Output	24V dc	Output	6	0.046	0	1746-OB6EI
Electronically Protected Current Sourcing DC Output	24V dc	Output	16	0.135	0	1746-OB16E
Electronically Protected Current Sourcing DC Output	24V dc	Output	32	0.190	0	1746-OB32E
Current Sourcing DC Output Module	24V dc	Output	8	0.135	0	1746-OBP8
High Current Sourcing DC Output Module	24V dc	Output	16	0.250	0	1746-OBP16
Current Sinking TTL Output Module	5V dc/TTL	Output	16	0.180	0	1746-OG16
High Current Sinking DC Output Module	24V dc	Output	16	0.250	0	1746-OVP16
Current Sinking DC Output Module	24V dc	Output	8	0.135	0	1746-OV8
Current Sinking DC Output Module	24V dc	Output	16	0.270	0	1746-OV16
Current Sinking DC Output Module	24V dc	Output	32	0.190(1)	0	1746-OV32

(1) Power supply loading for series D or later modules.

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***New or changed since previous issue.**

AC/DC Modules						
Module Description	Voltage Category	Input/ Output	Number of I/O	Power Supply Loading (A)		Catalogue Number
				5V dc	24V dc	
24 VAC/VDC Input Module	24V ac/V dc	Input	16	0.085	0	1746-IN16
Relay (hard contact) Output Module	ac/dc Relay	Output	4	0.045	0.045	1746-OW4
Relay (hard contact) Output Module	ac/dc Relay	Output	8	0.085	0.090	1746-OW8
Relay (hard contact) Output Module	ac/dc Relay	Output	16	0.170	0.180	1746-OW16
Isolated Relay Output Module	ac/dc Relay	Output	8	0.085	0.090	1746-OX8
Combination Input/Output Module	120 V ac Inputs - ac/dc Relay Outputs	both	2 in - 2 out	0.030	0.025	1746-IO4
Combination Input/Output Module	120 V ac Inputs - ac/dc Relay Outputs	both	4 in - 4 out	0.060	0.045	1746-IO8
Combination Input/Output Module	120 V ac Inputs - ac/dc Relay Outputs	both	6 in - 6 out	0.090	0.070	1746-IO12
Combination Input/Output Module	24 V dc Inputs - ac/dc Relay Outputs	both	6 in - 6 out	0.080	0.060	1746-IO12DC

AC Modules						
Module Description	Voltage Category	Input/ Output	Number of I/O	Power Supply Loading (A)		Catalogue Number
				5V dc	24V dc	
120V ac Input Module	100/120V	Input	4	0.035	0	1746-IA4
120V ac Input Module	100/120V	Input	8	0.050	0	1746-IA8
120V ac Input Module	100/120V	Input	16	0.085	0	1746-IA16
240V ac Input Module	200/240V	Input	4	0.035	0	1746-IM4
240V ac Input Module	200/240V	Input	8	0.050	0	1746-IM8
240V ac Input Module	200/240V	Input	16	0.085	0	1746-IM16
120/240V ac Output Module	120/240V	Output	8	0.185	0	1746-OA8
120/240V ac Output Module	120/240V	Output	16	0.370	0	1746-OA16
High Current AC Output Module	120/240V	Output	12	0.370	0	1746-OAP12

Analog I/O Modules

The 1746-NI4, -NIO4I, and -NIO4V input channels are filtered to reject high frequency noise and provide 14- to 16-bit (range-dependent) resolution. The 1746-FIO4I and -FIO4V have less input filtering and can sense more rapidly changing inputs. However, their input resolution is only 12-bit. All analog output channels provide 14-bit resolution and 2.5 ms conversion rate. The 1746-NI8 provides high accuracy and fast analog signal conversion. The 1746-NI8, -NI16I and -NI16V are high density analog input modules that are software configurable.

Catalogue Numbers

Module Description	Points per Module	Voltage Category	Power Supply Loading (A)		Catalogue Number
			5V dc	24V dc	
High Resolution Analog Input Module	4	-20 mA to +20 mA (or) -10V dc to +10V dc	0.025	0.085	1746-NI4
High Resolution Analog Input Module	8	-20 mA to +20 mA (or) -10V dc to +10V dc	0.200	0.100	1746-NI8
High Resolution Analog Input Module(1)	16	-20 mA to +20 mA	0.125	0.075	1746-NI16I*
High Resolution Analog Input Module(1)	16	-10V dc to +10V dc	0.125	0.075	1746-NI16V*
High Resolution Analog Combination I/O Module	2 Inputs 2 Outputs	-20 mA to +20 mA (or) -10V dc to +10V dc 0 to 20 mA	0.055	0.145	1746-NIO4I
High Resolution Analog Combination I/O Module	2 Inputs 2 Outputs	-20 mA to +20 mA (or) -10V dc to +10V dc -10V dc to +10V dc	0.055	0.115	1746-NIO4V
Fast Analog Combination I/O Module	2 Inputs 2 Outputs	0 to 20 mA (or) 0 to 10V dc 0 to 20 mA	0.055	0.150	1746-FIO4I
Fast Analog Combination I/O Module	2 Inputs 2 Outputs	0 to 10V dc (or) 0 to 20 mA -10V dc to +10V dc	0.055	0.120	1746-FIO4V
Analog Output Module	4	0 to 20 mA	0.055	0.195	1746-NO4I
Analog Output Module	4	-10V dc to +10V dc	0.055	0.145	1746-NO4V

(1) Single-ended connections only.

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***New or changed since previous issue.**

Specialty Modules

SLC 500 Thermocouple/mV Modules - All modules interface to thermocouple types J, K, T, E, R, S, B, and N, and also accept millivolt signals that standard analog modules are not able to detect. The 1746-INT4 also interfaces with thermocouple types C and D. **NOTE:** Block transfers are required in a remote I/O configuration, using a 1747-ASB with a PLC.

Barrel Temperature Module - The module provides four zones of Autotuned PID heat/cool temperature control, and can accept either J or K type thermocouples. It is compatible with SLC 5/02 and higher processors.

Catalogue Numbers

Module Description	Power Supply Loading (Amperes)		Catalogue Number
	5V dc	24V dc	
Thermocouple/mV Module	0.060	0.040	1746-NT4
Thermocouple/mV Module	0.120	0.070	1746-NT8
Isolated Thermocouple/mV Module	0.110	0.085	1746-INT4
Barrel Temperature Module	0.110	0.085	1746-BTM

RTD Input Modules - The RTD modules interface with platinum, nickel, copper, and nickel-iron RTDs, and with variable resistance devices such as potentioneters (0 to 3000Ω maximum). The module provides on-board RTD temperature scaling in degrees Celsius and degrees Fahrenheit or resistance scaling in ohms. **NOTE:** Block transfers are required in a remote I/O configuration, using a 1747-ASB with a PLC.

High Speed Counter Modules - The 1746-HSCE module offers a single bi-directional counting channel, which supports quadrature, pulse/direction, or up/down counter input. The 1746-HSCE2 Multi-Channel High Speed Counter provides two sets of ±A, ±B, and ±Z input channels, allowing up to two quadrature, differential line driver, or incremental encoders to be monitored. A and B input channels can also be configured to count single-ended pulse inputs from up to four input devices. **NOTE:** The 1747-ASB module is not compatible with the 1746-HSCE module.

Catalogue Numbers

Module Description	Power Supply Loading (Amperes)		Catalogue Number
	5V dc	24V dc	
RTD/Resistance Input Module	0.050	0.050	1746-NR4
RTD/Resistance Input Module	0.100	0.055	1746-NR8*
High-Speed Counter Encoder Module	0.320	0	1746-HSCE
Multi-Channel High-Speed Counter Encoder Module	0.250	0	1746-HSCE2

Open-Loop Velocity Control Module - This module povides an ideal control strategy for simple hydraulic applications. It can accelerate and decelerat the hydraulic ram, using as many as seven extend and seven retract segments. I/O update is two milliseconds.

Synchronized Axes Module - The module offers four axes of closed-loop servo positioning control, using internal logic to synchronize multiple axes. I/O update is two milliseconds. We recommend that you purchase the 1492-AIFMQS interface module and the 1492-ACABLExxQ pre-wired cable for use witht he 1746-QS module.

Blow Molding Module - The module features four independent axes of PID control plus one discrete I/O pair per channel for channel synchronization for comparison wall thickness control in blow molding machines. The 1746-BLM provides 256 points of resolution for each parison channel with interpolation, and has loop update times of 100 microseconds.

Catalogue Numbers

Module Description	Points per Module	Voltage Category	Power Supply Loading (Amperes)		Catalogue Number
Open-Loop Velocity Control Module	1 Input 1 Output	Temposonics II(DPM & RPM) (or) Balluff (BTL-2-L2 & -M2) -10V dc to +10V dc	0.215	0	1746-QV
Synchronized Axes Module	4 Input 4 Output	Input - LDT with RPM or DPM Output: -10V dc to +10V dc	1.0	0.200	1746-QS
Blow Molding Module	4 Analog Inputs 4 Analog Outputs 4 Discrete Inputs 4 Discrete Outputs	Analog I/O: -10V to + 10V Discrete I/O: 0 to +24V	1.0	0	1746-BLM

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*New or changed since previous issue.

BASIC Modules - The Basic modules add data collection and report generation capability to any SLC system. Two configurable channels enable you to connect to printers, operator interface terminals, modems, and other foreign devices. The module programs in the BASIC language using an ASCII terminal. Optional memory modules available for the processor can be used in the 1746-BAS module (Catalogue numbers 1747-M1, -M2, -M3, and -M4). The 1746-BAS-T module uses the 1771-DBMEM1 and -DBMEM2 memory modules.

BASIC Development Software - An optional software package, BASIC Development Software, provides a structured and efficient means to create and debug BASIC programs. It uses the personal computer to facilitate editing, compiling, uploading, and downloading of BASIC programs.

Catalogue Numbers

Description	Power Supply Loading (Amperes)		Comments	Catalogue Number
	5V dc	24V dc		
BASIC Module	0.150	0.040 (see comments)	If the BASIC Module DH-485 channel is connected to a Catalogue Number **1747-AIC** Link Coupler, add 0.085A to the BASIC module's power supply loading value at 24V dc.	**1746-BAS**
BASIC-T Module	0.150	0.040 (see comments)	If the BASIC Module is connected to any device (HHT, DTAM, PIC) either directly or through a 1747-AIC Link Coupler, add the appropriate current loading for the device to the BASIC module's power supply loading value at 24V dc.	**1746-BAS-T***
BASIC Development Software	Not Applicable		The BASIC module can be programmed with this software and an MS-DOS personal computer. The personal computer requires 640K bytes of RAM, a fixed disk drive with 2M bytes of free disk space, and DOS version 3.1 or later	**1747-PBASE**

Support Continuation Information -

Software Catalogue Number	Support Continuation Description	Support Program Catalogue Number(1)
1747-PBASE	one year support renewal	**1747-PBASES**
1747-PBASE	one year support reinstatement (out of warranty purchase)	**1747-PBASER**

(1) Not subject to discount schedule. Consult your local Rockwell Automation sales office for more information.

Communication Devices

1761-NET-AIC Advanced Interface Converter (AIC+) - This device is an isolated RS-232 to RS-485 converter. It allows two RS-232 devices
(SLC 5/03, SLC 5/04, SLC 5/05; MicroLogix 1000, 1200, and 1500; DTAM Micro; PanelView 500 and 900) to connect to the DH-485 network.

1747-AIC Isolated Link Coupler - The panel-mountable isolated link coupler is used to connect SLC 500 fixed, SLC 5/01, SLC 5/02, and SLC 5/03 processors to a DH-485 network. Where there are two or more SLC 500 processors (fixed or modular) on the link, one isolated link coupler is required for each processor. When another device (DTAM, HHT, or personal computer) is connected to an SLC 500 processor at a distance greater than 6.09 m (20 ft), an isolated link coupler must be connected at each end of the link. A 1747-C11 cable is included with the coupler for connection to the processor.
Important: The 1747-PIC does not have a driver that is Windows 2000 compliant. The existing driver is for use with Windows 98 and NT operating systems.

1747-PIC Personal Interface Converter - This device is an RS-232 to DH-485 converter. It is typically used with an SLC 500 fixed, SLC 5/01,
SLC 5/02, or SLC 5/03 processor to interface to a personal computer. A 1747-C10 cable is included with this product.
Important: The 1747-PIC does not have a driver that is Windows 2000 compliant. The existing driver is for use with Windows 98 and NT operating systems.

1747-KE DH-485/RS-232C Interface Module - This module is a communication interface that acts as a bridge between DH-485 networks and RS-232C devices using DF1 protocol. It enables you to access your SLC 500 through an RS-232C link.

Specialty Module to AIC Cable - When using a BASIC or KE module, you may use a 1747-C13 Specialty Module to Isolated Link Coupler Cable to connect these modules to an isolated link coupler.

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*New or changed since previous issue.

Catalogue Numbers

Module Description[1]	Power Supply Loading (Amperes)		Catalogue Number
	5V dc	24V dc	
Advanced Interface Converter (AIC+)	0	0.120	**1761-NET-AIC**
Isolated Link Coupler - includes a 1747-C11 cable	0	0.085	**1747-AIC**
Personal Interface Converter - includes a 1747-C10 cable	0	0.060 [2]	**1747-PIC**
DH-485/RS-232C Interface Module	0.150	0.040 [3]	**1747-KE**

(1) A listing of communication cables that can be purchased separately for use with any of the above modules is provided in the table on page 12.

(2) The 24V dc loading values of the PIC are included in the 24V dc loading value of the processor.

(3) If the KE module's DH-485 channel is connected to a 1747-AIC Link Coupler, add 0.085A to the KE module's power supply loading. If the KE module is connected to any device (HHT, DTAM, PIC) either directly or through a 1747-AIC Link Coupler, add that device's current loading to the KE module's power supply loading value at 24V dc.

1747-PCI Interface- This interface is a PCI Bus Card that provides high-speed local I/O by linking a personal computer based (PC-based) controller to the 1746 I/O chassis over the standard PCI bus used in personal computers. Using any soft programmable controller, including SoftLogix™ 5 (release 1.1 or later) software, the PCI Interface supports as many as three local 1746 chassis (30 I/O modules maximum). PCI Interface components are sold separately or in bundled packages.

1747-PCI_ _ is a bundled Catalogue number that includes the following items:

- a PCI bus card with choice of memory (1747-PCIA_ or 1747-PCIB_),
- an interconnect cable with choice of length (1747-PCI_A or 1747-PCI_B), and
- a chassis interface module

Component Catalogue Numbers

Description	Catalogue Number
256K Static Memory PCI Bus Card	**1747-PCIS**
1MB Static Memory PCI Bus Card	**1747-PCIS2**
3-meter Interconnect Cable	**1747-PCIC**
10-meter Interconnect Cable	**1747-PCIC2**
Chassis Interface Module	**1747-PCIL**
API Software for MS-DOS®	**1747-PCIDOS**
API Software for Windows NT™	**1747-PCINT**

Bundled Package Catalogue Numbers

Description	Catalogue Number
256K Static Memory PCI Bus Card, 3-meter Interconnect Cable, and Chassis Interface Module	**1747-PCIAA**
256K Static Memory PCI Bus Card, 10-meter Interconnect Cable, and Chassis Interface Module	**1747-PCIAB**
1MB Static Memory PCI Bus Card, 3-meter Interconnect Cable, and Chassis Interface Module	**1747-PCIBA**
1MB Static Memory PCI Bus Card, 10-meter Interconnect Cable, and Chassis Interface Module	**1747-PCIBB**

Communication Cables - Additional cable selection information can be found in the on page 18.

Catalogue Numbers

Description	Catalogue Number
SLC 5/03, 5/04, and 5/05 Communication Cable - This 45 cm (17.7 in.) cable has two 9-pin DTE connectors and is used to connect the SLC 5/03, 5/04, or 5/05 processor RS-232 channel (channel 0) to port 1 of the 1761-NET-AIC.	**1761-CBL-AC0 0**
SLC 5/03, 5/04, and 5/05 Communication Cable - This 45 cm (17.7 in.) cable has a 9-pin DTE and an 8-pin mini DIN connector and is used to connect the SLC 5/03, 5/04, or 5/05 processor RS-232 channel (channel 0) to port 2 of the 1761-NET-AIC.	**1761-CBL-AP0 0**
SLC 5/03, 5/04, and 5/05 Communication Cable - This 2m (6.5 ft.) cable has a 9-pin DTE and an 8-pin mini DIN connector and is used to connect the SLC 5/03, 5/04, or SLC 5/05 processor RS-232 channel (channel 0) to port 2 of the 1761-NET-AIC.	**1761-CBL-PM0 2**
RJ45 to 6-Pin Phoenix Connector Communication Cable - This 3 m (9.8 ft) cable is used to connect the SLC 500 fixed, SLC 5/01, SLC 5/02, and SLC 5/03 processor RJ45 port to port 3 of the 1761-NET-AIC.	**1761-CBL-AS03**
RJ45 to 6-Pin Phoenix Connector Communication Cable - This 9.5 m (31.2 ft) cable is used to connect the SLC 500 fixed, SLC 5/01, SLC 5/02, and SLC 5/03 processor RJ45 port to port 3 of the 1761-NET-AIC.	**1761-CBL-AS09**

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***New or changed since previous issue.**

Description	Catalogue Number
SLC 5/03, 5/04, and 5/05 RS-232 Programmer Cable - This 3.96 m (12 ft) cable has two 9-pin DTE connectors and is used to connect the SLC processor RS-232 channel (channel 0) to a personal computer serial port.	1747-CP3
Ferrite Collar -The ferrite collar is intended for use with an RS-232 cable connected to a 1747-L541, -L542, -L542P, or -L543 processor.	1747-FC

ControlNet Devices

ControlNet Scanner - The 1747-SCNR provides scheduled ControlNet network connections for SLC 5/02, 5/03, 5/04, and 5/05 processors. With scheduled messaging, the SLC processor can control I/O events in real time on the ControlNet network.

ControlNet Adapters - The 1747-ACN15 and -ACNR15 enable up to three 1746 chassis of I/O modules to produce/consume scheduled I/O on the ControlNet network. Both adapters are compatible with all 1746 discrete, analog, and specialty I/O, except those requiring G-file configuration.

ControlNet Messaging Module - The 1747-KFC15 modules provides the capability for an SLC 5/03, 5/04, and 5/05 processor to send or receive unscheduled ControlNet messages. With unscheduled messaging, the SLC controller program can send peer-to-peer messages or be accessed and edited over the ControlNet network using RSLogix 500.

Catalogue Numbers

Module Description	Power Supply Loading (Amperes)		Catalogue Number
	5V dc	24V dc	
ControlNet Scanner	0.900	–	1747-SCNR
ControlNet Adapter	0.900	–	1747-ACN15
ControlNet Adapter	0.900	–	1747-ACNR15
ControlNet Messaging Module	0.640	–	1747-KFC15

Remote I/O (RIO) Devices

Remote I/O Scanner - The 1747-SN module provides communication between an SLC 5/02 or higher processor and an Allen-Bradley or Encompass-certified RIO-compatible operator interface device or control devices via the RIO Link. The module supports up to four logical chassis of I/O data on the RIO Link.

Backup Scanner - The 1747-BSN module contains the full complement of RIO scanner features, plus backup capability for support of redundant processor applications. The backup system consists of one or more pairs of complementary modules, with one module residing in the primary system and the other in the backup system. The primary system controls the operation of remote I/O, while the backup system monitors communications via the high-speed serial link and is available to take control in the event of a fault in the primary system.

Direct Communications Module - This module is used to transfer data between an SLC 500 programmable controller and a supervisory Allen-Bradley programmable controller located on the RIO Link.

Remote I/O Adapter Module - This ASB module provides a communication link between SLC or PLC scanners and a wide variety of 1746 I/O modules over the RIO Link. The module maps the image of the I/O modules in its remote chassis directly to the SLC or PLC image table. Both discrete and block transfer image mapping are supported.

Catalogue Numbers

Module Description	Power Supply Loading (Amperes)		Catalogue Number
	5V dc	24V dc	
Remote I/O Scanner	0.600	–	1747-SN
Backup Scanner	0.800	–	1747-BSN
Direct Communications Module	0.360	–	1747-DCM
Remote I/O Adapter Module	0.375	–	1747-ASB

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*New or changed since previous issue.

DeviceNet Device

DeviceNet Scanner - This scanner module enables communication between and SLC 5/02 or higher processor with a maximum of 63 DeviceNet-compatible I/O devices. The scanner is the DeviceNet master, supporting up to 150 words of input data and 150 words of output data transfer between DeviceNet slave devices using the strobe and poll message mode. The scanner supports all standard DeviceNet communication rates (125K, 250K, and 500K bit/s). The SLC system supports multiple scanners in a single-processor chassis.

DeviceNet Interface - The DNI is a "smart" DeviceNet-to-DF1 interface, allowing connection of DF1-compatible devices to a DeviceNet network where the DNI functions as a DeviceNet slave. In addition, the DNI enables the setup of a peer-to-peer communications network on DeviceNet with other devices using DNIs, similar to a DH-485 or DH+ network.

DeviceNet Catalogue Numbers

Module Description	Power Supply Loading (Amperes)		Catalogue Number
	5V dc	24V dc	
DeviceNet Scanner	0.5	–	**1747-SDN**
DeviceNet Interface (DNI)	not applicable		**1761-NET-DNI**

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***New or changed since previous issue.**

Programming Options

RSLogix 500 Starter Programming Software - The RSLogix 500 Starter programming software offers the basic functionality of the full-featured version with many of the advanced features and communications adapters disabled. The starter only supports the 1747-PIC and DF1 full-duplex communication drivers. RSLogix 500 Starter is an effective solution for cost conscious or entry-level users. RSLogix 500 Starter may only be used with Windows 95®, Windows 98®, Windows 2000 or Windows NT™ (4.0)

RSLogix 500 Programming Software - The RSLogix 500 programming software is used to create, modify, and monitor application programs used by both the SLC 500 and MicroLogix Programmable Controller families. RSLogix 500 may only be used with Windows 95®, Windows 98®, Windows 2000 or Windows NT™ (4.0).

SLC 500 A.I. Series Programming Software - The SLC 500 A.I. Series programming software can be used with any 386DX personal computer or higher. The A.I. series DOS-based software brings a common look and feel to programming for Allen-Bradley MicroLogix™ 1000, SLC 500, PLC-2 PLC-3®, PLC-5, and PLC-5/250™ processors. With its menu-driven interface and function key programming, this software is an excellent tool for programming and troubleshooting your application.

RSPocketLogix - RSPocketLogix is a Microsoft® Windows CE®-based software that, when running on a hand-held Personal Computer (HPC), delivers a compact, portable, easy-to-use tool for factory floor maintenance and troubleshooting. Designed for Allen-Bradley SLC 500 and MicroLogix programmable controllers, it uses open CE technologies and a familiar look and feel to give users a flexible, robust program, easily tailored to specific control applications. Catalogue Number 9501-RL0H150ENF includes a Jornada 680e, cables, and the RSPocketLogix software (pre-installed).

Advanced Programming Software - The SLC 500 APS software can be used with an MS-DOS personal computer. Your computer must have:

- 640K bytes of RAM (minimum 2M bytes of extended memory required)
- 10M bytes fixed-disk drive (3.5M bytes of free hard-disk space)
- DOS version 3.3 or higher

Important: APS cannot be used with SLC 5/03 (Catalogue number 1747-L531) or SLC 5/05 (Catalogue numbers 1747-L551, L552, and L553). APS will not be able to program the new instructions available in OS302 Series C, and OS401 Series C operating systems.

Catalogue Numbers

Description	Catalogue Number
Personal Interface Converter (driver is not Windows 2000-compliant)	**1747-PIC**
Advanced Interface Converter (driver is not Windows 2000-compliant)	**1761-NET-AIC**
Advanced Programming Software (v 6.0) - English (1)	**9323-PA2E**
SLC 500 PID Logistics - Requires 9323-S5300D. Auto-tune SLC 500 PID Ladder Logic Instruction.	**9323-S5250D**
RSTune – PID Loop Tuner	**9323-1003D**
RSTune/WINtelligent Linx	**9323-TL1303D**
RSTune/RSLinx	**9323-TRSL1303D**
SLC 500 A.I. Series Programming Software - Allows you to program SLC 500 and MicroLogix 1000 Programmable Controllers. Includes RSLinx Lite (2) (3)	**9323-S5300D**
RSLogix 500 Starter Programming Software (CD-ROM) – GERMAN (2) (3) (4)	**9324-RL0100DEE**
RSLogix 500 Starter Programming Software (CD-ROM) – ENGLISH (2) (3) (4)	**9324-RL0100ENE**
RSLogix 500 Starter Programming Software (CD-ROM) – SPANISH (2) (3) (4)	**9324-RL0100ESE**
RSLogix 500 Starter Programming Software (CD-ROM) – FRENCH (2) (3) (4)	**9324-RL0100FRE**
RSLogix 500 Starter Programming Software (CD-ROM) – ITALIAN (2) (3) (4)	**9324-RL0100ITE**
RSLogix 500 Starter Programming Software (CD-ROM) – PORTUGUESE (2) (3) (4)	**9324-RL0100PTE**
RSLogix 500 Programming Software (CD-ROM) – GERMAN - Includes RSLinx Lite. (2) (3)	**9324-RL0300DEE**
RSLogix 500 Programming Software (CD-ROM) – ENGLISH - Includes RSLinx Lite. (2) (3)	**9324-RL0300ENE**
RSLogix 500 Programming Software (CD-ROM) – SPANISH - Includes RSLinx Lite. (2) (3)	**9324-RL0300ESE**
RSLogix 500 Programming Software (CD-ROM) – FRENCH - Includes RSLinx Lite. (2) (3)	**9324-RL0300FRE**
RSLogix 500 Programming Software (CD-ROM) – ITALIAN - Includes RSLinx Lite. (2) (3)	**9324-RL0300ITE**
RSLogix 500 Programming Software (CD-ROM) – PORTUGUESE - Includes RSLinx Lite. (2) (3)	**9324-RL0300PTE**
RSLogix Emulate 500	**9310-WE0200D**

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***New or changed since previous issue.**

Description	Catalogue Number
SLC 500 Ladder Emulation Module - Requires SLC 500 A.I. Series programming software.	9343-S5200D
RSPocketLogix (includes a Jornada 680e, cables and pre-installed RSPocketLogix software)	9501-RL0H150ENF*
Personal Interface Converter	1747-PIC
Advanced Interface Converter	1761-NET-AIC

(1) When using APS to program SLC 500 Processors, you must provide a means to communicate between the PC and the processor. For SLC 500 Fixed Controllers, SLC 5/01, SLC 5/02, and SLC 5/03 processors, use one of the Interface Converters listed above (see page 16 for more details). For SLC 5/04 processors, purchase the Controller-to-Personal Computer Cable (1747-CP3).

(2) When using RSLogix 500 or SLC 500 A.I. Series software to program SLC 500 Processors, you must provide a means to communicate between the PC and the processor. For SLC 500 Fixed Controllers, SLC 5/01, SLC 5/02, and SLC 5/03 processors, use one of the Interface Converters listed above (see page 11 for more details). For SLC 5/04 and SLC 5/05 processors, purchase the Controller-to-Personal Computer Cable (1747-CP3).

(3) When using RSLogix 500 or SLC 500 A.I. Series software to program MicroLogix Controllers, you must purchase the Controller-to-Personal Computer Cable (1761-CBL-PM02).

(4) Includes communications drivers for 1747-PIC and full-duplex DF1 (MicroLogix and SLC 500 CH0) only. 1747-PIC driver is not Windows 2000-compliant.

RSLogix and A.I. Series Support - Rockwell Software provides a full one-year limited warranty for RSLogix 500 and SLC 500 A.I. Series programming software products. Additional one-year terms of support can be purchased as shown below.

Ordering Procedures - Orders for support continuation agreements must be accompanied by customer's name, address, software serial number and version number (or a copy of the customer's registration card). Orders should be sent to the local Allen-Bradley sales office or authorized distributor.

Support Continuation Information -

Software Catalogue Number	Support Continuation Description	Support Program Catalogue Number
9323-1003D	one year support renewal	**9323-1003ENS**
9323-1003D	one year support reinstatement (out of warranty purchase)	**9323-1003ENR**
9323-PA2E (English)	Advanced Programming Software with one year support renewal	**9323-PA2ES**
9323-PA2E (English)	one year support reinstatement (out of warranty purchase)	**9323-PA2ER**
9323-S5250D	one year support renewal	**9323-S5250S**
9323-S5250D	one year support reinstatement (out of warranty purchase)	**9323-S5250R**
9323-S5300D	one year support renewal	**9323-S5300S**
9323-S5300D	one year support reinstatement (out of warranty purchase)	**9323-S5300R**
9343-S5200D	one year support renewal	**9343-S5200S**
9343-S5200D	one year support reinstatement (out of warranty purchase)	**9343-S5200R**
9324-RL0100DEE	one year support renewal	**9324-RL0100DES**
9324-RL0100DEE	one year support reinstatement (out of warranty purchase)	**9324-RL0100DER**
9324-RL0100ENE	one year support renewal	**9324-RL0100ENS**
9324-RL0100ENE	one year support reinstatement (out of warranty purchase)	**9324-RL0100ENR**
9324-RL0100ESE	one year support renewal	**9324-RL0100ESS**
9324-RL0100ESE	one year support reinstatement (out of warranty purchase)	**9324-RL0100ESR**
9324-RL0100FRE	one year support renewal	**9324-RL0100FRS**
9324-RL0100FRE	one year support reinstatement (out of warranty purchase)	**9324-RL0100FRR**
9324-RL0100ITE	one year support renewal	**9324-RL0100ITS**
9324-RL0100ITE	one year support reinstatement (out of warranty purchase)	**9324-RL0100ITR**
9324-RL0100PTE	one year support renewal	**9324-RL0100PTS**
9324-RL0100PTE	one year support reinstatement (out of warranty purchase)	**9324-RL0100PTR**
9324-RL0300DEE	one year support renewal	**9324-RL0300DES**
9324-RL0300DEE	one year support reinstatement (out of warranty purchase)	**9324-RL0300DER**
9324-RL0300ENE	one year support renewal	**9324-RL0300ENS**

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Software Catalogue Number	Support Continuation Description	Support Program Catalogue Number
9324-RL0300ENE	one year support reinstatement (out of warranty purchase)	**9324-RL0300ENR**
9324-RL0300ESE	one year support renewal	**9324-RL0300ESS**
9324-RL0300ESE	one year support reinstatement (out of warranty purchase)	**9324-RL0300ESR**
9324-RL0300FRE	one year support renewal	**9324-RL0300FRS**
9324-RL0300FRE	one year support reinstatement (out of warranty purchase)	**9324-RL0300FRR**
9324-RL0300ITE	one year support renewal	**9324-RL0300ITS**
9324-RL0300ITE	one year support reinstatement (out of warranty purchase)	**9324-RL0300ITR**
9324-RL0300PTE	one year support renewal	**9324-RL0300PTS**
9324-RL0300PTE	one year support reinstatement (out of warranty purchase)	**9324-RL0300PTR**
9310-WE0200D	one year support renewal	**9310-WE0200S**
9310-WE0200D	one year support reinstatement (out of warranty purchase)	**9310-WE0200R**

Hand-Held Programming Terminal (HHT) - The HHT can be used to easily enter, edit, and monitor a user program. The HHT can be connected to an SLC 5/01 or SLC 5/02 anywhere over the DH-485 Network (1219m / 4000 ft maximum), or used as a stand-alone programming device. An optional battery is recommended to provide back-up for the HHT RAM memory. A Memory Pak must be ordered with each HHT.



HHT Specifications -

Description	Specification
Power Supply Loading	0.105A at 24V dc (1)
Communications	DH-485
Approximate Dimensions	Height = 201.3 mm (7.925 in.),Width = 193.04 mm (7.6 in.), Depth = 50.8 mm (2 in.)
	Dimensions are not intended to be used for manufacturing purposes.
Important: The HHT cannot be used with SLC 5/03 and higher processors.	

(1) The 24V dc loading values of the HHT, PIC, and DTAM are included in the 24V dc loading value of the processor.

Catalogue Numbers

Description	Catalogue Number
Hand-Held Terminal includes 1747-C10 cable. (No battery or Memory Pak included.)	**1747-PT1**
Wall Mount Power Supply (120V ac input) unregulated (for stand-alone offline programming).	**1747-NP1**
Memory Pak, English version (v 2.03) includes Hand-Held Terminal Overlay.	**1747-PTA1E(1)**
Memory Pak, French version (v 2.03) includes Hand-Held Terminal Overlay.	**1747-PTA1F(1)**
Memory Pak, German version (v 1.1) includes Hand-Held Terminal Overlay.	**1747-PTA1G(1)**
Memory Pak, Italian version (v 1.1) includes Hand-Held Terminal Overlay.	**1747-PTA1I(1)**
Global Desk Top Power Supply (85/265V ac input) unregulated (for stand-alone offline programming).	**1747-NP2**
Carrying case for Hand-Held Programmer.	**1747-PT1CC**
Battery (for RAM memory retention).	**1747-BA**
HHT Keypad Replacement Overlay	–
English Memory Pak Firmware Releases 1.02, 1.07 and 1.10	**1747-R20**
French Memory Pak Firmware Releases 1.10	**1747-R20F**
German Memory Pak Firmware Releases 1.10	**1747-R20G**
Italian Memory Pak Firmware Releases 1.10	**1747-R20I**
English Memory Pak Firmware Releases 2.00 and Later	**1747-R21**
French Memory Pak Firmware Releases 2.00 and Later	**1747-R21F**

(1) Consult your local Rockwell Automation sales office for price and delivery on an upgrade, if you have a Memory Pak version earlier than those listed.

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***New or changed since previous issue.**

Replacement Parts

Replacement Cables and Connectors

Catalogue Numbers -

Description	Catalogue Number
Chassis Interconnect Cable - The 1746-C7 is a 152.4 mm (6 in.) ribbon cable used when linking modular hardware style chassis up to 152.4 mm (6 in.) apart in an enclosure.	1746-C7
Chassis Interconnect Cable - The 1746-C9 is a 914.4 mm (36 in.) cable used when linking modular hardware style chassis from 152.4 mm (6 in.) up to 914.4 mm (36 in.) apart in an enclosure.	1746-C9
Chassis Interconnect Cable - The 1746-C16 is a 1.27m (50 in.) cable used when linking modular hardware style chassis from 0.914m (36 in.) up to 1.27m (50 in.) apart in an enclosure. This is the longest chassis interconnect cable recommended by Allen-Bradley.	1746-C16
32 Point Mating Connector - This connector is used for terminating a user-made cable. It is compatible with the Catalogue Number 1492-IFM40x, DIN RAIL mountable terminal block interface module (used with 32-point I/O modules).	1746-N3
Replacement Processor to Peripheral Programming/Communication Cable - This 1.8 m (6 ft) cable is used to connect the interface converter to the SLC 500 controller when using personal computer interface software. This cable is also used to connect the Hand-Held Terminal to the SLC 500 controller and to connect the Data Table Access Module to the SLC 500 controller.	1747-C10
Replacement Processor to Isolated Link Coupler Cable - This 304.8 mm (12 in.) cable is used to connect the SLC 500 controller to the isolated link coupler.	1747-C11
Communication Module to Isolated Link Coupler Cable - This 914.4 mm (36 in.) cable is used to connect communication modules (i.e. 1746-BAS and 1747-KE) to the isolated link coupler. The isolated link coupler must be powered by an external power supply or connected to a device with a Catalogue Number 1747-C10 or 1747-C11 cable.	1747-C13
Replacement Processor to Peripheral Programming/Communication Cable - This 6.096 m (20 ft) cable is used to connect the interface converter to the SLC 500 controller when using personal computer interface software. This cable is also used to connect the Hand-Held Terminal to the SLC 500 controller and to connect the Data Table Access Module to the SLC 500 controller.	1747-C20
SLC 5/03, 5/04, and 5/05 RS-232 Programmer Cable - This 3.96 m (12 ft) cable has two 9-pin DTE connectors and is used to connect the SLC processor RS-232 channel (channel 0) to a personal computer serial port.	1747-CP3
SLC 5/03, 5/04, and 5/05 Communication Cable - This 45 cm (17.7 in.) cable has two 9-pin DTE connectors and is used to connect the SLC processor RS-232 channel (channel 0) to port 1 of the 1761-NET-AIC Advanced Interface Converter.	1761-CBL-AC00
SLC 5/03, 5/04, and 5/05 Communication Cable - This 2 m (6.5 in.) cable has a 9-pin DTE and an 8-pin mini DIN connector and is used to connect the SLC processor RS-232 channel (channel 0) to port 2 of the 1761-NET-AIC Advanced Interface Converter.	1761-CBL-PM02
SLC 5/03, 5/04, and 5/05 Communication Cable - This 45 cm (17.7 in.) cable has a 9-pin DTE and an 8-pin mini DIN connector and is used to connect the SLC processor RS-232 channel (channel 0) to port 2 of the 1761-NET-AIC Advanced Interface Converter.	1761-CBL-AP00
RJ45 to 6-Pin Phoenix Connector Communication Cable - This 3 m (9.8 ft) cable is used to connect the SLC 500 fixed, SLC 5/01, SLC 5/02, and SLC 5/03 processor RJ45 port to port 3 of the 1761-NET-AIC Advanced Interface Converter.	1761-CBL-AS03
RJ45 to 6-Pin Phoenix Connector Communication Cable - This 9.5 m (31.2 ft) cable is used to connect the SLC 500 fixed, SLC 5/01, SLC 5/02, and SLC 5/03 processor RJ45 port to port 3 of the 1761-NET-AIC Advanced Interface Converter.	1761-CBL-AS09
Catalogue 1492 Pre-wired Interface Cables (See publication 1492-2.15 for more information.)	

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*New or changed since previous issue.

Cable Connectivity Summary -

For Connectivity Between These Devices		Preferred Cable Catalogue Number	These Cables May Be Used
1746-A4, -A7, -A10, or -A13 Chassis	1746-A4, -A7, -A10, or -A13 Chassis	**1746-C7** **1746-C9** **1746-C16**	–
1747-PIC Personal Interface Converter 1747-PT1 Hand-Held Programming Terminal 1747-DTAM-E Data Table Access Module 2707-Lxxx, -Vxxx DTAM Plus	1747-AIC Isolated Link Coupler SLC 500 Processors (DH-485 Channel)	**1747-C10**	1747-C11 1747-C20
1747-AIC Isolated Link Coupler	SLC 500 Processors (DH-485 Channel)	**1747-C11**	1747-C10 1747-C13 1747-C20
1747-KE DH-485/RS-232C Interface Module 1746-BAS BASIC Module	1747-AIC Isolated Link Coupler	**1747-C13**	1747-C11 1747-C10
1746-xx32 32 Point I/O Modules	1492-IFM40x	**1492-CABLExH**	–
SLC 5/03 Processor (RS-232 Channel 0) SLC 5/04 Processor (RS-232 Channel 0) SLC 5/05 Processor (RS-232 Channel 0)	Personal Computer Serial Port (9-Pin DTE)	**1747-CP3**	–
1746-I/O	1492-IFMxx Interface Modules	**1492-CABLExx**	–
1747-SN Remote I/O Scanner 1747-DCM Direct Communication Module 1747-ASB SLC Remote I/O Adapter Module SLC 5/04 Processors (1747-L541, -542, and -543)	Remote I/O Network	**Belden 9463**	–
1747-AIC Isolated Link Coupler 1770-KF3 DH-485 Communication Interface 1784-KR Personal Computer Interface	1747-AIC Isolated Link Coupler	**Belden 9842**	–

Replacement Terminal Blocks

Catalogue Numbers

Description	Catalogue Number
Replacement Terminal Block (Blue) — Used with DC I/O modules, Catalogue Numbers 1746-IB16, -IC16, -IH16, -IV16, -OBP8, -OB16, -OB16E, -OBP16, -OVP16 -OV16, -IN16, -IG16, -OG16	**1746-RT25B**
Replacement Terminal Block (Orange) — Used with relay output modules, Catalogue Numbers 1746-OW16, -OX8	**1746-RT25C**
Replacement Terminal Block (Green) — Used with Specialty I/O modules, Catalogue Numbers 1746-HSCE, -IO12, -NR4, -NI8	**1746-RT25G**
Replacement Terminal Block (Red) — Used with AC I/O modules, Catalogue Numbers 1746-IA16, -OA16, -IM16, -OAP12	**1746-RT25R**
Replacement Terminal Block — 2-position terminal block used with analog outputs, Catalogue Numbers 1746-NO4I, -NO4V	**1746-RT26**
Replacement Terminal Block — 8-position terminal block used with analog outputs, Catalogue Numbers 1746-NO4I, -NO4V	**1746-RT27**
Replacement Terminal Block — Used with analog input modules, Catalogue Numbers 1746-NI4, -NIO4I, -NIO4V, -FIO4I, -FIO4V	**1746-RT28**
Replacement Terminal Block — Used with RIO Communication Modules, Catalogue Numbers 1747-SN, -DSN, -DCM	**1746-RT29**
Replacement Terminal Block — 6-position DH-485 plug/connector; used with DH-485 Link Coupler, Catalogue Number 1747-AIC and Advanced Interface Converter, Catalogue Number 1761-NET-AIC	**1746-RT30**
Replacement Terminal Block — Used with SLC 500 Remote I/O Adapter Module, Catalogue Number 1747-ASB	**1746-RT31**
Replacement Terminal Block — Used with Thermocouple/mV Module, Catalogue Number 1746-NT4	**1746-RT32**
Replacement Terminal Block — 3-position DH+ connector; used with SLC 5/04 Processors, Catalogue Numbers 1747-L541, 1747-L542, -L542P, 1747-L543	**1746-RT33**
Replacement Terminal Block (Green) — Used with Thermocouple/mV Input Module, Catalogue Number 1746-NT8	**1746-RT34**
Replacement Terminal Block (Green) — Used with RTD/Resistance Module, Catalogue Number 1746-NR8	**1746-RT35**

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Other Replacement Hardware

Catalogue Numbers

Description	Catalogue Number
Replacement Fuses — Five fuses per package. Orders must be for multiples of five.	–
Catalogue Number for 1746-P1 power supply.	1746-F1
Catalogue Number for 1746-P2 power supply.	1746-F2
Catalogue Number for 1746-P3 power supply.	1746-F3
Fixed I/O AC units, MDL 1.25 Ampere.	1746-F4
Fixed I/O DC units, MDL 1.6 Ampere.	1746-F5
Catalogue Numbers for 1746-OBP16 and 1746-OVP16 output modules.	1746-F8
Catalogue Numbers for 1746-OAP12 output module.	1746-F9
Modular Card Slot Fillers — Two fillers per package. Orders must be for multiples of two.	1746-N2
Connector — Mating Connector for 32-point user-made cable	1746-N3
Kit consisting of 4 replacement terminal covers and labels for 4, 8, 16 I/O modules	1746-R9
Replacement Covers and Labels — Two covers per package. Orders must be for multiples of two covers.	–
Catalogue Number for 1746-P1.	1746-R10
Catalogue Numbers for 1746-P2 and -P3 power supplies.	1746-R11
SLC 5/01 and SLC 5/02 Processors.	1746-R12
Specialty I/O.	1746-R13
SLC 5/03, SLC 5/04, and SLC 5/05 Processor.	1746-R14
Catalogue Number for 1747-ASB.	1746-R16
Replacement Fuse Holder for Catalogue Number 1746-OAP12. Two fuse holders per package. Orders must be for multiples of two.	1746-R17
Replacement Retainer Clips — Four clips per package. Orders must be for multiples of four.	1746-R15
Replacement Remote I/O Address Labels: Includes five labels for remote PLC system and five labels for remote SLC system.	1746-RL35
Replacement Octal Label Kit — Kit includes one octal LED label and one door label.	–
for 1746-IA16.	1746-RL40
for 1746-IB16.	1746-RL41
for 1746-IG16.	1746-RL42
for 1746-IM16.	1746-RL43
for 1746-IN16.	1746-RL44
for 1746-IV16.	1746-RL45
for 1746-ITB16.	1746-RL46
for 1746-ITV16.	1746-RL47
for 1746-OA16.	1746-RL50
for 1746-OB16.	1746-RL51
for 1746-OG16.	1746-RL52
for 1746-OV16.	1746-RL53
for 1746-OW16.	1746-RL54
for 1746-OBP16.	1746-RL55
for 1746-OVP16.	1746-RL56
for 1746-OAP12.	1746-RL57
for 1746-IC16.	1746-RL58
for 1746-IH16.	1746-RL59
for 1746-IB32.	1746-RL60
for 1746-IV32.	1746-RL61
for 1746-OB32 and 1746-OB32E.	1746-RL70
for 1746-OV32.	1746-RL71
for 1746-OB16E.	1746-RL72
Lithium Battery Assembly. This is an optional part used for the SLC 500 Fixed and Modular Hardware Style processors and the Hand-Held Terminal. Refer to product documentation for proper storage and handling instructions. For disposal information, consult your nearest Allen-Bradley Sales Office.	1747-BA
Replacement Keys for the SLC 5/03, SLC 5/04, and SLC 5/05 processors	1747-KY1
Replacement Parts Kit for 20 I/O Fixed Hardware Style Processor, consists of: two Output Terminal Covers, two Input Terminal Covers, two Prom/Battery Covers, and one HHT/Comm Connector Cover.	1747-R5

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Description	Catalogue Number
Replacement Parts Kit for 30 & 40 I/O Fixed Hardware Style Processors, consists of: two Output Terminal Covers, two Input Terminal Covers, two PROM/Battery Covers, and one HHT/Comm Connector Cover.	1747-R7

Manuals ALL MANUALS ON INCLUDED CD

Catalogue Numbers

Description[1]	Catalogue Number	Publication Number
Barrel Temperature Control Module (1746-BTM) User Manual	**D1746-6.10**	1746-6.10
Open-Loop Velocity Control Module (1746-QV) User Manual	**D1746-6.18**	1746-6.18
Multi-Channel High Speed Counter Module (1746-HSCE2) User Manual	**D1746-UM002A-US-P**	1746-UM002A-US-P
SLC 500 NT8 Thermocouple/mV Module User Manual	**D1746-6.22**	1746-6.22
SLC 500 Analog I/O Modules User Manual	**D1746-6.4**	1746-6.4
High-Speed Counter Module (1746-HSCE) User Manual	**D1746-6.5**	1746-6.5
SLC 500 (1746-NT4) Thermocouple/mV Module User Manual	**D1746-6.6.1**	1746-6.6.1
SLC 500 (1746-NR4) RTD/Resistance Input Module User Manual	**D1746-6.7**	1746-6.7
1746-NI8 Analog Input Module User Manual	**D1746-6.8**	1746-6.8
1746-FIO4I and -FIO4V Fast Analog Modules User Manual	**D1746-6.9**	1746-6.9
BASIC Language Reference Manual	**D1746-RM001A-US-P**	1746-RM001A-US-P
BASIC Development Software Programming Manual	**D1746-PM001A-US-P**	1746-PM001A-US-P
SLC 500 (1746-NI16) Analog Input Module User Manual	**D1746-UM001A-US-P**	1746-UM001A-US-P
SLC 500 (1746-NR8) RTD/Resistance Input Module User Manual	**D1746-UM003A-EN-P**	1746-UM003A-EN-P
SLC 500 BASIC Module User Manual	**D1746-UM004A-US-P**	1746-UM004A-US-P
ControlNet RS-232 Interface Module User Manual (1747-KFC15)	**D1747-5.34**	1747-5.34
Data Table Access Module (1747-DTAM-E) User Manual	**D1747-6.1**	1747-6.1
DH-485/RS-232C Interface Module (1747-KE) User Manual	**D1747-6.12**	1747-6.12
Remote I/O Adapter Module (1747-ASB) User Manual	**D1747-6.13**	1747-6.13
SLC 500 and MicroLogix 1000 Instruction Set Reference Manual	**D1747-6.15**	1747-6.15
Synchronized Axes Control Module (1746-QS) User Manual	**D1746-6.19**	1746-6.19
Modular Hardware Style Installation and Operation Manual	**D1747-6.2**	1747-6.2
Fixed Hardware Style Installation and Operation Manual	**D1747-6.21**	1747-6.21
Backup Scanner Module User Manual	**D1747-6.22**	1747-6.22
DeviceNet Scanner (1747-SDN) User Manual	**D1747-6.5.2**	1747-6.5.2
Remote I/O Scanner Module (1747-SN) User Manual	**D1747-6.6**	1747-6.6
Direct Communication Module (1747-DCM) User Manual	**D1747-6.8**	1747-6.8
HHT Getting Started Guide	**D1747-NM009**	1747-NM009
HHT User Manual	**D1747-NP002**	1747-NP002
ControlNet Scanner Module User Manual	**D1747-6.23**	1747-6.23
ControlNet Adapter Module User Manual	**D1747-UM003A-EN-P**	1747-UM003A-EN-P
DeviceNet Interface (1761-NET-DNI) User Manual	**D1761-6.5**	1761-6.5
SLC 500 APS Import/Export Utility User Manual	**9399APSIE**	9399APSIE
SLC 500 APS Manual Set	**9399APSMAN**	9399APSMAN
SLC 500 APS Quick Start Guide	**9399APSQS**	9399APSQS
SLC 500 APS User Manual	**9399APSUM**	9399APSUM
RSLogix 500 Getting Results Guide	**9399RL50GR**	9399RL50GR
MicroLogix 1000 and PLC 500 A.I. Series Manual Set	**9399S5MAN**	9399S5MAN
SLC 500 A.I. Series Software Reference	**9399S5SR**	9399S5SR

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Chapter 15 MAIN PLC SOFTWARE AS BUILT.

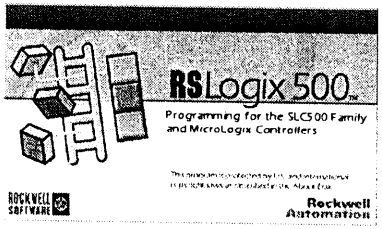
MANUFACTURER/DISTRIBUTOR:

DEVCAR INC
368 21^{E} AVENUE NORD
ST-JÉRÔME.QUE. J7Z-3W2
PHONE/FAX 450-436-3164

15.1 MAIN PLC SOFTWARE AS BUILT.

END OF CHAPTER 15

RSLogix500 Project Report



1.5.1

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Processor Information

Processor Type: 1747-L551B/C 5/05 CPU - 16K Mem. OS501 Series C

Processor Name: WWTP

Total Memory Used: 1960 Instruction Words Used - 1205 Data Table Words Used

Total Memory Left: 10328 Instruction Words Left

Program Files: 13

Data Files: 22

Program ID: 92db

I/O Configuration

0	1747-L551B/C	5/05 CPU - 16K Mem. OS501 Series C
1	1746-IB16	16-Input (SINK) 24 VDC
2	1746-IB16	16-Input (SINK) 24 VDC
3	1746-OX8	8-Output Isolated Relay
4	1746-OX8	8-Output Isolated Relay
5	1746-NI8	Analog 8 Channel Input - Class 3
6	1746-NO4I	Analog 4 Ch. Current Output
7	1746-IA16	16-Input 100/120 VAC
8	1746-IA16	16-Input 100/120 VAC
9	1746-OX8	8-Output Isolated Relay
10	1746-OX8	8-Output Isolated Relay
11	1746-NT8	Analog 8 Ch Thermocouple Input
12	1746-OW16	16-Output (RLY) 240 VAC
--	---	---
13	1746-NO4I	Analog 4 Ch. Current Output
14	1746-NI8	Analog 8 Channel Input - Class 3
15		
16		

PID - Rung #4:4 - N21:0

Controller Gain, Kc: 0.1
Reset Term, Ti: 0.1
Rate Term, Td: 0.00
Loop Update Time: 10.23
Control Mode: E = SP - PV
PID Control: Auto
Time Mode: Timed
Output Limiting: No
Reset and Gain: No

Setpoint: 7680
Maximum Setpoint Limit: 0
Minimum Setpoint Limit: 0
Control Variable Percent (CV%): 0
Output Max CV(%): 0
Output Min CV(%): 0
Derivative Action(DA): No
Deadband: 200

16.1

GENERAL
Channel 1 Write Protected: No
Channel 1 Edit Resource/Owner Timeout: 60
Channel 1 Passthru Link ID: 2
Channel 1 Diagnostic File: (Unused)

Channel 0 Write Protected: No
Channel 0 Edit Resource/Owner Timeout: 60
Channel 0 Passthru Link ID: 2
Channel 0 Current Mode: System
Channel 0 Mode Change Enabled: No
Channel 0 Mode Change Attention Character: \1b
Channel 0 Mode Change System Character: S
Channel 0 Mode Change User Character: U
Channel 0 Diagnostic File: 0

CHANNEL 1 (SYSTEM) - Driver: Ethernet
Broadcast Address: 0.0.0.0
Hardware Address: 00:00:BC:1E:9D:41
IP Address: 192.168.0.200
Subnet Mask: 255.255.255.0
Gateway Address: 0.0.0.0
Msg Connection Timeout (x 1mS): 15000
Msg Reply Timeout (x mS): 3000
Inactivity Timeout (x Min): 30
Bootp Enable: No
Bootp Valid: No
SNMP Enable: Yes
HTTP Enable: Yes
Auto Negotiate Enable: No
Port Speed Enable: 10 Mbps Half Duplex Forced
Contact:
Location:

CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex
Source ID: 0 (decimal)
Baud: 19200
Parity: NONE
Stop Bits: 1
Control Line : No Handshaking
Error Detection: CRC
Embedded Responses: Enabled
Duplicate Packet Detect: Yes
ACK Timeout: 50
NAK Retries: 3
ENQ Retries: 3

CHANNEL 0 (USER) - Driver: ASCII
Baud: 1200
Parity: NONE
Stop Bits: 1
Data Bits: 8
Control Line : No Handshaking
Delete mode: Ignore
Echo: No
XON/XOFF: No
Termination Character 1: \d
Termination Character 2: \ff
Append Character 1: \d
Append Character 2: \a

Multipoint Monitor

	Address	Symbol	State	On Description	Off Description	Protected
0						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						

Program File List

Name	Number	Type	Rungs	Debug	Bytes
[SYSTEM]	0	SYS	0	No	0
	1	SYS	0	No	0
MAIN	2	LADDER	15	No	193
TIME BASE	3	LADDER	21	No	757
AHU	4	LADDER	33	No	1467
LIFTSTATIO	5	LADDER	40	No	2860
PRIM SCRN	6	LADDER	27	No	1053
PRIM FILT	7	LADDER	44	No	1759
FEW TANK	8	LADDER	28	No	1276
GAS ALARM	9	LADDER	3	No	115
BOILLERS	10	LADDER	10	No	303
ALARM	11	LADDER	16	No	617
FEW HEAT	12	LADDER	18	No	476

Data File List

Name	Number	Type	Scope	Debug	Words	Elements	Last
OUTPUT	0	O	Global	No	135	45	O:44
INPUT	1	I	Global	No	132	44	I:43
STATUS	2	S	Global	No	0	83	S:82
BINARY	3	B	Global	No	45	45	B3:44
TIMER	4	T	Global	No	135	45	T4:44
COUNTER	5	C	Global	No	18	6	C5:5
CONTROL	6	R	Global	No	3	1	R6:0
INTEGER	7	N	Global	No	254	254	N7:253
FLOAT	8	F	Global	No	44	22	F8:21
ROUTINGTAB	10	N	Global	No	128	128	N10:127
STRING	11	N	Global	No	32	32	N11:31
CH1 Diag	20	N	Global	No	256	256	N20:255
PID LEN 23	21	N	Global	No	23	23	N21:22

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Ladder Table of Contents

File	Rung	Page Title	Page
3	0	make36 sec base (1/100 heures)	15
3	8	define bit	17
3	10	count ttsn all item	18
3	11	build 0 1 2 3 second base	21
3	13	trend build fast ramp	22
3	15	trend build sine base	23
4	0	TOTAL TIME CALCULATION	24
4	1	COPY INFO FROM THERMOCOUPLE CARD FOR MMI AND CONTROL	25
4	17	air handling unit data for mmi	30
4	19	supply fan data for mmi	33
4	21	exhaust fan data for mmi	34
4	30	select off to reset	37
4	31	trailler room temperature alarm set point	38
5	0	lit 101 level indication / conversion	39
5	3	fit 101 flow indication/conversion in L/min	40
5	4	if flow very small ,,, let to 0	41
5	5	volume totaliser	42
5	7	nerlay all fail	43
5	8	low low level lift station call out	44
5	14	status and loop p102	46
5	19	status and loop p103	50
5	23	status p104	54
5	29	automatic proportional control level loop	58
5	30	automatic proportional control level loop	59
5	35	RESET MINICAS ALARM	63
5	36	priority management p102	64
5	37	priority management p103	66
5	38	priority management p104	68
6	0	lit 102 level indication / conversion	70
6	6	both screw fail	72
6	12	screw screen wash	75
6	14	if screw not run for x time auto wash	77
6	19	start wash depending of level	78
6	24	count number of wash cycle on screws screens	79
7	1	conversion level transmitter	81
7	3	compressor air pressure	83
7	4	belt drive sequences	84
7	7	manual mode or auito beelt speed	85
7	8	auto reset belt speed after 2 minutes	87
7	23	main contro sequences	91
7	34	primary filter blower fan fault	95
7	37	primary filter blower fault	96
7	41	count flush cycle and reset	97
8	0	lit 102 level indication / conversion	98
8	1	low few	99
8	3	few empty pump luckout	100
8	10	few pump low press more then 10 min pump fail alarm	102
8	12	few control (under pic control)	103
8	21	priority management few p1	105
8	22	priority management few p2	106
8	23	priority management few p3	107
10	5	b1 low fire	116
10	6	b2 low fire	117
11	7	auto dialler routine	120
11	9	auto dialler routine	121
11	12	emergency stop beep routine	122
12	5	COPY INFO FROM THERMOCOUPLE CARD FOR MMI AND CONTROL	125

Initialization for Slot 14 - 1746-NI8 - Analog 8 Channel Input - Class 3

0000 First Pass S:1 15

COP
Copy File
Source #N11:20
Dest #O:14.0
Length 12

Initialization for Slot 11 - 1746-NT8 - Analog 8 Ch Thermocouple Input

0001 First Pass S:1 15

COP
Copy File
Source #N11:12
Dest #O:11.0
Length 8

Initialization for Slot 5 - 1746-NI8 - Analog 8 Channel Input - Class 3

0002 First Pass S:1 15

COP
Copy File
Source #N11:0
Dest #O:5.0
Length 12

0003
JSR
Jump To Subroutine
SBR File Number U:3

0004
JSR
Jump To Subroutine
SBR File Number U:4

0005
JSR
Jump To Subroutine
SBR File Number U:5

0006
JSR
Jump To Subroutine
SBR File Number U:6

0007
JSR
Jump To Subroutine
SBR File Number U:7

0008
JSR
Jump To Subroutine
SBR File Number U:8

0009
JSR
Jump To Subroutine
SBR File Number U:9

0010
JSR
Jump To Subroutine
SBR File Number U:10

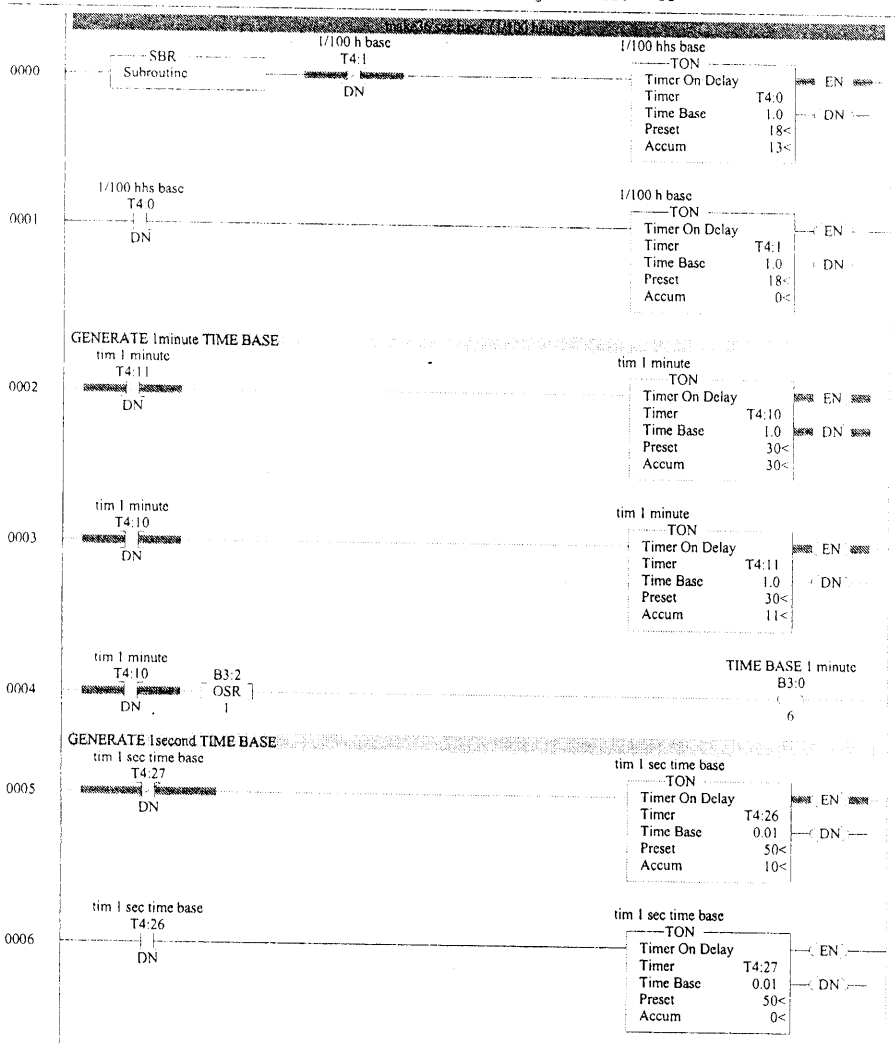
0011
JSR
Jump To Subroutine
SBR File Number U:11

0012
JSR
Jump To Subroutine
SBR File Number U:12

0013 B3:0 3

Overflow Trap S:5 U 0

0014 END


0000
SBR
Subroutine
1/100 h basc
T4:1
DN
1/100 hhs base
TON
Timer On Delay
Timer T4:0
Time Base 1.0
Preset 18<
Accum 13<
EN
DN
0001
1/100 hhs base
T4:0
DN
1/100 h base
TON
Timer On Delay
Timer T4:1
Time Base 1.0
Preset 18<
Accum 0<
EN
DN
GENERATE 1minute TIME BASE
0002
tim 1 minute
T4:11
DN
tim 1 minute
TON
Timer On Delay
Timer T4:10
Time Base 1.0
Preset 30<
Accum 30<
EN
DN
0003
tim 1 minute
T4:10
DN
tim 1 minute
TON
Timer On Delay
Timer T4:11
Time Base 1.0
Preset 30<
Accum 11<
EN
DN
0004
tim 1 minute
T4:10
DN
B3:2
OSR
1
TIME BASE 1 minute
B3:0
6
GENERATE 1second TIME BASE
0005
tim 1 sec time base
T4:27
DN
tim 1 sec time base
TON
Timer On Delay
Timer T4:26
Time Base 0.01
Preset 50<
Accum 10<
EN
DN
0006
tim 1 sec time base
T4:26
DN
tim 1 sec time base
TON
Timer On Delay
Timer T4:27
Time Base 0.01
Preset 50<
Accum 0<
EN
DN


0007
tim 1 sec time base
T4:26
DN
B3:2
OSR
4
1 second time base
valid one scan
B3:0
0

0008

alayays on
B3:0
14

0009

alayays on
B3:0
14

alaways off
B3:0
15

0010

1/100 h basc
T4:1
DN

raw sewer
PI02_RUN?
I:1
1
1746-IB16

ADD
Add
Source A F8:5 699.2209<
Source B 0.01 0.01<
Dest F8:5 699.2209<

PI03_RUN
I:1
13
1746-IB16

ADD
Add
Source A F8:6 304.6961<
Source B 0.01 0.01<
Dest F8:6 304.6961<

PI04_RUN
I:2
1
1746-IB16

ADD
Add
Source A F8:7 361.0611<
Source B 0.01 0.01<
Dest F8:7 361.0611<

sscr 105 run
I:7
1
1746-IA16

ADD
Add
Source A F8:8 459.7974<
Source B 0.01 0.01<
Dest F8:8 459.7974<

sscr 106 run
I:8
1
1746-IA16

ADD
Add
Source A F8:9 442.6807<
Source B 0.01 0.01<
Dest F8:9 442.6807<

FEW PUMP 1 RUN

FEW S_P1RUN
N7:65
2

ADD
Add
Source A F8:10 34.72018<
Source B 0.01 0.01<
Dest F8:10 34.72018<

FEW PUMP 2 RUN

FEW S_P2RUN
N7:65
3

ADD
Add
Source A F8:11 6.700058<
Source B 0.01 0.01<
Dest F8:11 6.700058<

few p3 run

FEW S_P3RUN
N7:65
4

ADD
Add
Source A F8:12 70.7067<
Source B 0.01 0.01<
Dest F8:12 70.7067<

not few hot water recirc p21
I:7
10
1746-IA16

few p21 recirc pump

ADD
Add
Source A F8:15 958.9944<
Source B 0.01 0.01<
Dest F8:15 958.9944<

not hot water booster pump run p20
I:7
11
1746-IA16

few p20 recirc pump

ADD
Add
Source A F8:16 1133.425<
Source B 0.01 0.01<
Dest F8:16 1133.425<

few elect heater running
I:7
12
1746-IA16

few electric heater heating

ADD
Add
Source A F8:17 11.18016<
Source B 0.01 0.01<
Dest F8:17 11.18016<

Build 0.1 2.3 second base

essai de sinus

Time Base

0011

S:4	B3:0
8	OSR 5

ADD

Add	
Source A	N7:3 2<
Source B	1 1<
Dest	N7:3 2<

0012

GRT

Greater Than (A>B)	
Source A	N7:3 2<
Source B	3 3<

B3:0 3

MOV

Move	
Source	0 0<
Dest	N7:3 2<

Build 0.1 2.3 second base

essai de sinus

Time Base

0013

S:4	B3:0
5	OSR 4

SIM FAST RAMP

ADD

Add	
Source A	N7:2 9<
Source B	1 1<
Dest	N7:2 9<

0014

SIM FAST RAMP

GRT

Greater Than (A>B)	
Source A	N7:2 9<
Source B	100 100<

B3:0 3

SIM FAST RAMP

MOV

Move	
Source	0 0<
Dest	N7:2 9<

essai de sinus

0015
Time Base
S:4
0
B3:0
OSR
2
SIM SIN
ADD
Add
Source A N7:0 409<
Source B 1 1<
Dest N7:0 409<

0016
SIM SIN
GRT
Greater Than (A>B)
Source A N7:0 409<
Source B 627 627<
B3:0
3
SIM SIN
MOV
Move
Source 0 0<
Dest N7:0 409<

0017
build sinus
DIV
Divide
Source A N7:0 409<
Source B 100.0 100.0<
Dest F8:0 4.19<

0018
build sinus
SIN
Sine
Source F8:0 4.19<
Dest F8:1 -0.8666297<

0019
SIM SIN OUT
MUL
Multiply
Source A F8:1 -0.8666297<
Source B 1000.0 1000.0<
Dest N7:1 -812<

0020
END

1.5.1

TOTAL TIME CALCULATION

0000
1/100 h base
T4:1
DN
mcc ahu3 sf
not running
I:8
6
1746-IA16
AHU SF TTSN
ADD
Add
Source A F8:13 3024.63<
Source B 0.01 0.01<
Dest F8:13 3024.63<
mcc ahu3 ef
not running
I:8
7
1746-IA16
AHU EF TTSN
ADD
Add
Source A F8:14 3024.63<
Source B 0.01 0.01<
Dest F8:14 3024.63<

COPY INFO FROM THERMOCOUPLE CARD FOR SIMULATION CONTROL

AHU-3 SUPPLY AIR TEM

AHU_S:SAT

0001

MOV
Move
Source I:11.0 208<
Dest N7:80 207<

AHU-3 EXHAUST AIR
temperature

AHU_S:HAT

MOV
Move
Source I:11.1 206<
Dest N7:82 206<

OUTSIDE AIR TEMPERA

OAT_S:TEMP

MOV
Move
Source I:11.2 199<
Dest N7:76 199<

AHU_S:OAT

DIV
Divide
Source A N7:76 199<
Source B 10 10<
Dest N7:85 20<

HEATING SYSTEM CUREN

BOILER_S:TEMP

MOV
Move
Source I:11.3 748<
Dest N7:75 748<

glycol temperatur
give real val
10 = 10c

GLYCOL:DIV

DIV
Divide
Source A N7:75 748<
Source B 10 10<
Dest N7:99 75<

trailler room
tempreature

MOV
Move
Source I:11.5 206<
Dest N7:97 206<

0002

SCP
Scale w/Parameters
Input N7:81 15<
Input Min. -60 -60<
Input Max. 100 100<
Scaled Min. 0 0<
Scaled Max. 16383 16383<
Output N21:2 7680<

0003

SCP
Scale w/Parameters
Input N7:80 207<
Input Min. -600 -600<
Input Max. 1000 1000<
Scaled Min. 0 0<
Scaled Max. 16383 16383<
Output N7:201 8263<

PID 2ND ITEM ON PID MODUL ADRESS BLOC (N21:2) IS THE SET POINT !!!!

0004

pid ahu3

PID

PID	
Control Block	N21:0
Process Variable	N7:201
Control Variable	N7:202
Control Block Length	23
Setup Screen	

0005

AHU_S_MV

SCP

Scale w/Parameters	
Input	N7:202
	0<
Input Min.	0.0
	0.0<
Input Max.	16383.0
	16383.0<
Scaled Min.	0.0
	0.0<
Scaled Max.	100.0
	100.0<
Output	N7:79
	0<

0006

ahu-3 coil control valve

SCP

Scale w/Parameters	
Input	N7:202
	0<
Input Min.	0
	0<
Input Max.	16384
	16384<
Scaled Min.	0
	0<
Scaled Max.	31208
	31208<
Output	O:6.3
	0<

0007

auto

AHU_AUTO

I:7

7

1746-IA16

ahu3 auto

AHU_BIT_STATUS

N7:84

1

15.1

demultuiplex console on air handling unit

0008

high speed

AHU_HIGH_SPEED

I:7

8

1746-IA16

low speed

AHU_LOW_SPEED

I:7

9

1746-IA16

tim ahu on

TOF

Timer Off Delay	
Timer	T4:7
Time Base	0.01
Preset	50<
Accum	50<

EN

DN

0009

tim ahu on

T4:7

DN

ahu3 hand

AHU_BIT_STATUS

N7:84

2

0010

high speed

AHU_HIGH_SPEED

I:7

8

1746-IA16

low speed

AHU_LOW_SPEED

I:7

9

1746-IA16

tim ahu

TON

Timer On Delay	
Timer	T4:8
Time Base	0.01
Preset	50<
Accum	0<

EN

DN

0011

tim ahu

T4:8

DN

osr ahu

B3:1

OSR

4

1- ahu3 high speed

0- ahu low speed

AHU_BIT_STATUS

N7:84

L

3

0012

low speed

AHU_LOW_SPEED

I:7

9

1746-IA16

high speed

AHU_HIGH_SPEED

I:7

8

1746-IA16

ahu ls

TON

Timer On Delay	
Timer	T4:9
Time Base	0.01
Preset	50<
Accum	0<

EN

DN

0013

ahu ls

T4:9

DN

osr ahu

B3:1

OSR

5

1- ahu3 high speed

0- ahu low speed

AHU_BIT_STATUS

N7:84

U

3

0014

high speed

AHU_HIGH_SPEED

I:7

8

1746-IA16

low speed

AHU_LOW_SPEED

I:7

9

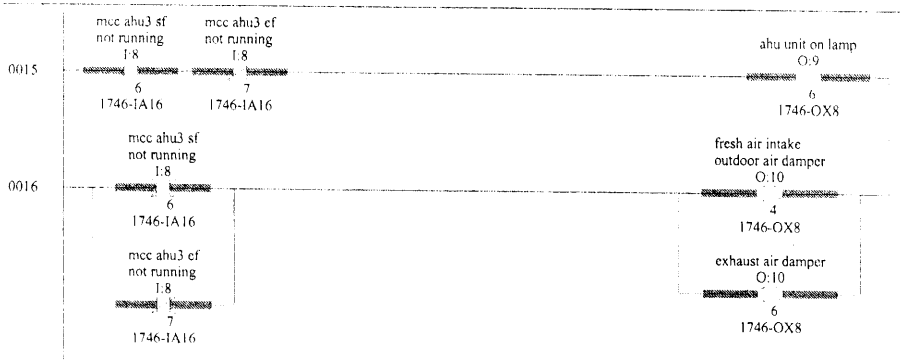
1746-IA16

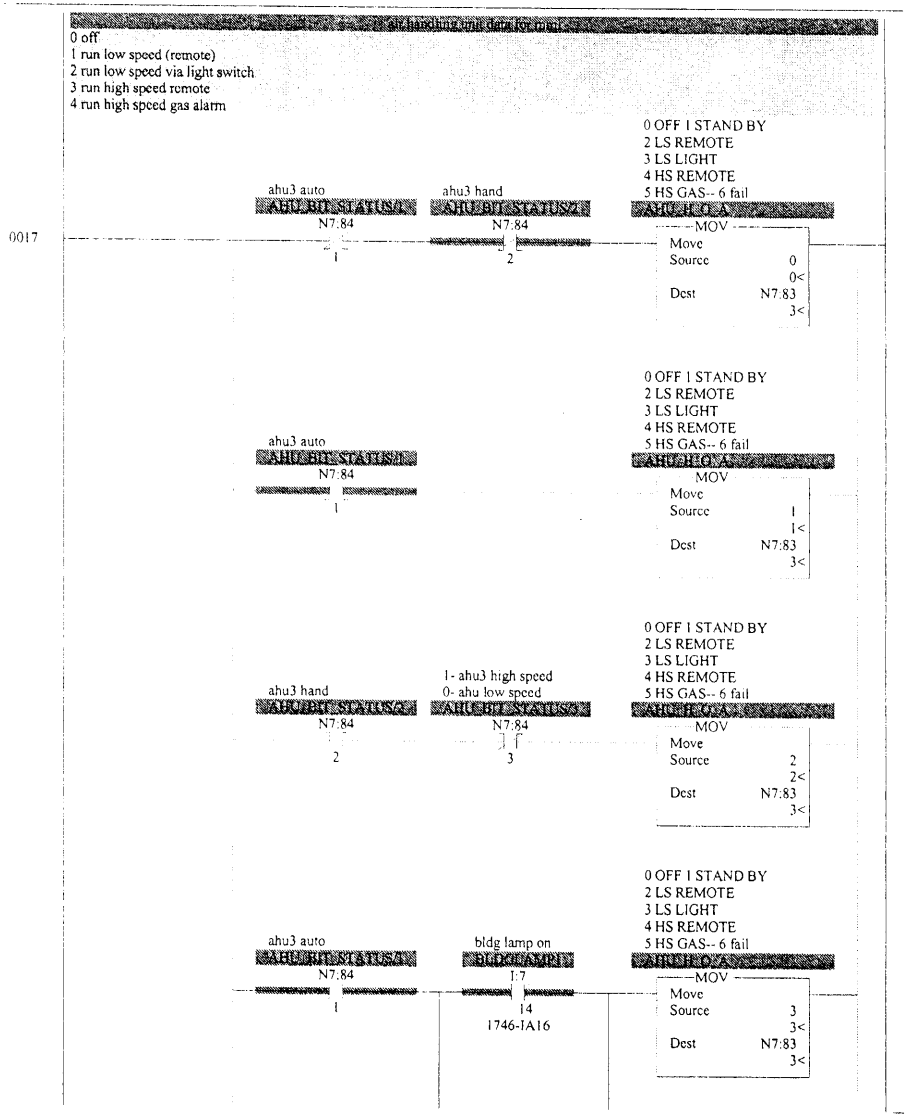
selector remote ahu defrost

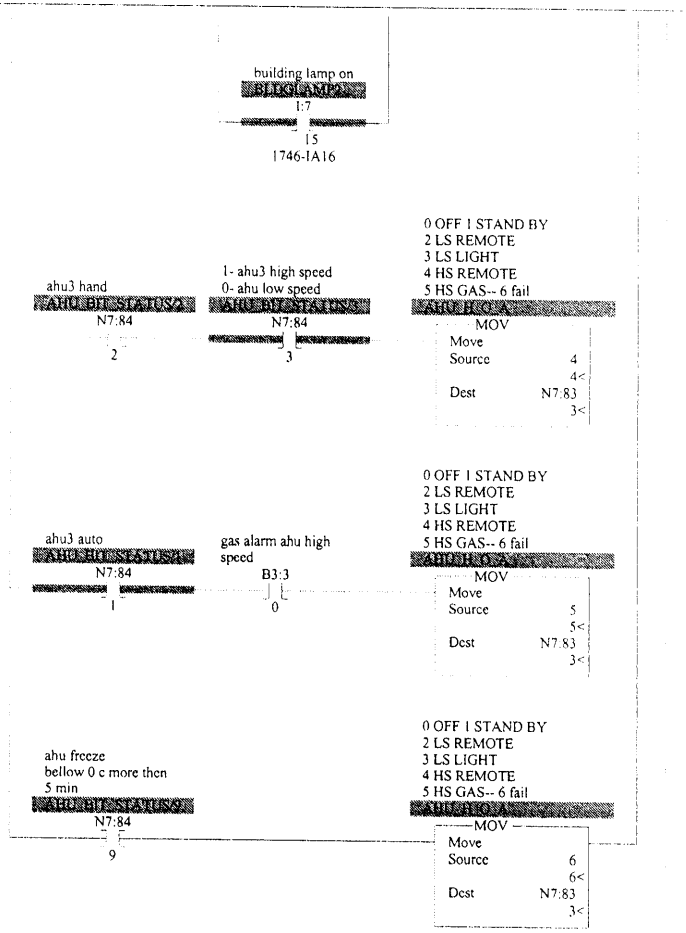
AHU_BIT_STATUS

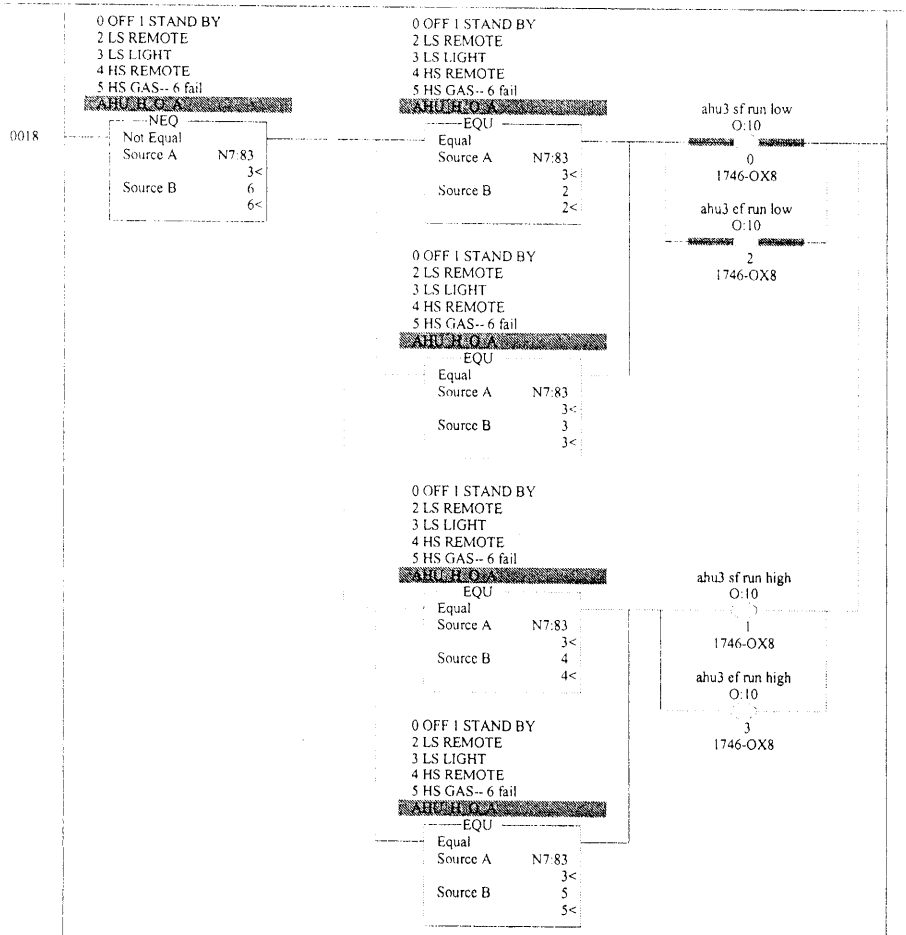
N7:84

8


0015
mcc ahu3 sf
not running
I:8
6
1746-IA16
mcc ahu3 ef
not running
I:8
7
1746-IA16
ahu unit on lamp
O:9
6
1746-OX8
0016
mcc ahu3 sf
not running
I:8
6
1746-IA16
mcc ahu3 ef
not running
I:8
7
1746-IA16
fresh air intake
outdoor air damper
O:10
4
1746-OX8
exhaust air damper
O:10
6
1746-OX8


0 off
1 run low speed (remote)
2 run low speed via light switch
3 run high speed remote
4 run high speed gas alarm
0017
ahu3 auto
AHU_BIT_STATUS_0
N7:84
1
ahu3 hand
AHU_BIT_STATUS_1
N7:84
2
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
MOV
Move
Source 0
0<
Dest N7:83
3<
ahu3 auto
AHU_BIT_STATUS_0
N7:84
1
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
MOV
Move
Source 1
1<
Dest N7:83
3<
ahu3 hand
AHU_BIT_STATUS_1
N7:84
2
1- ahu3 high speed
0- ahu low speed
AHU_BIT_STATUS_3
N7:84
3
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
MOV
Move
Source 2
2<
Dest N7:83
3<
ahu3 auto
AHU_BIT_STATUS_0
N7:84
1
bldg lamp on
BLDG_LAMP_IN
I:7
14
1746-IA16
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
MOV
Move
Source 3
3<
Dest N7:83
3<


building lamp on
BUILDLAMP01
I:7
15
1746-IA16
ahu3 hand
AHU_BIT_STATUS2
N7:84
2
1- ahu3 high speed
0- ahu low speed
AHU_BIT_STATUS1
N7:84
3
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
AHU_H_O_A
MOV
Move
Source 4
4<
Dest N7:83
3<
ahu3 auto
AHU_BIT_STATUS2
N7:84
1
gas alarm ahu high speed
B3:3
0
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
AHU_H_O_A
MOV
Move
Source 5
5<
Dest N7:83
3<
ahu freeze
bellow 0 c more then
5 min
AHU_BIT_STATUS0
N7:84
9
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
AHU_H_O_A
MOV
Move
Source 6
6<
Dest N7:83
3<


0018
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
AHU_H_O_A
NEQ
Not Equal
Source A N7:83
3<
Source B 6
6<
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
AHU_H_O_A
EQU
Equal
Source A N7:83
3<
Source B 2
2<
ahu3 sf run low
O:10
0
1746-OX8
ahu3 ef run low
O:10
2
1746-OX8
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
AHU_H_O_A
EQU
Equal
Source A N7:83
3<
Source B 3
3<
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
AHU_H_O_A
EQU
Equal
Source A N7:83
3<
Source B 4
4<
ahu3 sf run high
O:10
1
1746-OX8
ahu3 ef run high
O:10
3
1746-OX8
0 OFF 1 STAND BY
2 LS REMOTE
3 LS LIGHT
4 HS REMOTE
5 HS GAS-- 6 fail
AHU_H_O_A
EQU
Equal
Source A N7:83
3<
Source B 5
5<

supply fan data for mmf

0019

mcc ahu3 sf not running I:8/6 1746-IA16

0-off 1-low speed 2 high speed AHU_SF_STATUS

MOV Move Source 0 Dest N7:86

mcc ahu3 sf not running I:8/6 1746-IA16 ahu3 sf run low O:10/0 1746-OX8

0-off 1-low speed 2 high speed AHU_SF_STATUS

MOV Move Source 1 Dest N7:86

mcc ahu3 sf not running I:8/6 1746-IA16 ahu3 sf run high O:10/1 1746-OX8

0-off 1-low speed 2 high speed AHU_SF_STATUS

MOV Move Source 2 Dest N7:86

0020

mcc ahu3 sf not running I:8/6 1746-IA16 ahu3 sf run high O:10/1 1746-OX8 ahu3 sf run low O:10/0 1746-OX8

ahu sf fail

TON Timer On Delay Timer T4:13 Time Base 1.0 Preset 1 Accum 0 (EN) (DN)

ahu sf fail T4:13/DN

AHU_S_SF_FAIL N7:84/5

exhaust fan data for mmf

0021

mcc ahu3 ef not running I:8/7 1746-IA16

0-off 1-low speed 2 high speed AHU_EF_STATUS

MOV Move Source 0 Dest N7:87

mcc ahu3 ef not running I:8/7 1746-IA16 ahu3 ef run low O:10/2 1746-OX8

0-off 1-low speed 2 high speed AHU_EF_STATUS

MOV Move Source 1 Dest N7:87

mcc ahu3 ef not running I:8/7 1746-IA16 ahu3 ef run high O:10/3 1746-OX8

0-off 1-low speed 2 high speed AHU_EF_STATUS

MOV Move Source 2 Dest N7:87

0022

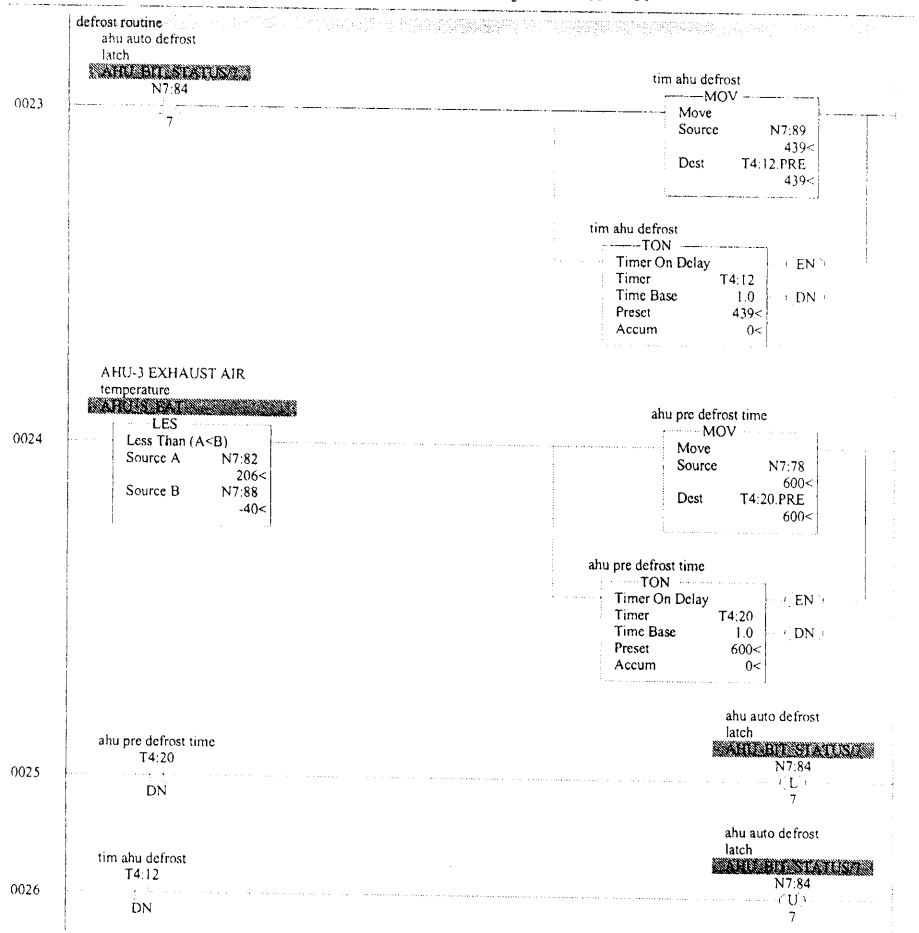
mcc ahu3 ef not running I:8/7 1746-IA16 ahu3 ef run high O:10/3 1746-OX8 ahu3 ef run low O:10/2 1746-OX8

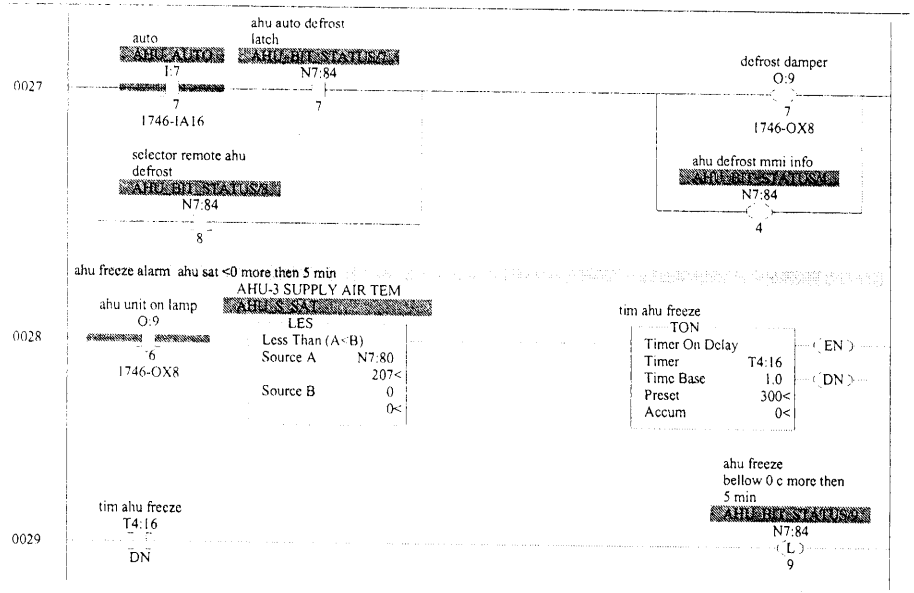
ahu ef fail

TON Timer On Delay Timer T4:14 Time Base 1.0 Preset 1 Accum 0 (EN) (DN)

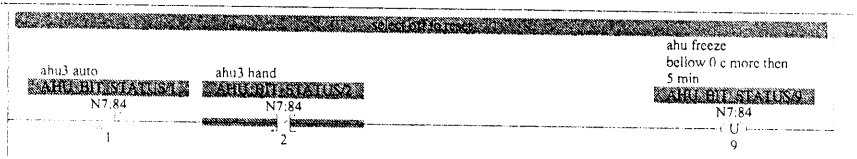
ahu ef fail T4:14/DN

AHU_S_EF_FAIL N7:84/6

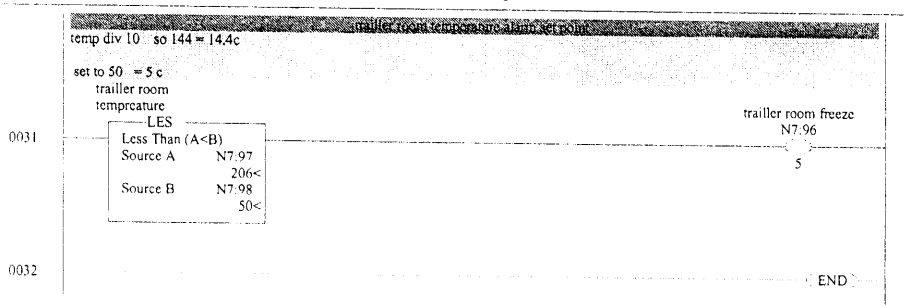

defrost routine
ahu auto defrost latch
AHU_BIT_STATUS/7
N7:84
7
0023
tim ahu defrost
MOV
Move
Source N7:89 439<
Dest T4:12.PRE 439<
tim ahu defrost
TON
Timer On Delay
Timer T4:12
Time Base 1.0
Preset 439<
Accum 0<
EN
DN
AHU-3 EXHAUST AIR temperature
AHU3_EAT
LES
Less Than (A<B)
Source A N7:82 206<
Source B N7:88 -40<
0024
ahu pre defrost time
MOV
Move
Source N7:78 600<
Dest T4:20.PRE 600<
ahu pre defrost time
TON
Timer On Delay
Timer T4:20
Time Base 1.0
Preset 600<
Accum 0<
EN
DN
ahu pre defrost time
T4:20
DN
0025
ahu auto defrost latch
AHU_BIT_STATUS/7
N7:84
L
7
tim ahu defrost
T4:12
DN
0026
ahu auto defrost latch
AHU_BIT_STATUS/7
N7:84
U
7


auto
AHU_AUTO
I:7
7
1746-IA16
ahu auto defrost latch
AHU_BIT_STATUS/7
N7:84
7
0027
defrost damper
O:9
7
1746-OX8
selector remote ahu defrost
AHU_BIT_STATUS/4
N7:84
8
ahu defrost mmi info
AHU_BIT_STATUS/4
N7:84
4
ahu freeze alarm ahu sat <0 more then 5 min
ahu unit on lamp
O:9
6
1746-OX8
AHU-3 SUPPLY AIR TEM
AHU_SAT
LES
Less Than (A<B)
Source A N7:80 207<
Source B 0 0<
0028
tim ahu freeze
TON
Timer On Delay
Timer T4:16
Time Base 1.0
Preset 300<
Accum 0<
EN
DN
ahu freeze bellow 0 c more then 5 min
AHU_BIT_STATUS/5
N7:84
L
9
tim ahu freeze
T4:16
DN
0029

15.1



0030



0031

0032

0000

RAW SEWER LIFT STATION LEVEL IN %

SCP

Scale w/Parameters	
Input	I:5.4
	10589<
Input Min.	4000
	4000<
Input Max.	20000
	20000<
Scaled Min.	0
	0<
Scaled Max.	100
	100<
Output	N7:41
	41<

0001

RAW SEWER LIFT STATI LEVEL IN MM

SCP

Scale w/Parameters	
Input	I:5.4
	10589<
Input Min.	4000
	4000<
Input Max.	20000
	20000<
Scaled Min.	0
	0<
Scaled Max.	3600
	3600<
Output	N7:42
	1483<

0002

lit 101 waste water lift station level indication

LES

Less Than (A<B)	
Source A	I:5.4
	10589<
Source B	3500
	3500<

lit 101 fail
N7:9
4

0003

RAW SEWER FLOW (L/min)

SCP

Scale w/Parameters	
Input	I:5.2
	8377<
Input Min.	4000
	4000<
Input Max.	20000
	20000<
Scaled Min.	0
	0<
Scaled Max.	8000
	8000<
Output	N7:43
	2190<

0004

RAW SEWER FLOW
(L/min)
FIT101.FLOW

LES
Less Than (A<B)
Source A N7:43
2190<
Source B 10
10<

RAW SEWER FLOW
(L/min)
FIT101.FLOW

MOV
Move
Source 0
0<
Dest N7:43
2190<

0005

liter by minutes
div 60 for liter/sec
div 1000 for m3/sec
1 second time base
valid one scan
B3:0
0

total volume m3
temp var

DIV
Divide
Source A N7:43
2190<
Source B 60000.0
60000.0<
Dest F8:20
0.03646667<

total volume
totaliser m3

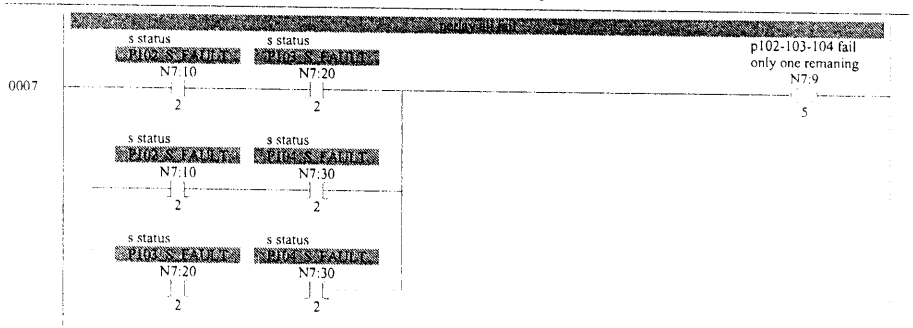
ADD
Add
Source A F8:21
385.7378<
Source B F8:20
0.03646667<
Dest F8:21
385.7378<

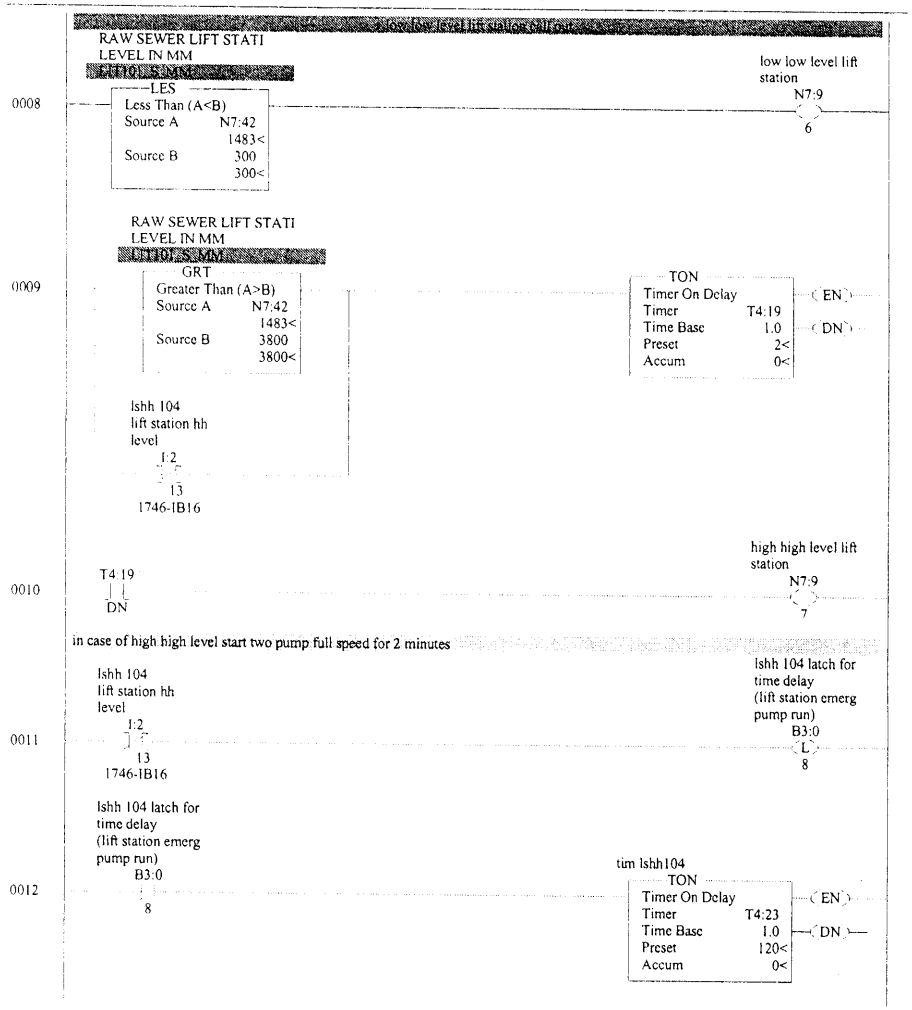
0006

fit total reset
fit102 flow
totaliser reset
N7:9
2

total volume
totaliser m3

MOV
Move
Source 0.0
0.0<
Dest F8:21
385.7378<


0007
s status
P102.S.FAULT
N7:10
2
s status
P103.S.FAULT
N7:20
2
p102-103-104 fail
only one remaning
N7:9
5
s status
P102.S.FAULT
N7:10
2
s status
P104.S.FAULT
N7:30
2
s status
P103.S.FAULT
N7:20
2
s status
P104.S.FAULT
N7:30
2


RAW SEWER LIFT STATI
LEVEL IN MM
LES
Less Than (A<B)
Source A N7:42
1483<
Source B 300
300<
low low level lift
station
N7:9
6
0008
RAW SEWER LIFT STATI
LEVEL IN MM
GRT
Greater Than (A>B)
Source A N7:42
1483<
Source B 3800
3800<
TON
Timer On Delay
Timer T4:19
Time Base 1.0
Preset 2<
Accum 0<
EN
DN
0009
lshh 104
lift station hh
level
I:2
13
1746-IB16
high high level lift
station
N7:9
7
T4:19
DN
0010
in case of high high level start two pump full speed for 2 minutes
lshh 104
lift station hh
level
I:2
13
1746-IB16
lshh 104 latch for
time delay
(lift station emerg
pump run)
B3:0
L
8
0011
lshh 104 latch for
time delay
(lift station emerg
pump run)
B3:0
8
tim lshh104
TON
Timer On Delay
Timer T4:23
Time Base 1.0
Preset 120<
Accum 0<
EN
DN
0012

151

0013

tim lshh104
T4:23
DN

lshh 104 latch for time delay (lift station emerg pump run)
B3:0
U
8

0014

status and resp p102

raw sewer
P102 AUTO
I:1
0
1746-IB16

e-stop p-102
I:7
6
1746-IA16

s status
UNDER PLC CONTROL
P102_S_AUTO
N7:10
0

raw sewer
P102 RUN
I:1
1
1746-IB16

s status
P102_S_RUNNING
N7:10
1

raw sewer
P102 FAULT
I:1
2
1746-IB16

s status
P102_S_FAULT
N7:10
2

s status
P102_S_FAULT
N7:20
2

s status
P104_S_FAULT
N7:30
2

0 LEAD, 1LAG 2 STAND
P102_S_PRIORITY

MOV
Move
Source 2
2<
Dest N7:14
0<

raw sewer
P102 LEAK
I:1
3
1746-IB16

s status
P102_S_LEEK
N7:10
3

0015

a -> action pv->plc
1AUTO 0HAND
[redacted]
N7:10
4

raw waste water
speed set point
analog out 4-20ma
int 6242-31208
[redacted]

SCP
Scale w/Parameters

Input	N7:12 89<
Input Min.	0 0<
Input Max.	100 100<
Scaled Min.	6242 6242<
Scaled Max.	31208 31208<
Output	O:6.0 26964<

a action (set point)
(0-100%)
[redacted]

B3:0
OSR
9

MOV
Move

Source	N7:13 83<
Dest	N7:12 89<

a -> action pv->plc
1AUTO 0HAND
[redacted]
N7:10
4

raw waste water
speed set point
analog out 4-20ma
int 6242-31208
[redacted]

SCP
Scale w/Parameters

Input	N7:13 83<
Input Min.	0 0<
Input Max.	100 100<
Scaled Min.	6242 6242<
Scaled Max.	31208 31208<
Output	O:6.0 26964<

0016

lshh 104 latch for
time delay
(lift station emerg
pump run)
B3:0
8

raw waste water
speed set point
analog out 4-20ma
int 6242-31208
[redacted]

MOV
Move

Source	31208 31208<
Dest	O:6.0 26964<

s status
(CURRENT)(0-100%)
[redacted]

SCP
Scale w/Parameters

Input	I:5.0 17133<
Input Min.	4000 4000<
Input Max.	20000 20000<
Scaled Min.	0 0<
Scaled Max.	100 100<
Output	N7:11 82<

0017

a -> action pv->plc
1AUTO 0HAND
P102:A_0HAND
N7:10
4

a action (set point)
(0-100%)
P102:A_SPEED

GRT
Greater Than (A>B)
Source A N7:12 89<
Source B 30 30<

P102START
O:3
0
1746-OX8

a -> action pv->plc
1AUTO 0HAND
P102:A_0HAND
N7:10
4

E EXPECTED
(AUTO)(0-100%)
P102:E_SPEED

GEQ
Grtr Than or Eql (A>=B)
Source A N7:13 83<
Source B N7:47 75<

s status
(CURRENT)(0-100%)
P102:S_SPEED

GEQ
Grtr Than or Eql (A>=B)
Source A N7:11 82<
Source B 20 20<

lshh 104 latch for
time delay
(lift station emerg
pump run)
B3:0
8

0 LEAD, 1LAG 2 STAND
P102:A_PRIORITY

EQU
Equal
Source A N7:14 0<
Source B 0 0<

0 LEAD, 1LAG 2 STAND
P102:A_PRIORITY

EQU
Equal
Source A N7:14 0<
Source B 1 1<

0018

0 LEAD, 1LAG 2 STAND
P102:A_PRIORITY

MOV
Move
Source N7:14 0<
Dest N7:14 0<

0019

s status s status
1UNDER PLC CONTROL
P103:S_AUTO
N7:20
0

P103:AUTO
I:1
12
1746-IB16

e-stop p103
I:8
4
1746-IA16

s status
P103:S_RUNNING
N7:20
1

P103:RUN
I:1
13
1746-IB16

s status
P103:S_FAULT
N7:20
2

P103:FAULT
I:1
14
1746-IB16

s status
P103:S_FAULT0
N7:10
2

s status
P103:S_FAULT1
N7:30
2

0 LEAD, 1LAG 2 STAND
P103:A_PRIORITY

MOV
Move
Source 2 2<
Dest N7:24 1<

s status
P103:S_PEAK
N7:20
3

P103:PEAK
I:1
15
1746-IB16

0020

a -> action pv->plc
P101A_HAND
N7:20
4

raw waste water
speed set point
SCP[0]

SCP
Scale w/Parameters

Input	N7:22
	0<
Input Min.	0
	0<
Input Max.	100
	100<
Scaled Min.	6242
	6242<
Scaled Max.	31208
	31208<
Output	O:6.2
	6242<

a action (set point)
P101A_SPEED

B3:0
OSR
10

MOV
Move

Source	N7:23
	0<
Dest	N7:22
	0<

a -> action pv->plc
P102A_HAND
N7:20
4

raw waste water
speed set point
SCP[0]

SCP
Scale w/Parameters

Input	N7:23
	0<
Input Min.	0
	0<
Input Max.	100
	100<
Scaled Min.	6242
	6242<
Scaled Max.	31208
	31208<
Output	O:6.2
	6242<

lshh 104 latch for
time delay
(lift station emerg
pump run)
B3:0
8

raw waste water
speed set point
SCP[0]

MOV
Move

Source	31208
	31208<
Dest	O:6.2
	6242<

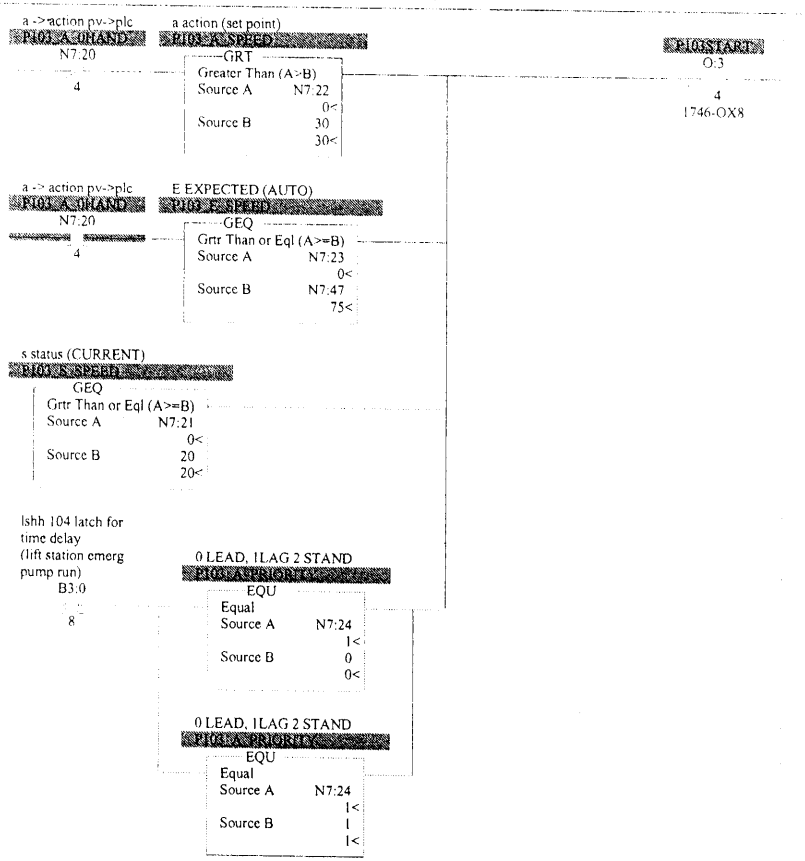
0021

s status (CURRENT)
P102A_SPEED

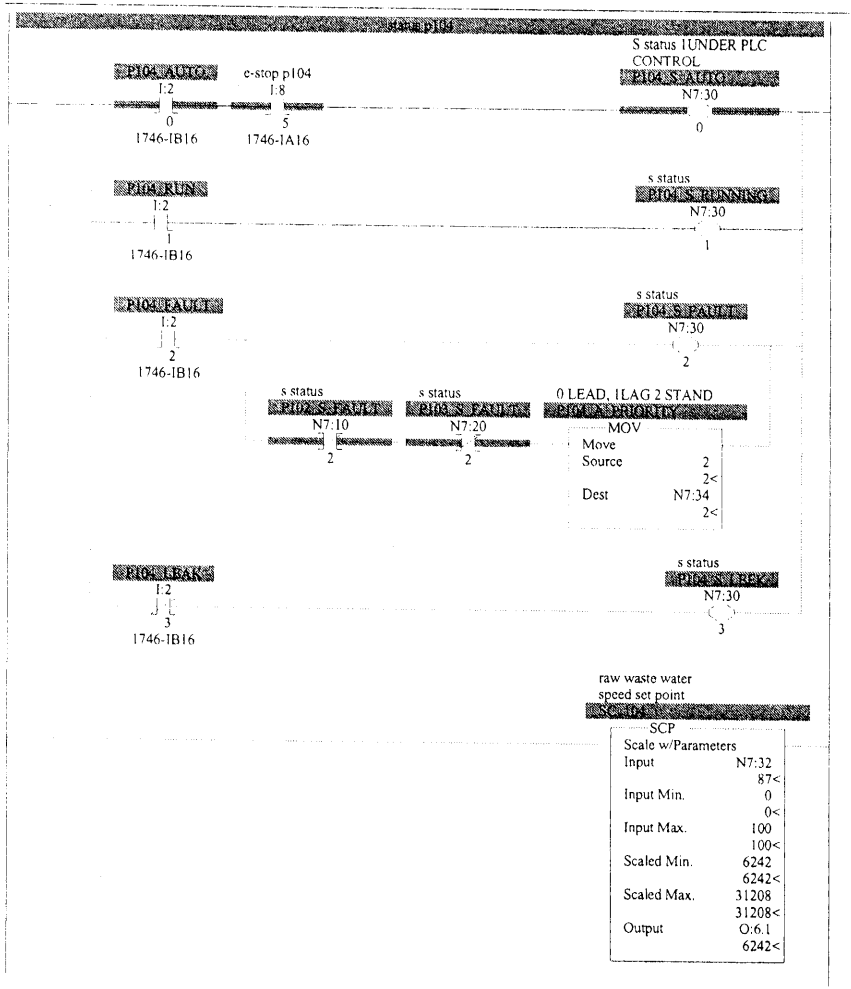
SCP
Scale w/Parameters

Input	I:5.3
	3990<
Input Min.	4000
	4000<
Input Max.	20000
	20000<
Scaled Min.	0
	0<
Scaled Max.	100
	100<
Output	N7:21
	0<

0022

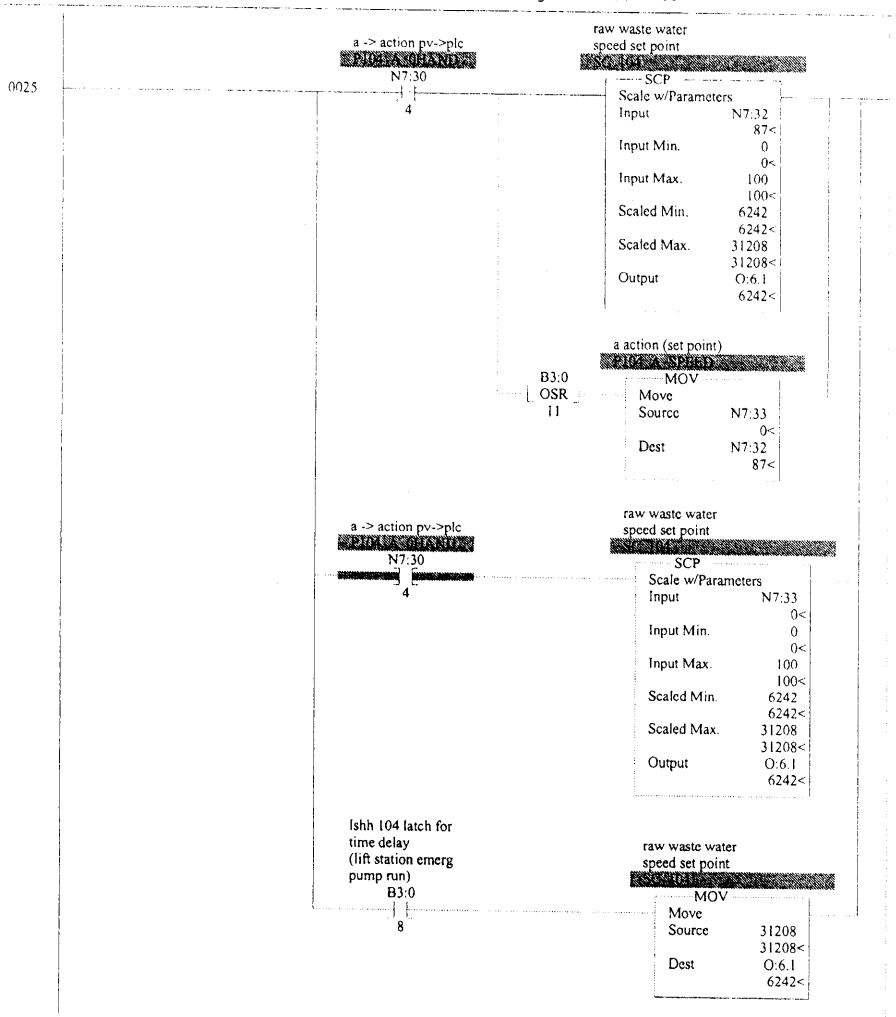


0023



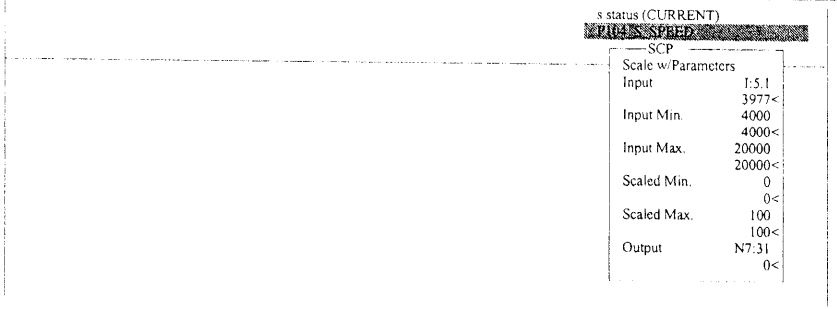
0024

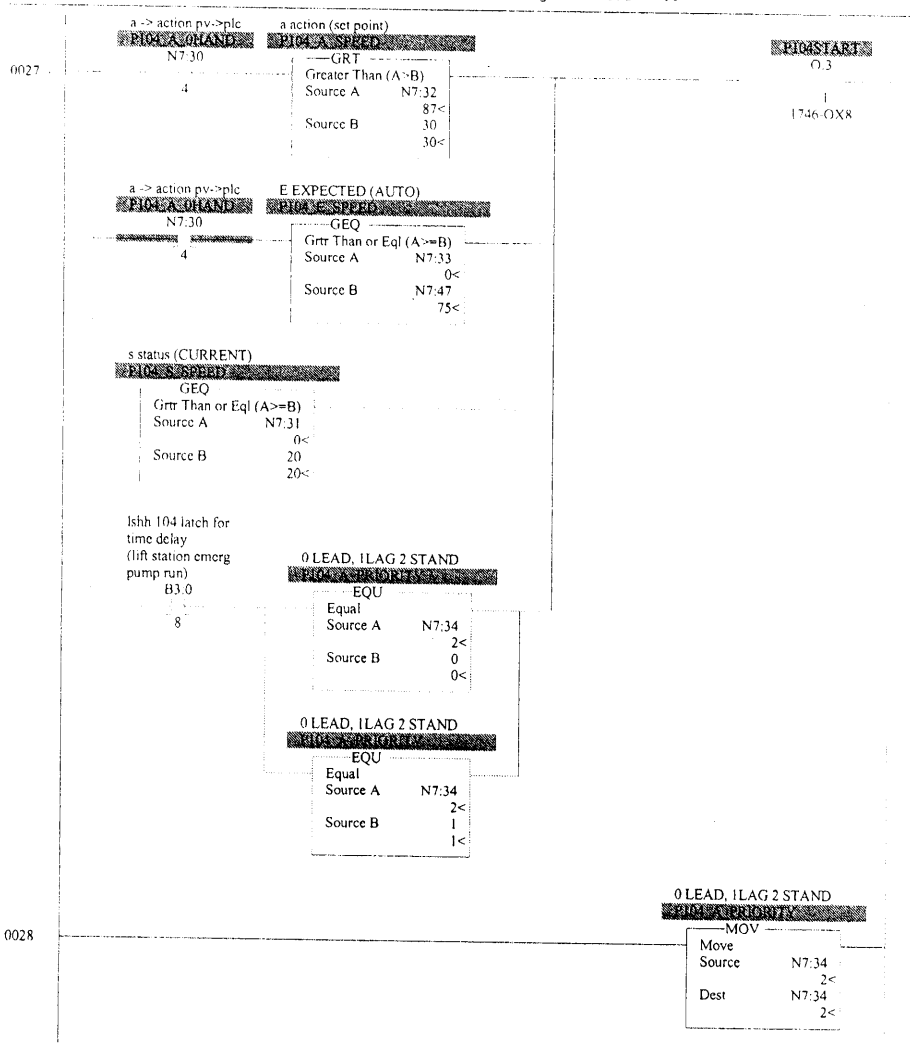
0025

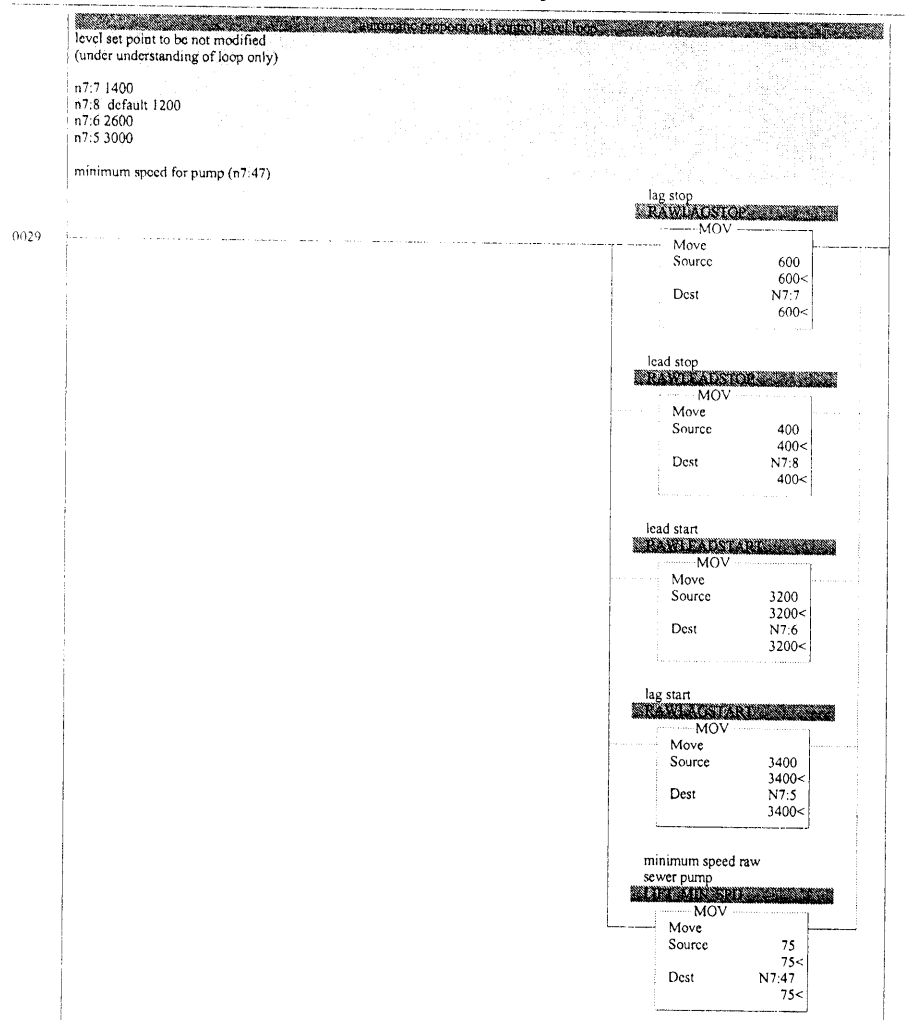


15.1

0026




a -> action pv->plc
P104:A.0HAND
N7:30
4
a action (set point)
P104:A.SPEED
GRT
Greater Than (A>B)
Source A N7:32
87<
Source B 30
30<
PI04START
O:3
1
1746:OX8
a -> action pv->plc
P104:A.0HAND
N7:30
4
E EXPECTED (AUTO)
P104:E.SPEED
GEQ
Grtr Than or Eql (A>=B)
Source A N7:33
0<
Source B N7:47
75<
s status (CURRENT)
P104:S.SPEED
GEQ
Grtr Than or Eql (A>=B)
Source A N7:31
0<
Source B 20
20<
lshh 104 latch for
time delay
(lift station emerg
pump run)
B3:0
8
0 LEAD, 1LAG 2 STAND
P104:A.PRIORITY
EQU
Equal
Source A N7:34
2<
Source B 0
0<
0 LEAD, 1LAG 2 STAND
P104:A.PRIORITY
EQU
Equal
Source A N7:34
2<
Source B 1
1<
0 LEAD, 1LAG 2 STAND
P104:A.PRIORITY
MOV
Move
Source N7:34
2<
Dest N7:34
2<


Automatic proportional control level loop
level set point to be not modified
(under understanding of loop only)
n7:7 1400
n7:8 default 1200
n7:6 2600
n7:5 3000
minimum speed for pump (n7:47)
lag stop
RAW.LAGSTOP
MOV
Move
Source 600
600<
Dest N7:7
600<
lead stop
RAW.LEADSTOP
MOV
Move
Source 400
400<
Dest N7:8
400<
lead start
RAW.LEADSTART
MOV
Move
Source 3200
3200<
Dest N7:6
3200<
lag start
RAW.LAGSTART
MOV
Move
Source 3400
3400<
Dest N7:5
3400<
minimum speed raw
sewer pump
PP1.MIN_SPD
MOV
Move
Source 75
75<
Dest N7:47
75<

set up level control

level control
start polni lead lag , to be defined

0030

RAW SEWER LIFT STATI
LEVEL IN MM

LES
Less Than (A<B)
Source A N7:42 1483<
Source B N7:7 600<

RAWLAGLATCH
N7:9
U
1

RAW SEWER LIFT STATI
LEVEL IN MM

LES
Less Than (A<B)
Source A N7:42 1483<
Source B N7:8 400<

RAWLEADLATCH
N7:9
U
0

RAW SEWER LIFT STATI
LEVEL IN MM

GRT
Greater Than (A>B)
Source A N7:42 1483<
Source B 1400 1400<

RAWLEADLATCH
N7:9
L
0

lshh 104 latch for
time delay
(lift station emerg
pump run)
B3:0
8

RAW SEWER LIFT STATI
LEVEL IN MM

GRT
Greater Than (A>B)
Source A N7:42 1483<
Source B 3200 3200<

RAWLAGLATCH
N7:9
L
1

lshh 104 latch for
time delay
(lift station emerg
pump run)
B3:0
8

0031

math temp raw

SCP
Scale w/Parameters
Input N7:42 1483<
Input Min. N7:7 600<
Input Max. N7:6 3200<
Scaled Min. N7:47 75<
Scaled Max. 100 100<
Output N7:4 83<

math temp raw

GRT
Greater Than (A>B)
Source A N7:4 83<
Source B 100 100<

math temp raw

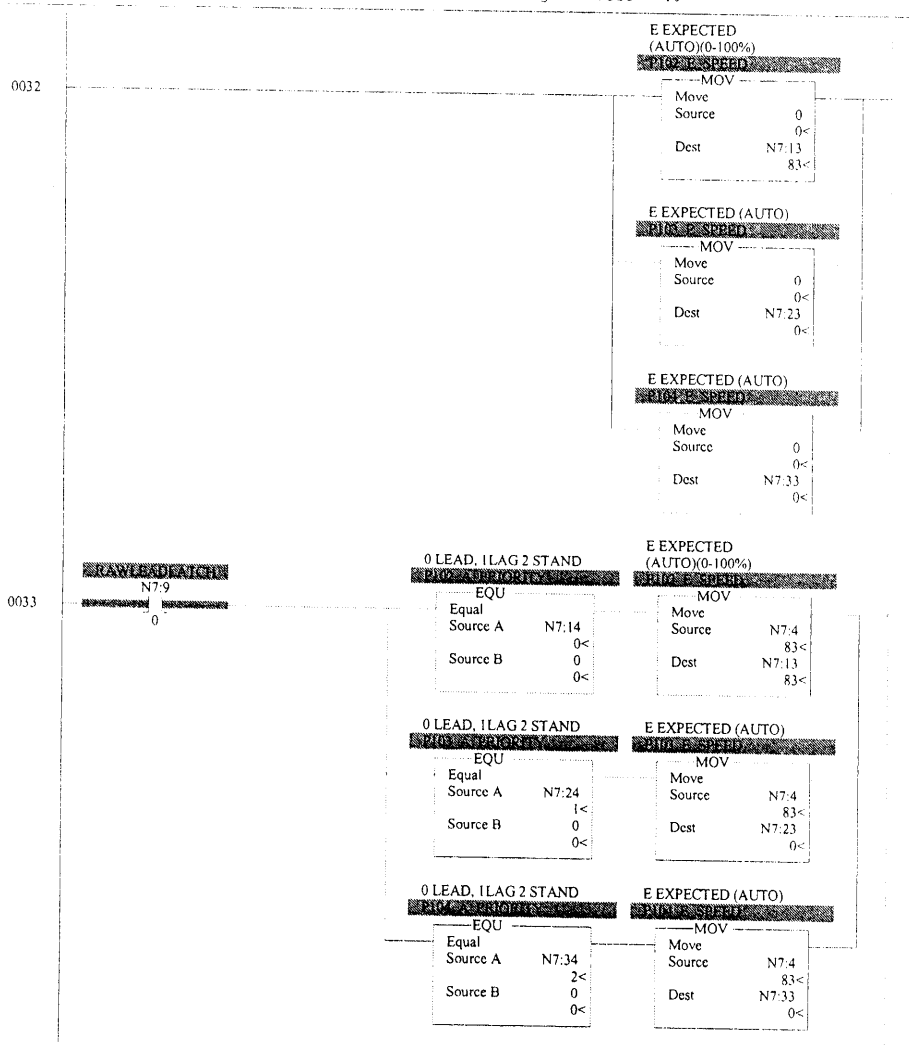
MOV
Move
Source 100 100<
Dest N7:4 83<

math temp raw

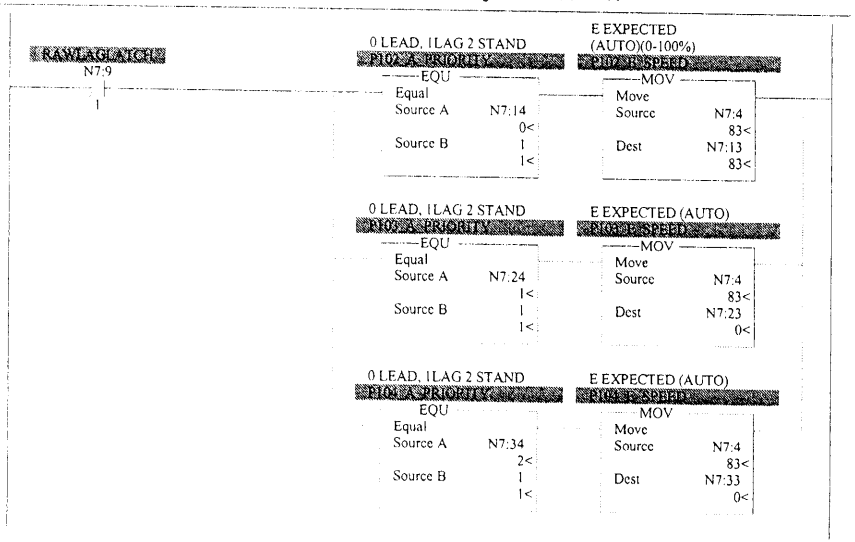
LES
Less Than (A<B)
Source A N7:4 83<
Source B N7:47 75<

math temp raw

MOV
Move
Source N7:47 75<
Dest N7:4 83<


0032
E EXPECTED (AUTO)(0-100%)
P102 E SPEED
MOV
Move
Source 0 0<
Dest N7:13 83<
E EXPECTED (AUTO)
P103 E SPEED
MOV
Move
Source 0 0<
Dest N7:23 0<
E EXPECTED (AUTO)
P104 E SPEED
MOV
Move
Source 0 0<
Dest N7:33 0<
0033
RAWLEADLATCH
N7:9
0
0 LEAD, 1LAG 2 STAND
P102 A PRIORITY
EQU
Equal
Source A N7:14 0<
Source B 0 0<
E EXPECTED (AUTO)(0-100%)
P102 E SPEED
MOV
Move
Source N7:4 83<
Dest N7:13 83<
0 LEAD, 1LAG 2 STAND
P103 A PRIORITY
EQU
Equal
Source A N7:24 1<
Source B 0 0<
E EXPECTED (AUTO)
P103 E SPEED
MOV
Move
Source N7:4 83<
Dest N7:23 0<
0 LEAD, 1LAG 2 STAND
P104 A PRIORITY
EQU
Equal
Source A N7:34 2<
Source B 0 0<
E EXPECTED (AUTO)
P104 E SPEED
MOV
Move
Source N7:4 83<
Dest N7:33 0<

151


0034
RAWLAGLATCH
N7:9
1
0 LEAD, 1LAG 2 STAND
P102 A PRIORITY
EQU
Equal
Source A N7:14 0<
Source B 1 1<
E EXPECTED (AUTO)(0-100%)
P102 E SPEED
MOV
Move
Source N7:4 83<
Dest N7:13 83<
0 LEAD, 1LAG 2 STAND
P103 A PRIORITY
EQU
Equal
Source A N7:24 1<
Source B 1 1<
E EXPECTED (AUTO)
P103 E SPEED
MOV
Move
Source N7:4 83<
Dest N7:23 0<
0 LEAD, 1LAG 2 STAND
P104 A PRIORITY
EQU
Equal
Source A N7:34 2<
Source B 1 1<
E EXPECTED (AUTO)
P104 E SPEED
MOV
Move
Source N7:4 83<
Dest N7:33 0<

RESET MINICAS ALARM

0035

LEEK ALARM RESET
MINICASRESET
N7:10
5

MINICAS LEEK ALARM RESET
LEAKALARMSRESET
O:3
7
1746-OX8

priority management B102

0036

0 LEAD, 1LAG 2 STAND
B102:A PRIORITY
NEQ
Not Equal
Source A N7:14 0<
Source B N7:240 0<

COPY N7:14 ... N7:240
MOV
Move
Source N7:14 0<
Dest N7:240 0<

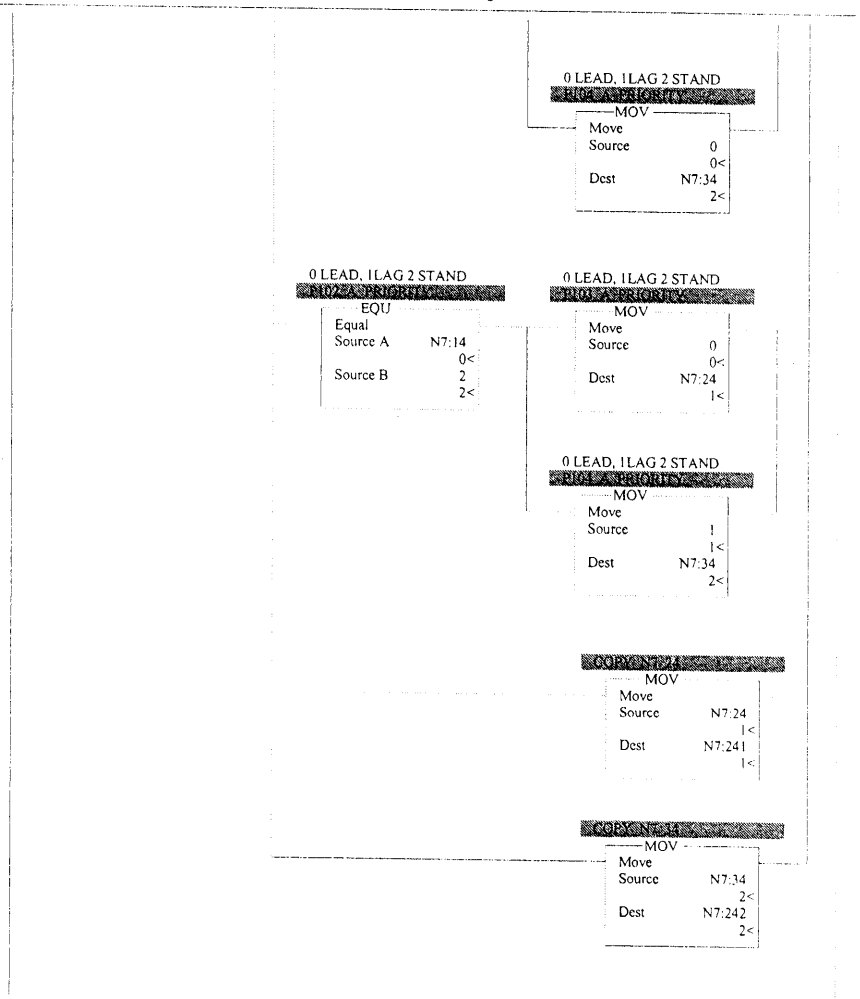
0 LEAD, 1LAG 2 STAND
B102:A PRIORITY
EQU
Equal
Source A N7:14 0<
Source B 0 0<

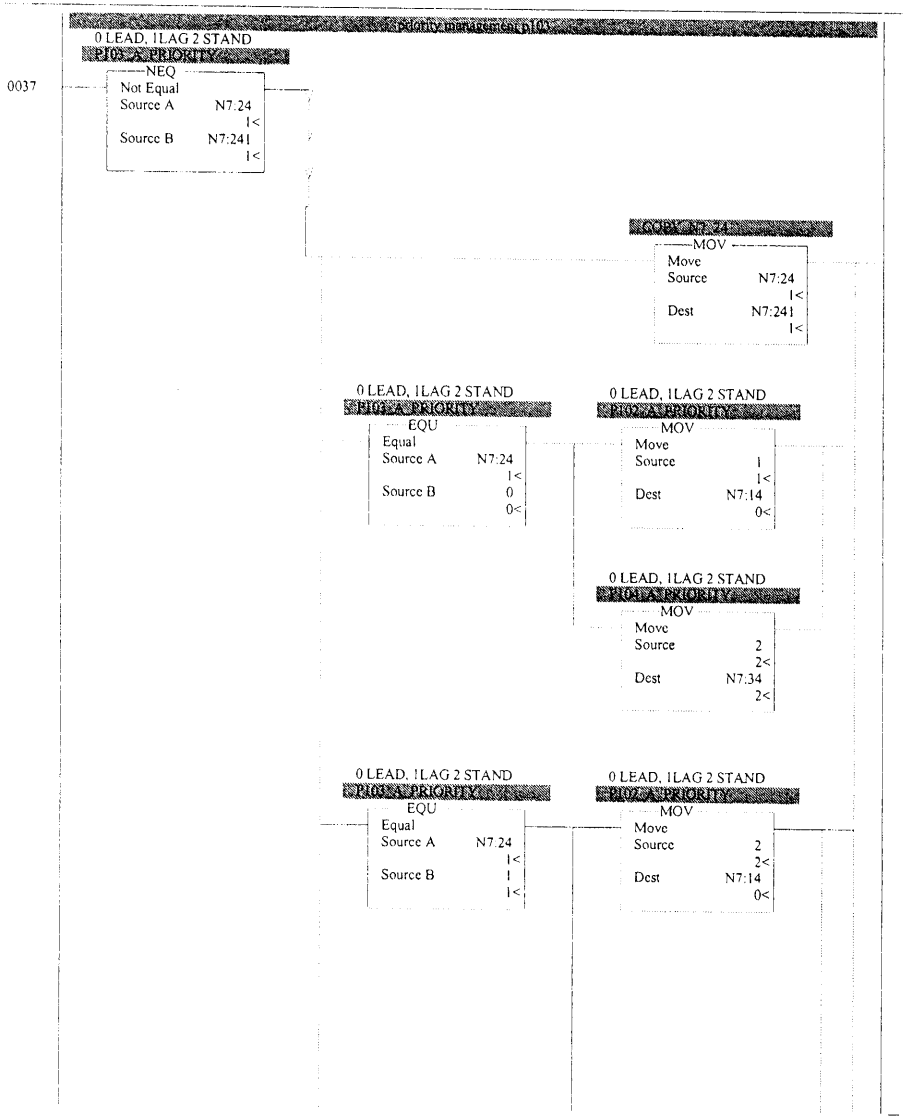
0 LEAD, 1LAG 2 STAND
B103:A PRIORITY
MOV
Move
Source 1 1<
Dest N7:24 1<

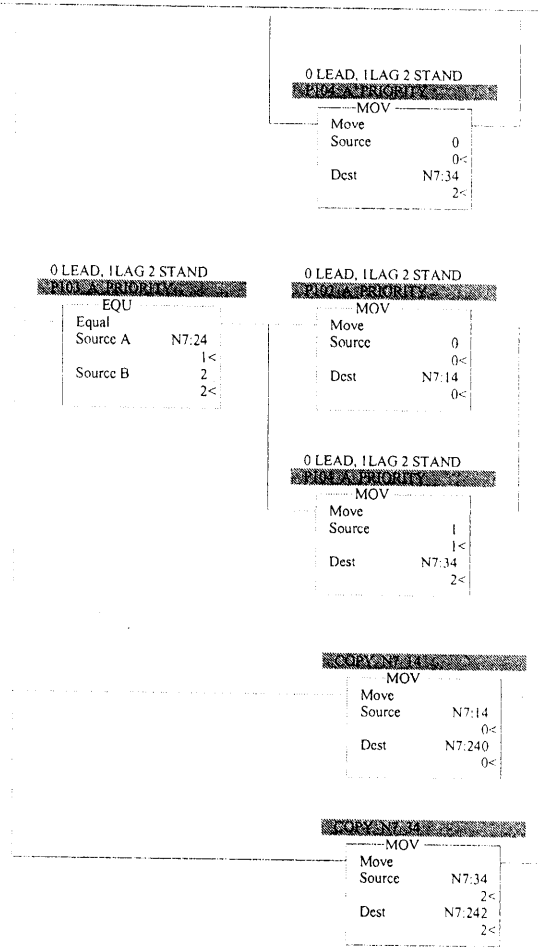
0 LEAD, 1LAG 2 STAND
B104:A PRIORITY
MOV
Move
Source 2 2<
Dest N7:34 2<

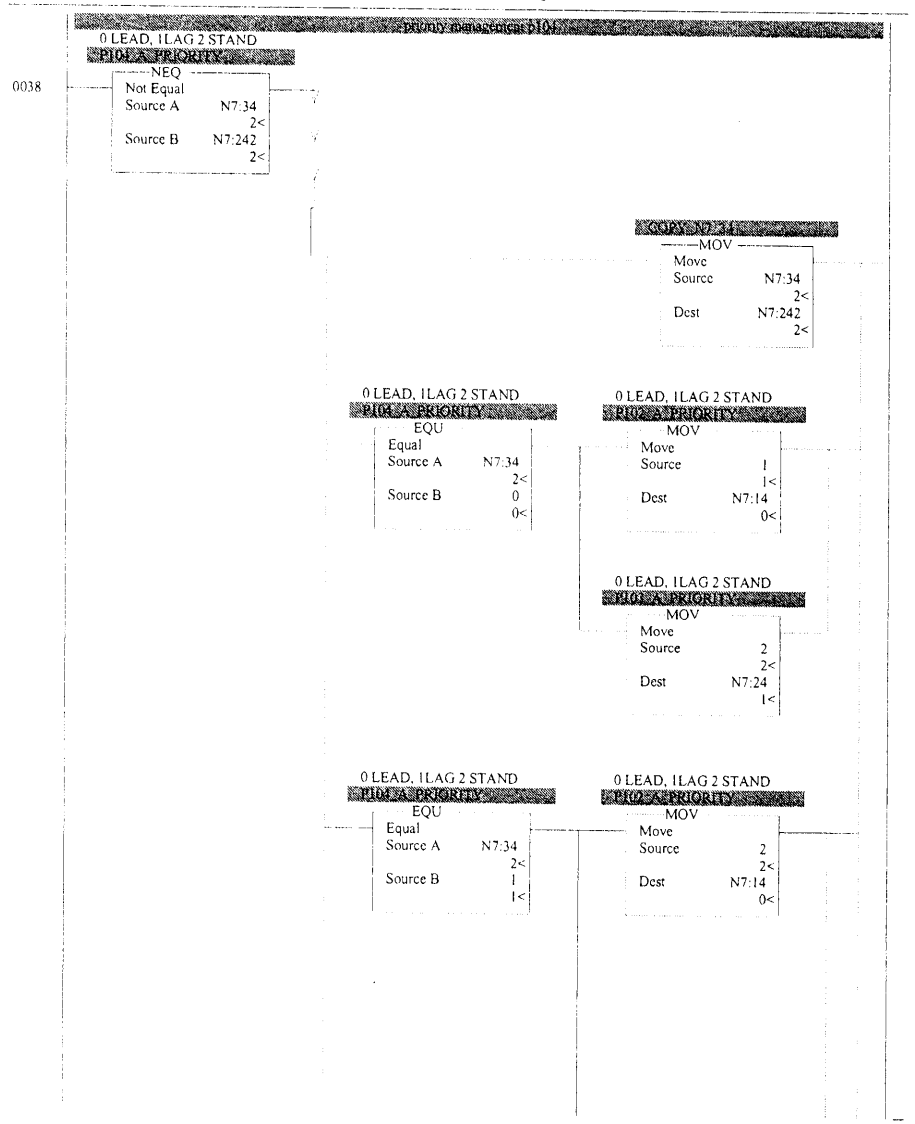
0 LEAD, 1LAG 2 STAND
B102:A PRIORITY
EQU
Equal
Source A N7:14 0<
Source B 1 1<

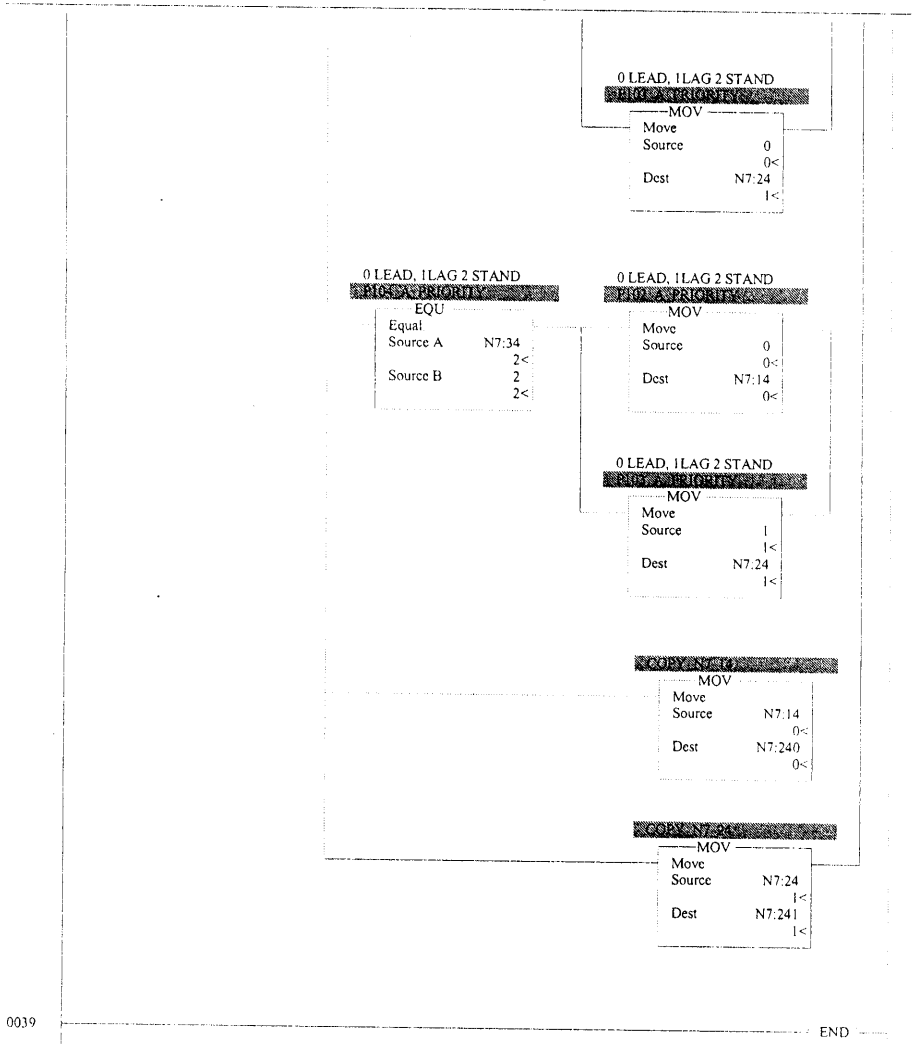
0 LEAD, 1LAG 2 STAND
B103:A PRIORITY
MOV
Move
Source 2 2<
Dest N7:24 1<

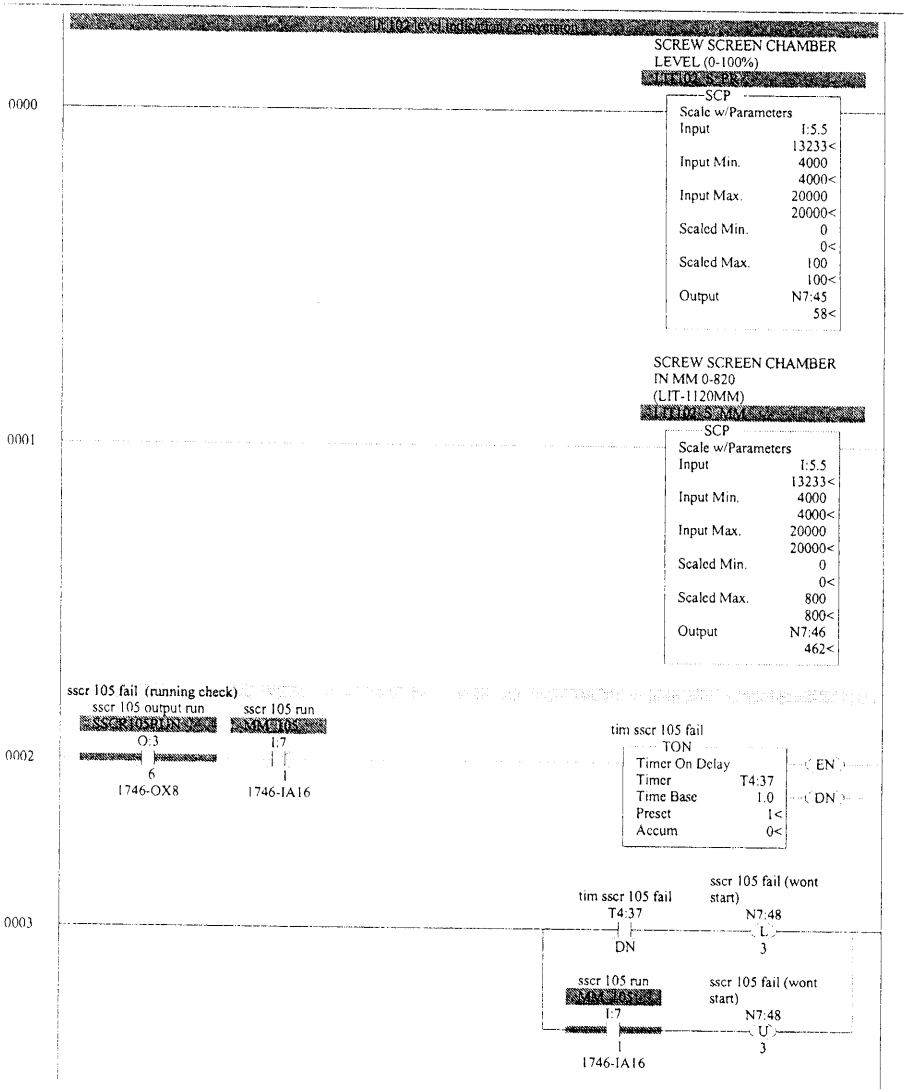

0 LEAD, 1LAG 2 STAND
MOV
Move
Source 0
Dest N7:34
0 LEAD, 1LAG 2 STAND
EQU
Equal
Source A N7:14
Source B 2
0 LEAD, 1LAG 2 STAND
MOV
Move
Source 0
Dest N7:24
0 LEAD, 1LAG 2 STAND
MOV
Move
Source 1
Dest N7:34
MOV
Move
Source N7:24
Dest N7:241
MOV
Move
Source N7:34
Dest N7:242

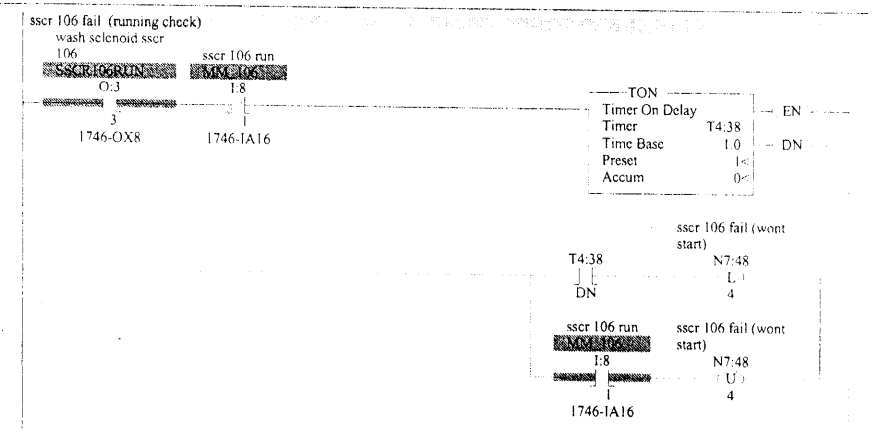

0 LEAD, 1LAG 2 STAND
0037
NEQ
Not Equal
Source A N7:24
Source B N7:241
MOV
Move
Source N7:24
Dest N7:241
0 LEAD, 1LAG 2 STAND
EQU
Equal
Source A N7:24
Source B 0
0 LEAD, 1LAG 2 STAND
MOV
Move
Source 1
Dest N7:14
0 LEAD, 1LAG 2 STAND
MOV
Move
Source 2
Dest N7:34
0 LEAD, 1LAG 2 STAND
EQU
Equal
Source A N7:24
Source B 1
0 LEAD, 1LAG 2 STAND
MOV
Move
Source 2
Dest N7:14

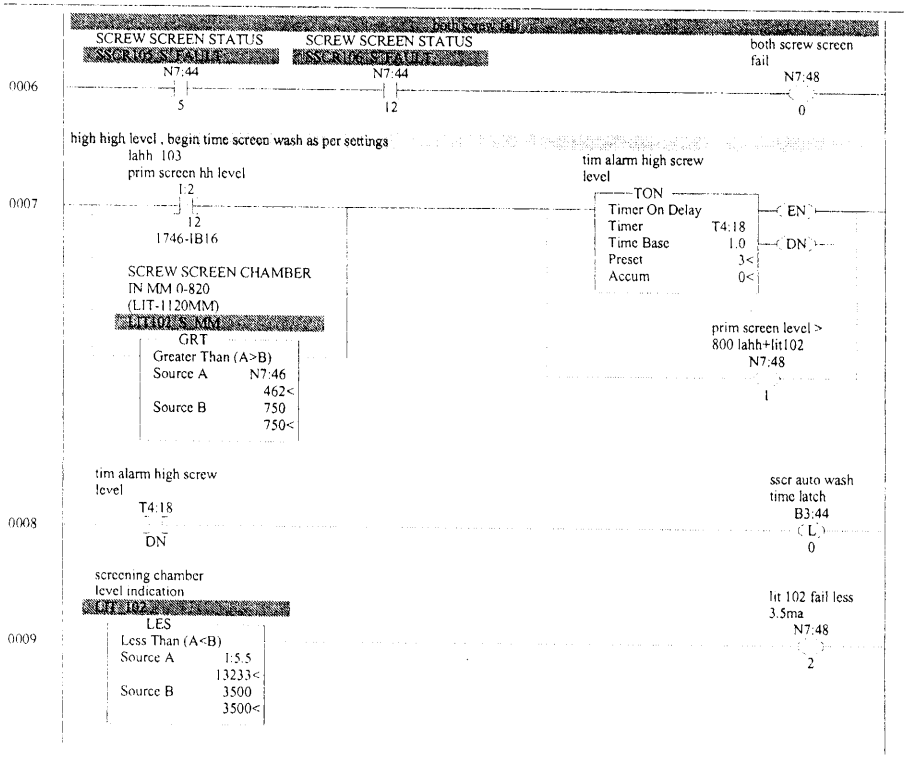

0 LEAD, 1LAG 2 STAND
P104 A PRIORITY
MOV
Move
Source 0
Dest N7:34
0 LEAD, 1LAG 2 STAND
P103 A PRIORITY
EQU
Equal
Source A N7:24
Source B 2
0 LEAD, 1LAG 2 STAND
P102 A PRIORITY
MOV
Move
Source 0
Dest N7:14
0 LEAD, 1LAG 2 STAND
P104 A PRIORITY
MOV
Move
Source 1
Dest N7:34
COPY N7:14
MOV
Move
Source N7:14
Dest N7:240
COPY N7:34
MOV
Move
Source N7:34
Dest N7:242


0038
0 LEAD, 1LAG 2 STAND
P104 A PRIORITY
NEQ
Not Equal
Source A N7:34
Source B N7:242
COPY N7:34
MOV
Move
Source N7:34
Dest N7:242
0 LEAD, 1LAG 2 STAND
P104 A PRIORITY
EQU
Equal
Source A N7:34
Source B 0
0 LEAD, 1LAG 2 STAND
P102 A PRIORITY
MOV
Move
Source 1
Dest N7:14
0 LEAD, 1LAG 2 STAND
P103 A PRIORITY
MOV
Move
Source 2
Dest N7:24
0 LEAD, 1LAG 2 STAND
P104 A PRIORITY
EQU
Equal
Source A N7:34
Source B 1
0 LEAD, 1LAG 2 STAND
P102 A PRIORITY
MOV
Move
Source 2
Dest N7:14

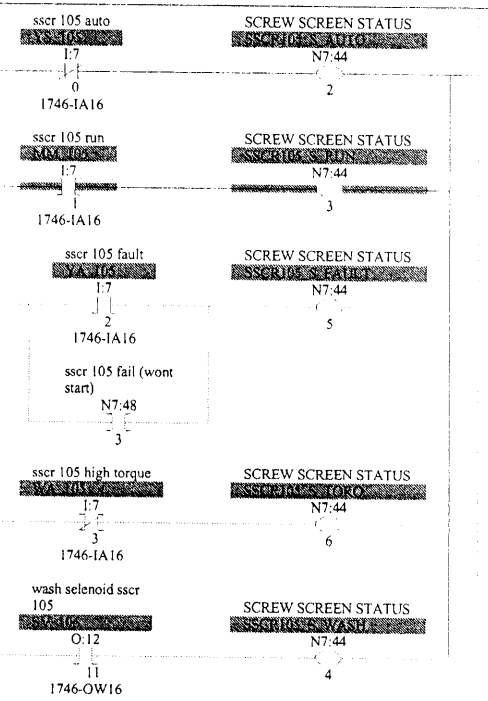

0 LEAD, 1LAG 2 STAND
MOV
Move
Source 0
Dest N7:24
0 LEAD, 1LAG 2 STAND
EQU
Equal
Source A N7:34
Source B 2
0 LEAD, 1LAG 2 STAND
MOV
Move
Source 0
Dest N7:14
0 LEAD, 1LAG 2 STAND
MOV
Move
Source 1
Dest N7:24
MOV
Move
Source N7:14
Dest N7:240
MOV
Move
Source N7:24
Dest N7:241
0039
END


SCREW SCREEN CHAMBER
LEVEL (0-100%)
SCP
Scale w/Parameters
Input I:5.5
13233<
Input Min. 4000
4000<
Input Max. 20000
20000<
Scaled Min. 0
0<
Scaled Max. 100
100<
Output N7:45
58<
0000
SCREW SCREEN CHAMBER
IN MM 0-820
(LIT-1120MM)
SCP
Scale w/Parameters
Input I:5.5
13233<
Input Min. 4000
4000<
Input Max. 20000
20000<
Scaled Min. 0
0<
Scaled Max. 800
800<
Output N7:46
462<
0001
sscr 105 fail (running check)
sscr 105 output run
O:3
6
1746-OX8
sscr 105 run
I:7
1
1746-IA16
0002
tim sscr 105 fail
TON
Timer On Delay
Timer T4:37
Time Base 1.0
Preset 1<
Accum 0<
EN
DN
0003
tim sscr 105 fail
T4:37
DN
sscr 105 fail (wont start)
N7:48
L
3
sscr 105 run
I:7
1
1746-IA16
sscr 105 fail (wont start)
N7:48
U
3

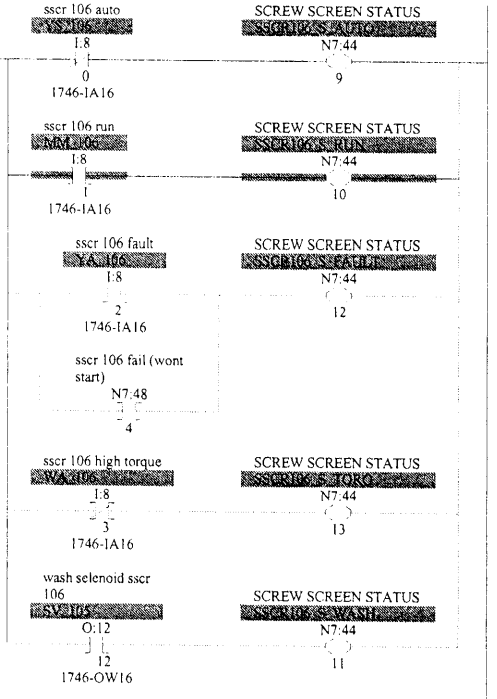

sscr 106 fail (running check)
wash selenoid sscr 106
SSCR106RUN
O:3
3
1746-OX8
sscr 106 run
MM106T
I:8
1746-IA16
0004
TON
Timer On Delay
Timer T4:38
Time Base 1.0
Preset 1<
Accum 0<
EN
DN
0005
T4:38
DN
sscr 106 fail (wont start)
N7:48
L
4
sscr 106 run
MM106T
I:8
1746-IA16
sscr 106 fail (wont start)
N7:48
U
4

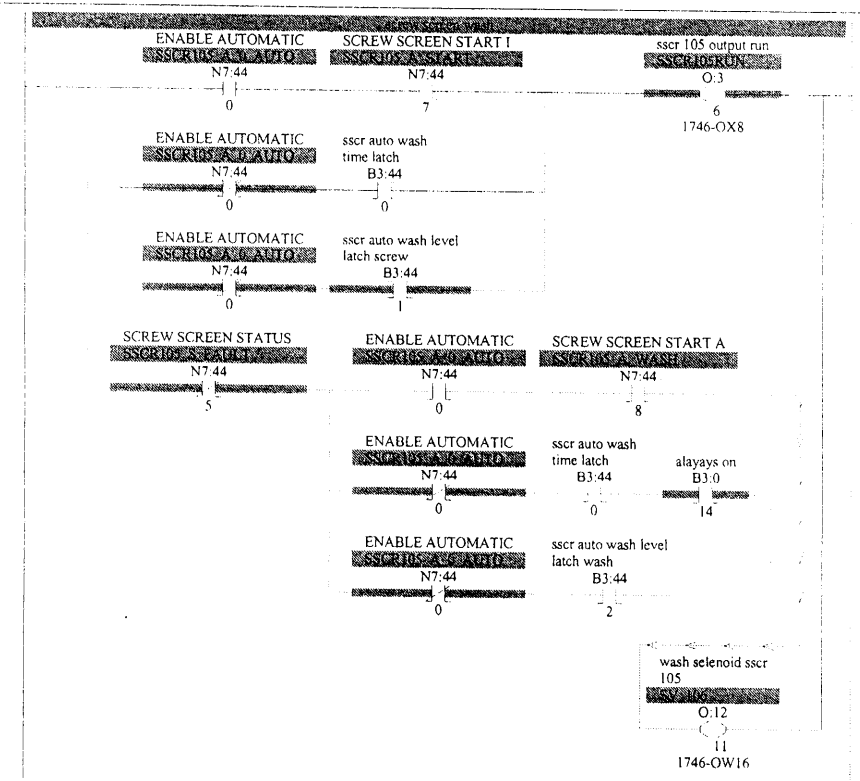

both screw fail
SCREW SCREEN STATUS
SSCR103FAULT
N7:44
5
SCREW SCREEN STATUS
SSCR106FAULT
N7:44
12
both screw screen fail
N7:48
0
0006
high high level , begin time screen wash as per settings
lahh 103
prim screen hh level
I:2
12
1746-IB16
0007
tim alarm high screw level
TON
Timer On Delay
Timer T4:18
Time Base 1.0
Preset 3<
Accum 0<
EN
DN
SCREW SCREEN CHAMBER
IN MM 0-820
(LIT-1120MM)
LIT102SMM
GRT
Greater Than (A>B)
Source A N7:46
462<
Source B 750
750<
prim screen level > 800 lahh+lit102
N7:48
1
tim alarm high screw level
T4:18
DN
0008
sscr auto wash time latch
B3:44
L
0
screening chamber level indication
LIT102SMM
LES
Less Than (A<B)
Source A I:5.5
13233<
Source B 3500
3500<
0009
lit 102 fail less 3.5ma
N7:48
2

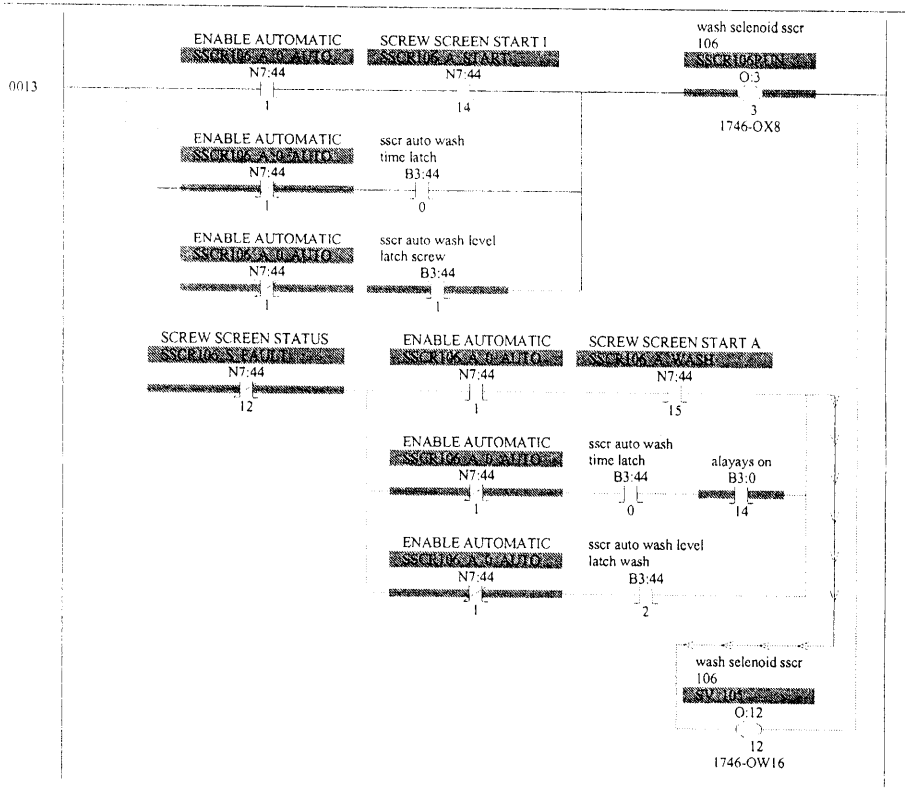
0010

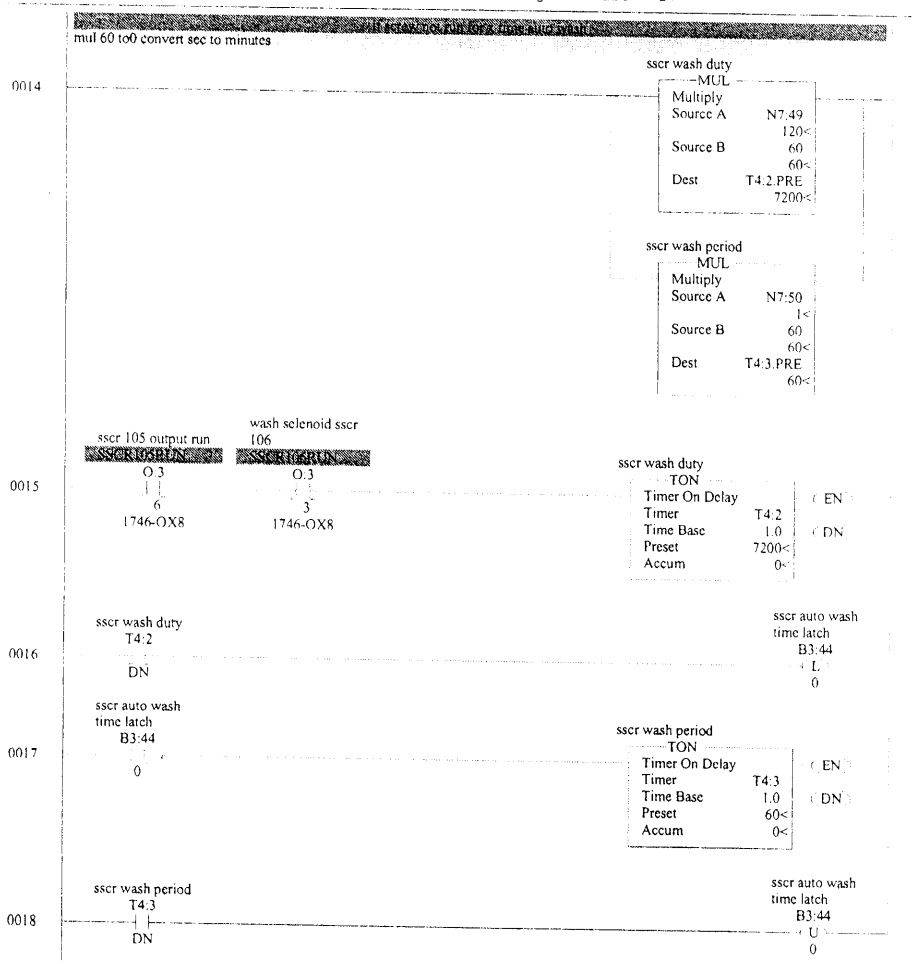

sscr 105 auto
I:7
0
1746-IA16
SCREW SCREEN STATUS
N7:44
2
sscr 105 run
I:7
1
1746-IA16
SCREW SCREEN STATUS
N7:44
3
sscr 105 fault
I:7
2
1746-IA16
SCREW SCREEN STATUS
N7:44
5
sscr 105 fail (wont start)
N7:48
3
sscr 105 high torque
I:7
3
1746-IA16
SCREW SCREEN STATUS
N7:44
6
wash selenoid sscr 105
O:12
11
1746-OW16
SCREW SCREEN STATUS
N7:44
4

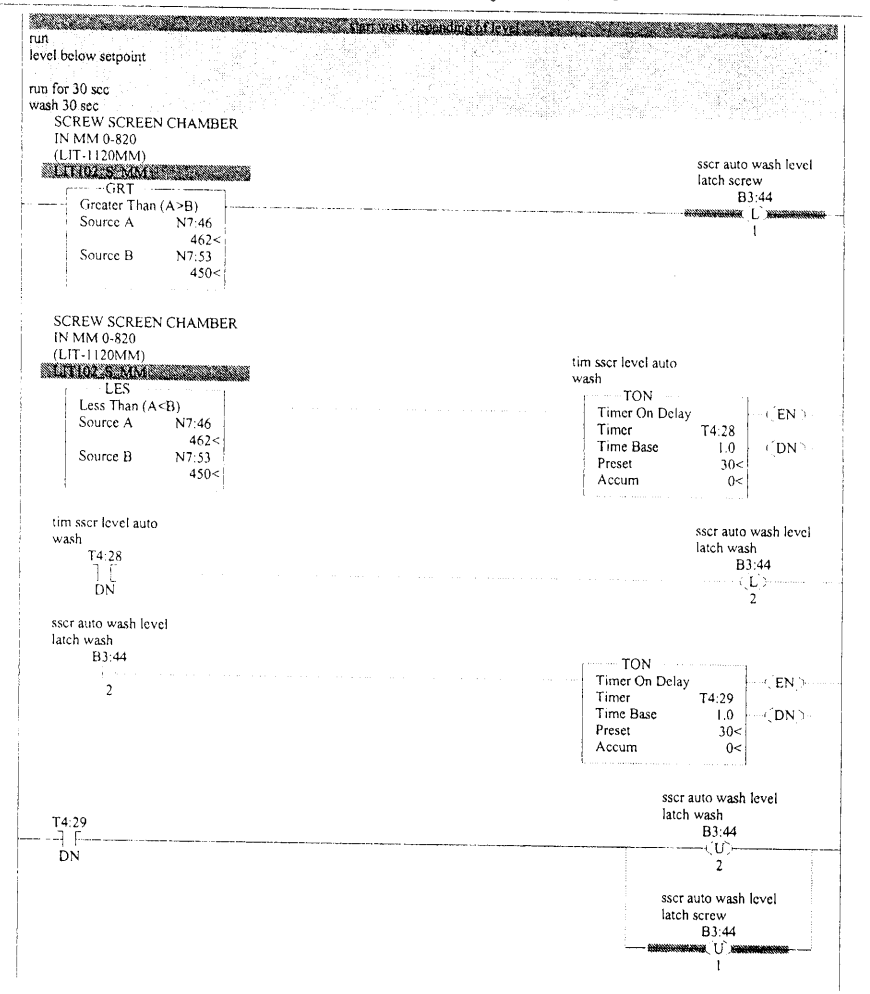
0011


sscr 106 auto
I:8
0
1746-IA16
SCREW SCREEN STATUS
N7:44
9
sscr 106 run
I:8
1
1746-IA16
SCREW SCREEN STATUS
N7:44
10
sscr 106 fault
I:8
2
1746-IA16
SCREW SCREEN STATUS
N7:44
12
sscr 106 fail (wont start)
N7:48
4
sscr 106 high torque
I:8
3
1746-IA16
SCREW SCREEN STATUS
N7:44
13
wash selenoid sscr 106
O:12
12
1746-OW16
SCREW SCREEN STATUS
N7:44
11


0012
ENABLE AUTOMATIC
SSCR105:A:0.AUTO
N7:44
0
SCREW SCREEN START I
SSCR105:A:START
N7:44
7
sscr 105 output run
SSCR105RUN
O:3
6
1746-OX8
ENABLE AUTOMATIC
SSCR105:A:0.AUTO
N7:44
0
sscr auto wash
time latch
B3:44
0
ENABLE AUTOMATIC
SSCR105:A:0.AUTO
N7:44
0
sscr auto wash level
latch screw
B3:44
1
SCREW SCREEN STATUS
SSCR105:S:FAULT
N7:44
5
ENABLE AUTOMATIC
SSCR105:A:0.AUTO
N7:44
0
SCREW SCREEN START A
SSCR105:A:WASH
N7:44
8
ENABLE AUTOMATIC
SSCR105:A:0.AUTO
N7:44
0
sscr auto wash
time latch
B3:44
0
alayays on
B3:0
14
ENABLE AUTOMATIC
SSCR105:A:0.AUTO
N7:44
0
sscr auto wash level
latch wash
B3:44
2
wash selenoid sscr
105
SV105
O:12
11
1746-OW16

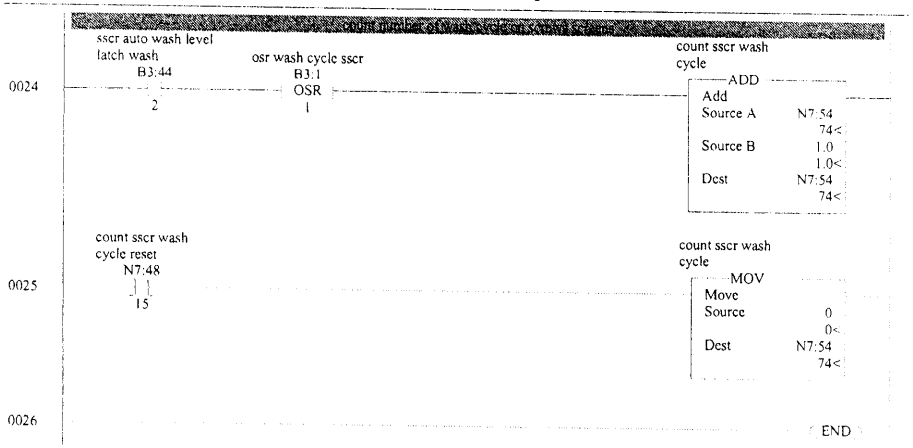

0013
ENABLE AUTOMATIC
SSCR106:A:0.AUTO
N7:44
1
SCREW SCREEN START I
SSCR106:A:START
N7:44
14
wash selenoid sscr
106
SSCR106RUN
O:3
3
1746-OX8
ENABLE AUTOMATIC
SSCR106:A:0.AUTO
N7:44
1
sscr auto wash
time latch
B3:44
0
ENABLE AUTOMATIC
SSCR106:A:0.AUTO
N7:44
1
sscr auto wash level
latch screw
B3:44
1
SCREW SCREEN STATUS
SSCR106:S:FAULT
N7:44
12
ENABLE AUTOMATIC
SSCR106:A:0.AUTO
N7:44
1
SCREW SCREEN START A
SSCR106:A:WASH
N7:44
15
ENABLE AUTOMATIC
SSCR106:A:0.AUTO
N7:44
1
sscr auto wash
time latch
B3:44
0
alayays on
B3:0
14
ENABLE AUTOMATIC
SSCR106:A:0.AUTO
N7:44
1
sscr auto wash level
latch wash
B3:44
2
wash selenoid sscr
106
SV106
O:12
12
1746-OW16


mul 60 to0 convert sec to minutes
0014
sscr wash duty
MUL
Multiply
Source A N7:49 120<
Source B 60 60<
Dest T4:2.PRE 7200<
sscr wash period
MUL
Multiply
Source A N7:50 1<
Source B 60 60<
Dest T4:3.PRE 60<
0015
sscr 105 output run
SSCR105RUN
O:3 6 1746-OX8
wash selenoid sscr 106
SSCR106RUN
O:3 3 1746-OX8
sscr wash duty
TON
Timer On Delay
Timer T4:2
Time Base 1.0
Preset 7200<
Accum 0<
EN
DN
0016
sscr wash duty T4:2 DN
sscr auto wash time latch B3:44 L 0
0017
sscr auto wash time latch B3:44 0
sscr wash period
TON
Timer On Delay
Timer T4:3
Time Base 1.0
Preset 60<
Accum 0<
EN
DN
0018
sscr wash period T4:3 DN
sscr auto wash time latch B3:44 U 0

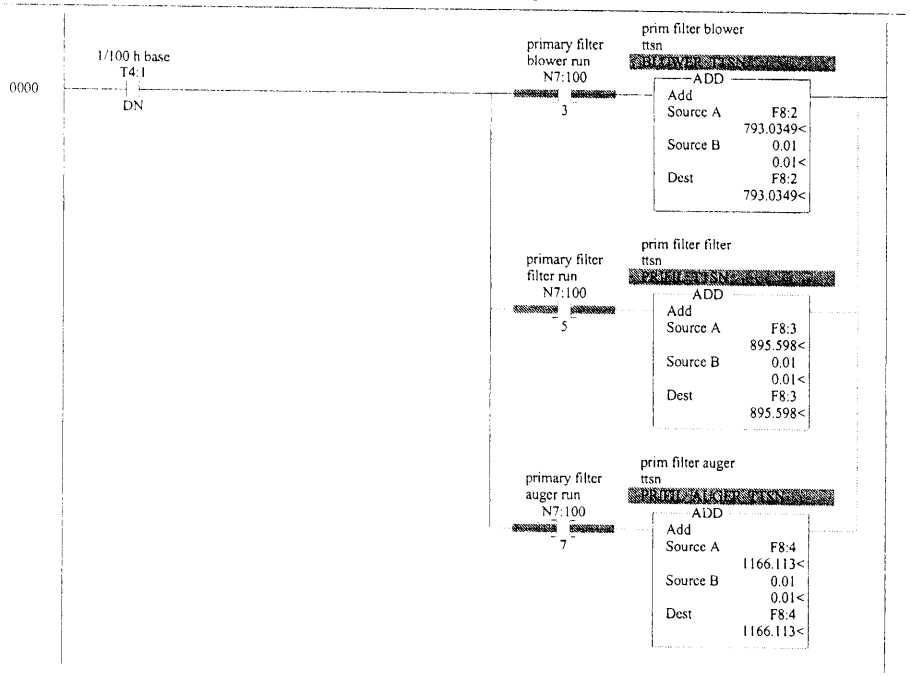

start wash depending of level
run
level below setpoint
run for 30 sec
wash 30 sec
0019
SCREW SCREEN CHAMBER
IN MM 0-820
(LIT-1120MM)
LIT102:S:MM
GRT
Greater Than (A>B)
Source A N7:46 462<
Source B N7:53 450<
sscr auto wash level latch screw B3:44 L 1
0020
SCREW SCREEN CHAMBER
IN MM 0-820
(LIT-1120MM)
LIT102:S:MM
LES
Less Than (A<B)
Source A N7:46 462<
Source B N7:53 450<
tim sscr level auto wash
TON
Timer On Delay
Timer T4:28
Time Base 1.0
Preset 30<
Accum 0<
EN
DN
0021
tim sscr level auto wash T4:28 DN
sscr auto wash level latch wash B3:44 L 2
0022
sscr auto wash level latch wash B3:44 2
TON
Timer On Delay
Timer T4:29
Time Base 1.0
Preset 30<
Accum 0<
EN
DN
0023
T4:29 DN
sscr auto wash level latch wash B3:44 U 2
sscr auto wash level latch screw B3:44 U 1

15.1

LAD 6 - PRIM SCRN --- Total Rungs in File = 27



LAD 7 - PRIM FILT --- Total Rungs in File = 44



4 - 20ma 0.1 bar full scale
0mm - 1020mm

set to -200 == 820 to permit -200 mm re3ading (lower level)

minimum speed on speed scale

0001

Time Base
S:4
6

osr few
B3:0
OSR
1

primary filter level
scaled in mm
PRIM_LVL.MM

SCP
Scale w/Parameters

Input	I:5.7
	10362<
Input Min.	4000
	4000<
Input Max.	20000
	20000<
Scaled Min.	-200
	-200<
Scaled Max.	820
	820<
Output	N7:114
	206<

calculated belt
speed function of
level via mmi
PRIM_CALCSPD

SCP
Scale w/Parameters

Input	N7:114
	206<
Input Min.	N7:107
	200<
Input Max.	300
	300<
Scaled Min.	10
	10<
Scaled Max.	100
	100<
Output	N7:113
	15<

0002

calculated belt
speed function of
level via mmi
PRIM_CALCSPD

GRT
Greater Than (A>B)

Source A	N7:113
	15<
Source B	100
	100<

calculated belt
speed function of
level via mmi
PRIM_CALCSPD

MOV
Move

Source	100
	100<
Dest	N7:113
	15<

calculated belt
speed function of
level via mmi
PRIM_CALCSPD

LES
Less Than (A<B)

Source A	N7:113
	15<
Source B	10
	10<

calculated belt
speed function of
level via mmi
PRIM_CALCSPD

MOV
Move

Source	10
	10<
Dest	N7:113
	15<

sensor 0- 1 bar 14.7 psi 1000 Mb

0003

Time Base S:4 6

osr prifil B3:0 OSR 13

primary filter compressor pressure PRIFIL_COMP_PRESS

SCP

Scale w/Parameters	
Input	I:14.0
	10438<
Input Min.	4000
	4000<
Input Max.	20000
	20000<
Scaled Min.	0
	0<
Scaled Max.	1000
	1000<
Output	N7:115
	402<

begin belt at n7:107
speed proportional n7:107 - 300 mm
stop belt at n7:108 for stop

0004

primary filter level scaled in mm PRIFIL_LEVEL_MM

GRT
Greater Than (A>B)

Source A	N7:114
	206<
Source B	N7:107
	200<

prim filter belt ask run PRIFIL_BELTRUN N7:100 L 15

dewatering conveyor enable N7:100 L 2

primary filter level scaled in mm PRIFIL_LEVEL_MM

LES
Less Than (A<B)

Source A	N7:114
	206<
Source B	N7:108
	70<

prim filter belt ask run PRIFIL_BELTRUN N7:100 U 15

0005

lshh 104 latch for time delay (lift station emerg pump run) B3:0 8

start high speed flush PRIFIL_HSFLUSH N7:101 L 10

start wash depending of level ex: 300mm

0006

wash cycle start level PRIFIL_WASHREQLVL

GRT
Greater Than (A>B)

Source A	N7:109
	305<
Source B	N7:114
	206<

osr prim fil B3:2 OSR 3

start high speed flush PRIFIL_HSFLUSH N7:101 L 10

0007

filter belt speed
0 hand
1 auto (auto reset 2 minutes)
N7:101
0

primary filter belt speed
SCP
Scale w/Parameters
Input N7:112 61<
Input Min. 0 0<
Input Max. 100 100<
Scaled Min. 6242 6242<
Scaled Max. 31208 31208<
Output O:13.0 8988<

manual belt set speed from mmi
B3:0
OSR
12

MOV
Move
Source N7:113 15<
Dest N7:112 61<

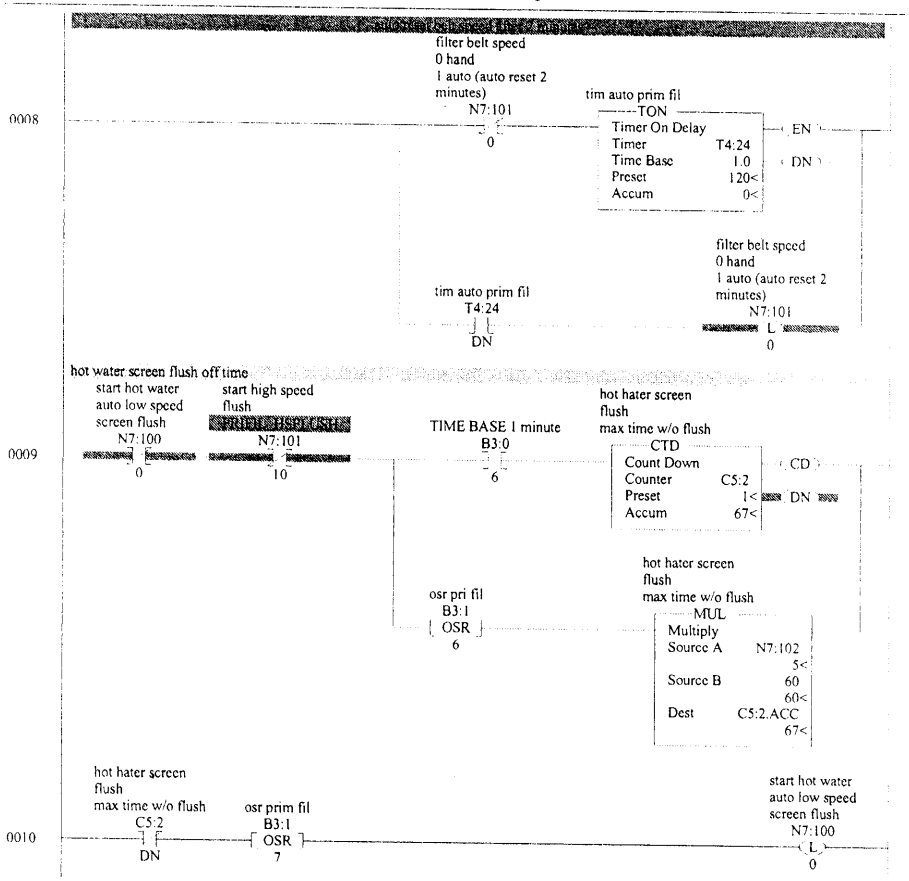
filter belt speed
0 hand
1 auto (auto reset 2 minutes)
N7:101
0

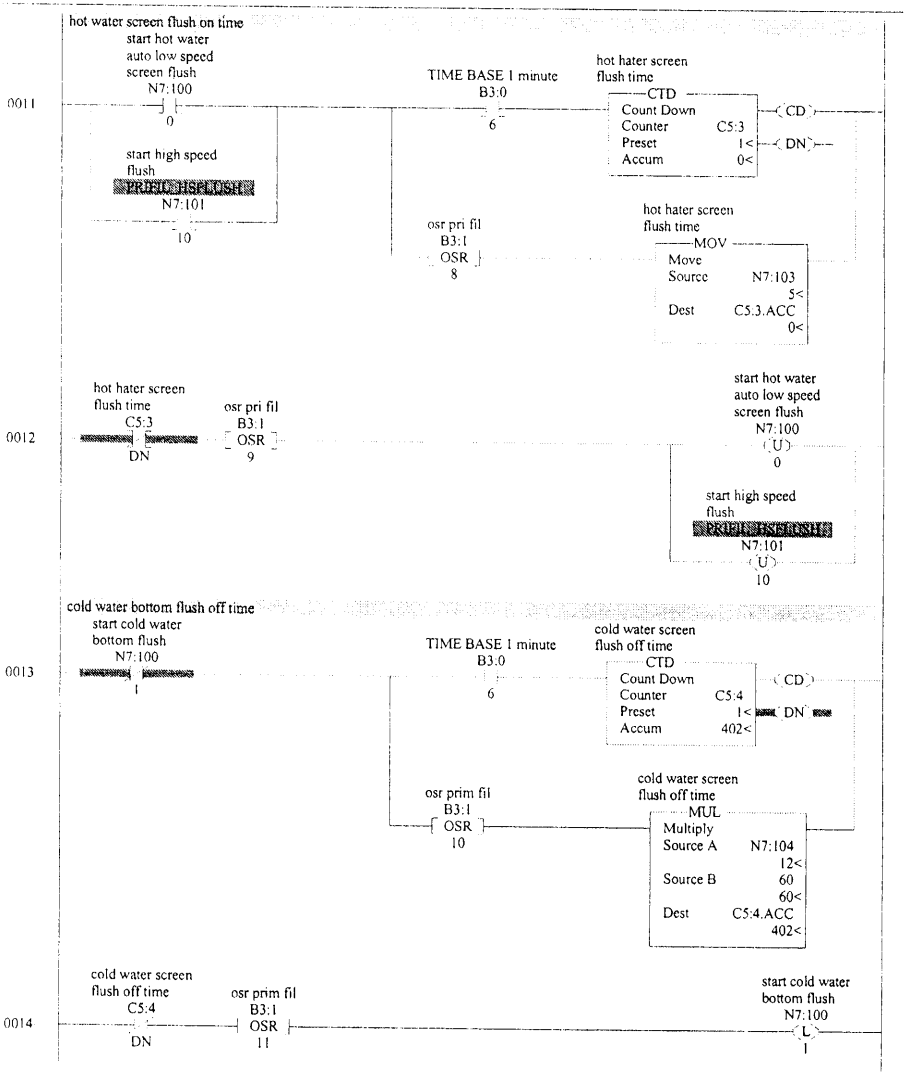
primary filter belt speed
SCP
Scale w/Parameters
Input N7:113 15<
Input Min. 0 0<
Input Max. 100 100<
Scaled Min. 6242 6242<
Scaled Max. 31208 31208<
Output O:13.0 8988<

start high speed flush
N7:101
10

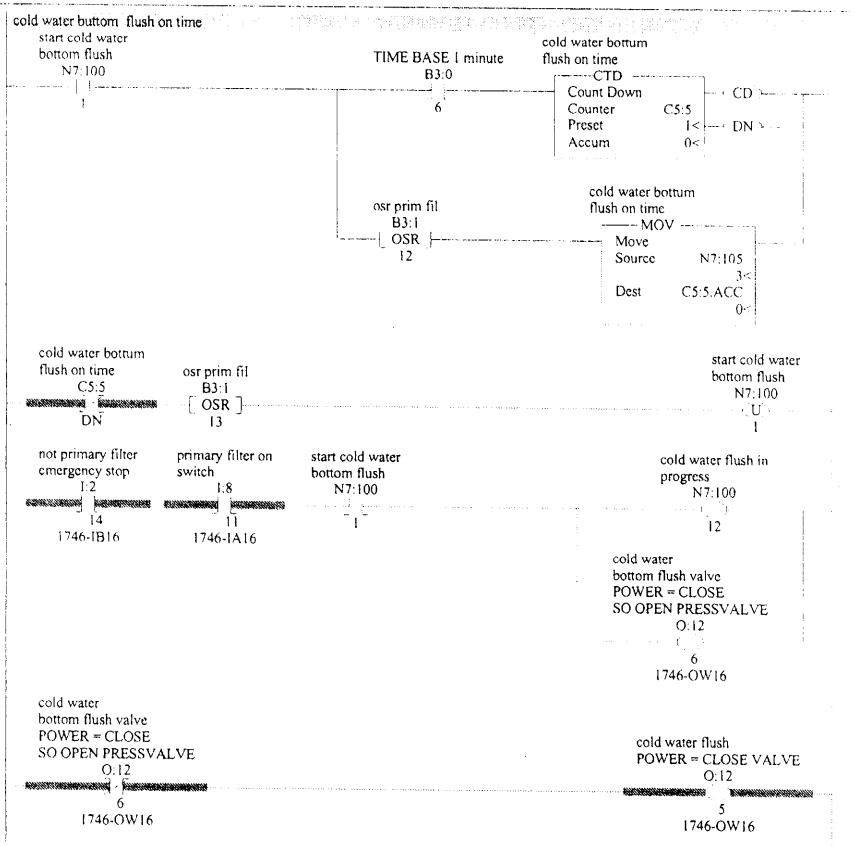
start hot water auto low speed screen flush
N7:100
0

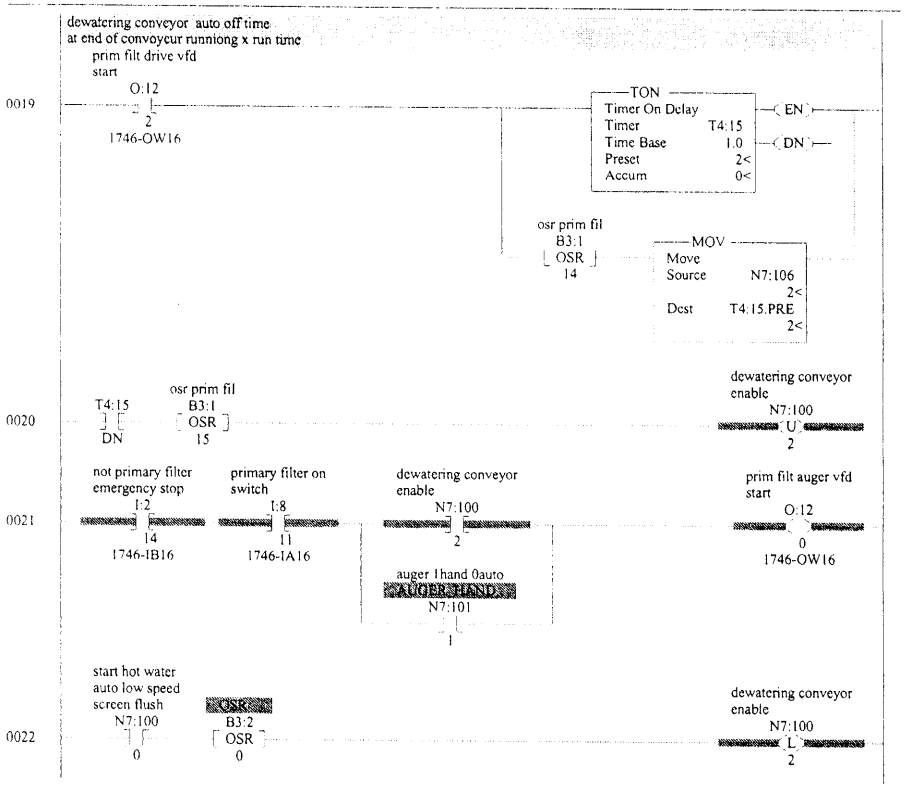
primary filter belt speed
SCP
Scale w/Parameters
Input N7:111 47<
Input Min. 0 0<
Input Max. 100 100<
Scaled Min. 6242 6242<
Scaled Max. 31208 31208<
Output O:13.0 8988<


filter belt speed
0 hand
1 auto (auto reset 2
minutes)
N7:101
0
tim auto prim fil
TON
Timer On Delay
Timer T4:24
Time Base 1.0
Preset 120<
Accum 0<
EN
DN
0008
tim auto prim fil
T4:24
DN
filter belt speed
0 hand
1 auto (auto reset 2
minutes)
N7:101
L
0
hot water screen flush off time
start hot water
auto low speed
screen flush
N7:100
0
start high speed
flush
PRIFIL.HSPLOSH
N7:101
10
TIME BASE 1 minute
B3:0
6
hot hater screen
flush
max time w/o flush
CTD
Count Down
Counter C5:2
Preset 1<
Accum 67<
CD
DN
0009
osr pri fil
B3:1
OSR
6
hot hater screen
flush
max time w/o flush
MUL
Multiply
Source A N7:102
5<
Source B 60
60<
Dest C5:2.ACC
67<
hot hater screen
flush
max time w/o flush
C5:2
DN
osr prim fil
B3:1
OSR
7
0010
start hot water
auto low speed
screen flush
N7:100
L
0


hot water screen flush on time
start hot water
auto low speed
screen flush
N7:100
0
start high speed
flush
PRIFIL.HSPLOSH
N7:101
10
TIME BASE 1 minute
B3:0
6
hot hater screen
flush time
CTD
Count Down
Counter C5:3
Preset 1<
Accum 0<
CD
DN
0011
osr pri fil
B3:1
OSR
8
hot hater screen
flush time
MOV
Move
Source N7:103
5<
Dest C5:3.ACC
0<
hot hater screen
flush time
C5:3
DN
osr pri fil
B3:1
OSR
9
0012
start hot water
auto low speed
screen flush
N7:100
U
0
start high speed
flush
PRIFIL.HSPLOSH
N7:101
U
10
cold water bottom flush off time
start cold water
bottom flush
N7:100
1
TIME BASE 1 minute
B3:0
6
cold water screen
flush off time
CTD
Count Down
Counter C5:4
Preset 1<
Accum 402<
CD
DN
0013
osr prim fil
B3:1
OSR
10
cold water screen
flush off time
MUL
Multiply
Source A N7:104
12<
Source B 60
60<
Dest C5:4.ACC
402<
cold water screen
flush off time
C5:4
DN
osr prim fil
B3:1
OSR
11
0014
start cold water
bottom flush
N7:100
L
1

151


cold water buttom flush on time
start cold water bottom flush
N7:100
1
0015
TIME BASE 1 minute
B3:0
6
cold water bottum flush on time
CTD
Count Down
Counter C5:5
Preset 1<
Accum 0<
CD
DN
osr prim fil
B3:1
OSR
12
cold water bottum flush on time
MOV
Move
Source N7:105
3<
Dest C5:5.ACC
0<
cold water bottum flush on time
C5:5
DN
0016
osr prim fil
B3:1
OSR
13
start cold water bottom flush
N7:100
U
1
not primary filter emergency stop
I:2
14
1746-IB16
0017
primary filter on switch
I:8
11
1746-IA16
start cold water bottom flush
N7:100
1
cold water flush in progress
N7:100
12
cold water bottom flush valve
POWER = CLOSE
SO OPEN PRESSVALVE
O:12
6
1746-OW16
cold water bottom flush valve
POWER = CLOSE
SO OPEN PRESSVALVE
O:12
6
1746-OW16
0018
cold water flush
POWER = CLOSE VALVE
O:12
5
1746-OW16


dewatering conveyor auto off time
at end of convoyeur runniong x run time
prim filt drive vfd
start
O:12
2
1746-OW16
0019
TON
Timer On Delay
Timer T4:15
Time Base 1.0
Preset 2<
Accum 0<
EN
DN
osr prim fil
B3:1
OSR
14
MOV
Move
Source N7:106
2<
Dest T4:15.PRE
2<
T4:15
DN
osr prim fil
B3:1
OSR
15
0020
dewatering conveyor enable
N7:100
U
2
not primary filter emergency stop
I:2
14
1746-IB16
primary filter on switch
I:8
11
1746-IA16
dewatering conveyor enable
N7:100
2
auger 1hand 0auto
AUGER_HAND
N7:101
1
0021
prim filt auger vfd start
O:12
0
1746-OW16
start hot water auto low speed screen flush
N7:100
0
OSR
B3:2
OSR
0
0022
dewatering conveyor enable
N7:100
L
2

0023

not primary filter emergency stop
1:2
14
1746-IB16

primary filter on switch
1:8
11
1746-IA16

primary filter fail lamp
O:12
10
1746-OW16

primary filter run lamp
O:12
9
1746-OW16

primfil unit on
PRIMFIL_ON
N7:100
14

prim filter belt ask run
PRIFIL_BELTRUN
N7:100
15

start hot water auto low speed screen flush
N7:100
0

start high speed flush
PRIFIL_HISPEEDFLUSH
N7:101
10

filter belt speed
0 hand
1 auto (auto reset 2 minutes)
N7:101
0

prim filt drive vfd start
O:12
2
1746-OW16

prim blower fan start
O:12
8
1746-OW16

prim filter vfd run
1:1
10
1746-IB16

primary filter filter alarm vfd fail
N7:100
6

primary filter blower fan alarm
N7:100
10

prim blower start
O:12
7
1746-OW16

start hot water auto low speed screen flush
N7:100
0

hot water flush in progress
N7:100
11

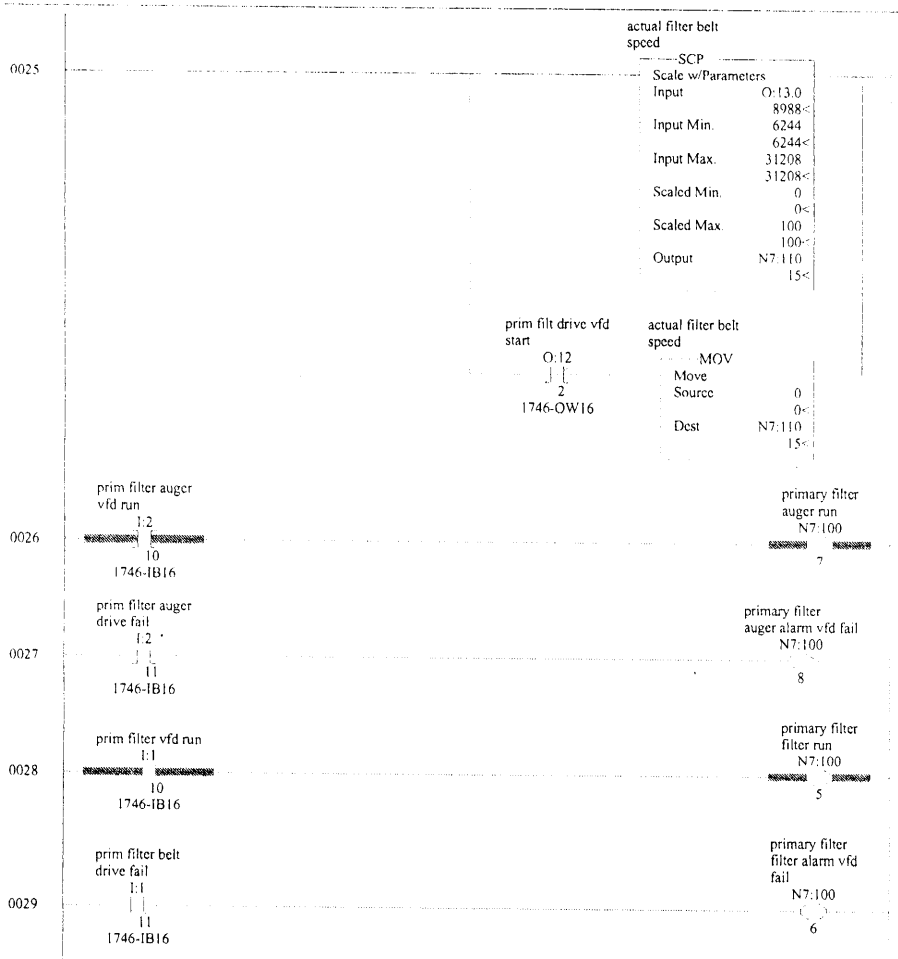
start high speed flush
PRIFIL_HISPEEDFLUSH
N7:101
10

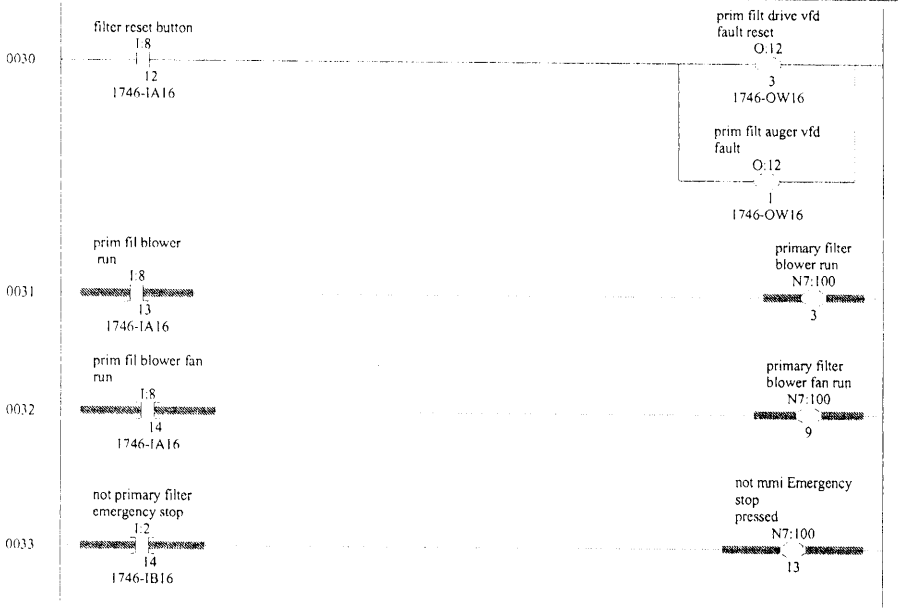
O:12/4 REVERS not hot water flush
B3:2
2

0024

O:12/4 REVERS not hot water flush
B3:2
2

hot water flush
O:12
4
1746-OW16


0025
actual filter belt speed
SCP
Scale w/Parameters
Input O:13.0 8988<
Input Min. 6244 6244<
Input Max. 31208 31208<
Scaled Min. 0 0<
Scaled Max. 100 100<
Output N7:110 15<
prim filt drive vfd start
O:12
2
1746-OW16
actual filter belt speed
MOV
Move
Source 0 0<
Dest N7:110 15<
0026
prim filter auger vfd run
I:2
10
1746-IB16
primary filter auger run
N7:100
7
0027
prim filter auger drive fail
I:2
11
1746-IB16
primary filter auger alarm vfd fail
N7:100
8
0028
prim filter vfd run
I:1
10
1746-IB16
primary filter filter run
N7:100
5
0029
prim filter belt drive fail
I:1
11
1746-IB16
primary filter filter alarm vfd fail
N7:100
6


0030
filter reset button
I:8
12
1746-IA16
prim filt drive vfd fault reset
O:12
3
1746-OW16
prim filt auger vfd fault
O:12
1
1746-OW16
0031
prim fil blower run
I:8
13
1746-IA16
primary filter blower run
N7:100
3
0032
prim fil blower fan run
I:8
14
1746-IA16
primary filter blower fan run
N7:100
9
0033
not primary filter emergency stop
I:2
14
1746-IB16
not mmi Emergency stop pressed
N7:100
13

primary filter blower fan fault

0034

prim fil blower fan run
I:8
14
1746-IA16

prim blower fan start
O:12
8
1746-OW16

tim prifil blower fan fail
TON
Timer On Delay
Timer T4:30
Time Base 1.0
Preset 1<
Accum 0<
EN
DN

0035

tim prifil blower fan fail
T4:30
DN

primary filter blower fan alarm
N7:100
L
10

0036

prim fil blower fan run
I:8
14
1746-IA16

primary filter blower fan alarm
N7:100
U
10

primary filter blower fault

0037

prim fil blower run
I:8
13
1746-IA16

prim blower start
O:12
7
1746-OW16

prim filter blower fail
TON
Timer On Delay
Timer T4:31
Time Base 1.0
Preset 1<
Accum 0<
EN
DN

0038

prim filter blower fail
T4:31
DN

blower fail
N7:100
L
4

0039

prim fil blower run
I:8
13
1746-IA16

blower fail
N7:100
U
4

0040

filter reset button
I:8
12
1746-IA16

B3:1
OSR
3

blower fail
N7:100
U
4

primary filter blower fan alarm
N7:100
U
10

count flush cycle and reset

0041
hot water flush in progress N7:100/11
osr prifil count wash B3:2/OSR 5
prifil_wash_count ADD
Add
Source A N7:116 0<
Source B 1 1<
Dest N7:116 0<

0042
prifil_wash reset N7:101/2
prifil_wash_count MOV
Move
Source 0 0<
Dest N7:116 0<

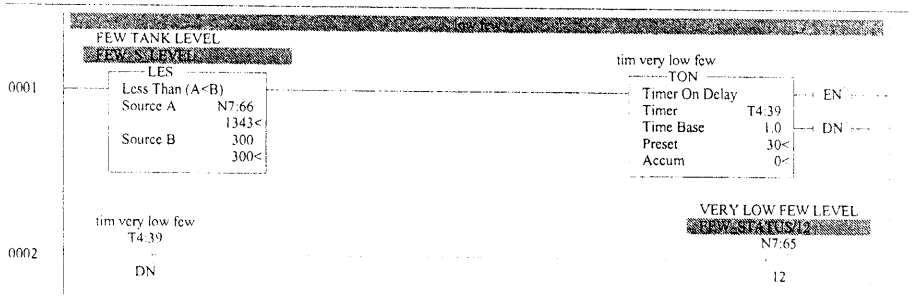
0043
END

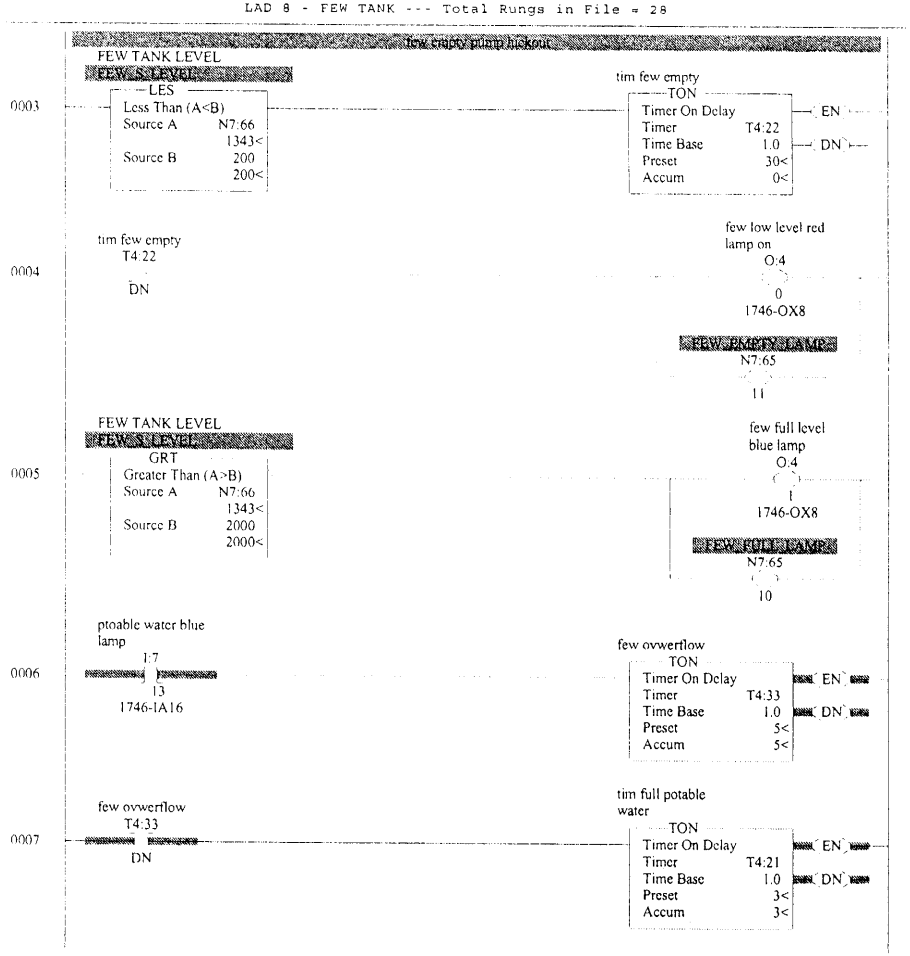
fe1002 level indication conversion

conversion
full sacle 20 ma , 4 ma -> zero
kpa 200
pa 200000
psi 29.00754755
in h20 803.0161286
mh2o 20.39660967
mm h2o 20396.60967

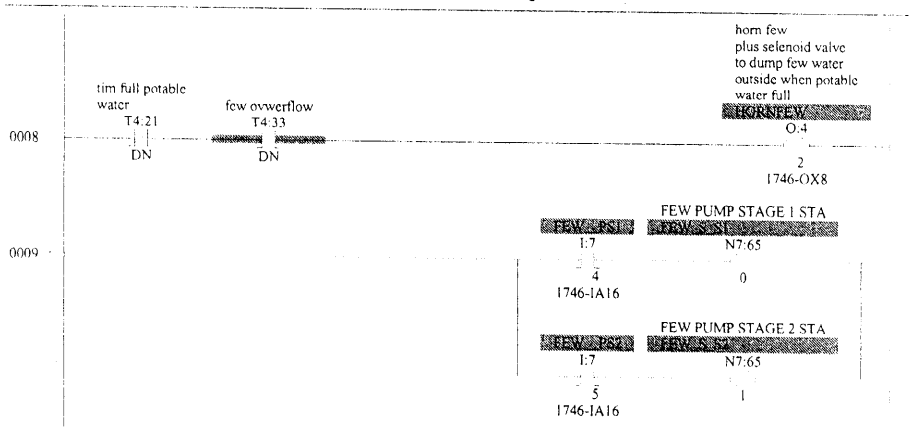
ACTUAL DEEPNES OF FEW TANK 2.6M 2600MM
OVERFLOW 2200MM

0000
Time Base S:4/8
B3:0/OSR 7
FEW TANK LEVEL
FEW_S_LEVEL
SCP
Scale w/Parameters
Input I:5.6 4946<
Input Min. 4000 4000<
Input Max. 20000 20000<
Scaled Min. 150 150<
Scaled Max. 20396 20396<
Output N7:66 1343<

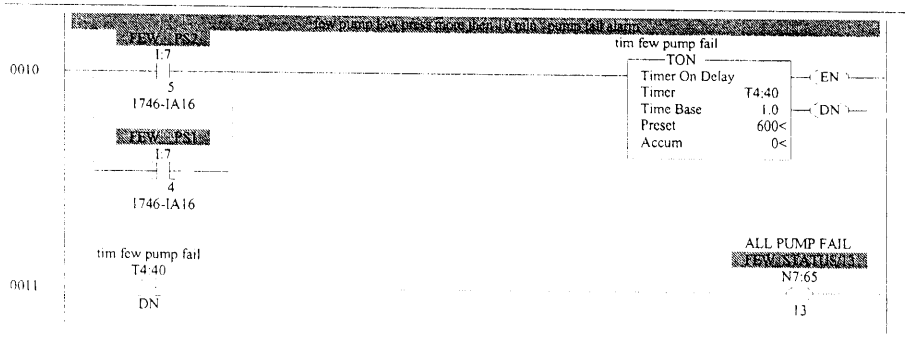

low few
FEW TANK LEVEL
FEW.S:1.LEVEL
0001
LES
Less Than (A<B)
Source A N7:66
1343<
Source B 300
300<
tim very low few
TON
Timer On Delay
Timer T4:39
Time Base 1.0
Preset 30<
Accum 0<
EN
DN
tim very low few
T4:39
DN
0002
VERY LOW FEW LEVEL
FEW.STATUS:12
N7:65
12

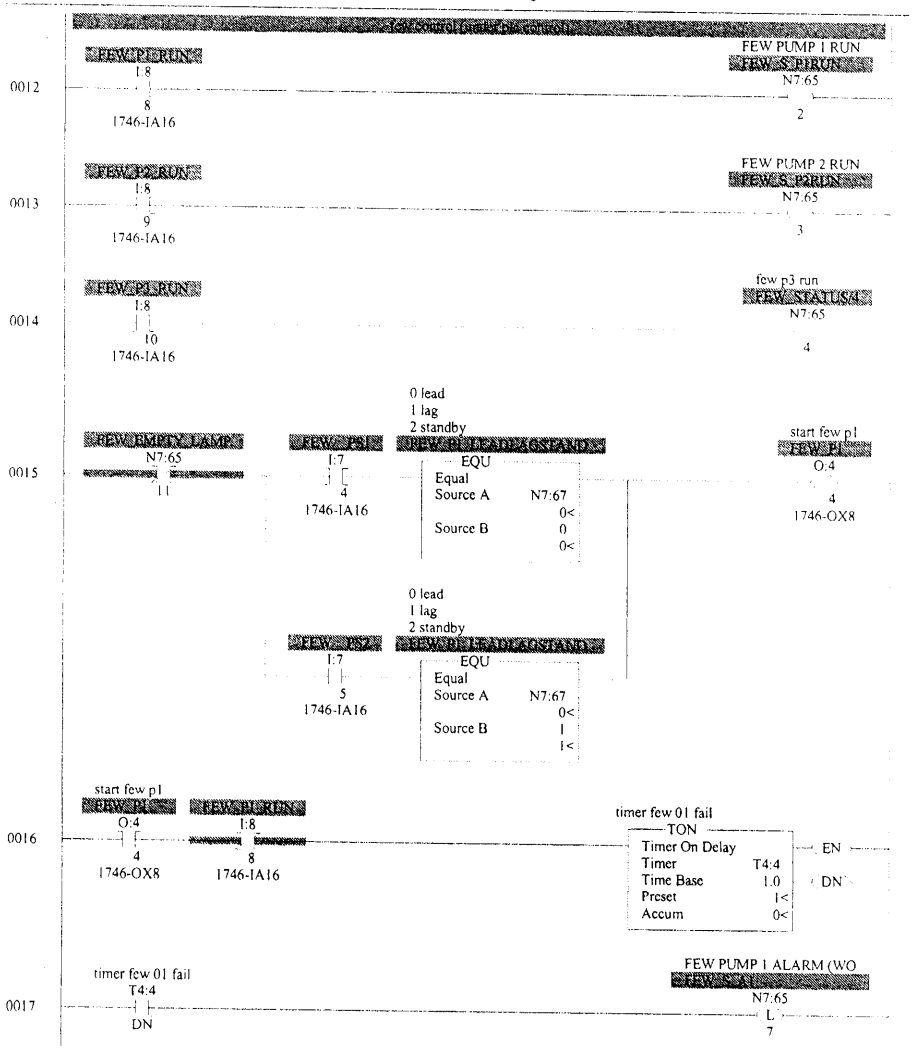

few empty pump lockout
FEW TANK LEVEL
FEW.S:1.LEVEL
0003
LES
Less Than (A<B)
Source A N7:66
1343<
Source B 200
200<
tim few empty
TON
Timer On Delay
Timer T4:22
Time Base 1.0
Preset 30<
Accum 0<
EN
DN
tim few empty
T4:22
DN
0004
few low level red lamp on
O:4
0
1746-OX8
FEW.EMPTY_LAMP
N7:65
11
FEW TANK LEVEL
FEW.S:1.LEVEL
0005
GRT
Greater Than (A>B)
Source A N7:66
1343<
Source B 2000
2000<
few full level blue lamp
O:4
1
1746-OX8
FEW.FULL_LAMP
N7:65
10
ptoable water blue lamp
I:7
13
1746-IA16
0006
few ovwerflow
TON
Timer On Delay
Timer T4:33
Time Base 1.0
Preset 5<
Accum 5<
EN
DN
few ovwerflow
T4:33
DN
0007
tim full potable water
TON
Timer On Delay
Timer T4:21
Time Base 1.0
Preset 3<
Accum 3<
EN
DN

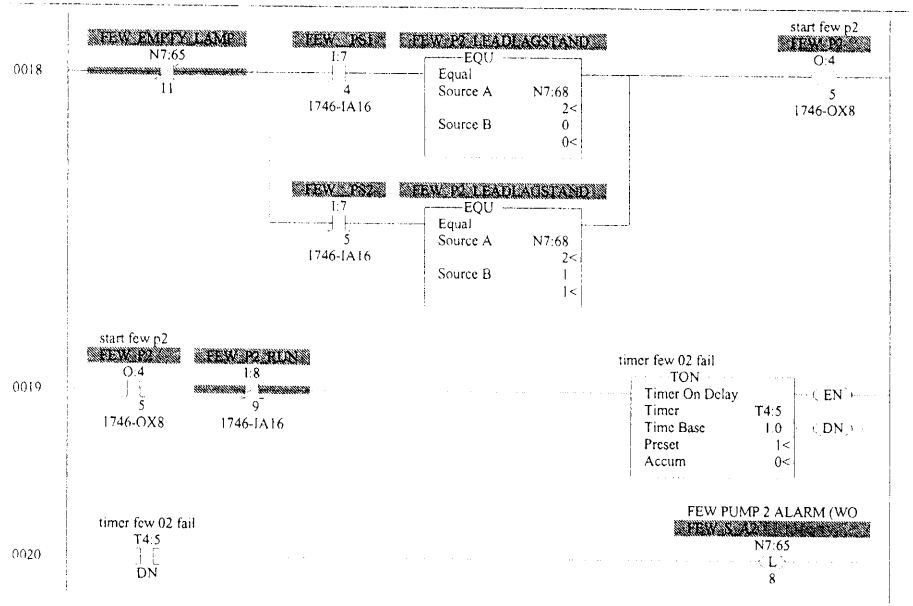
LAD 8 - FEW TANK --- Total Rungs in File = 28

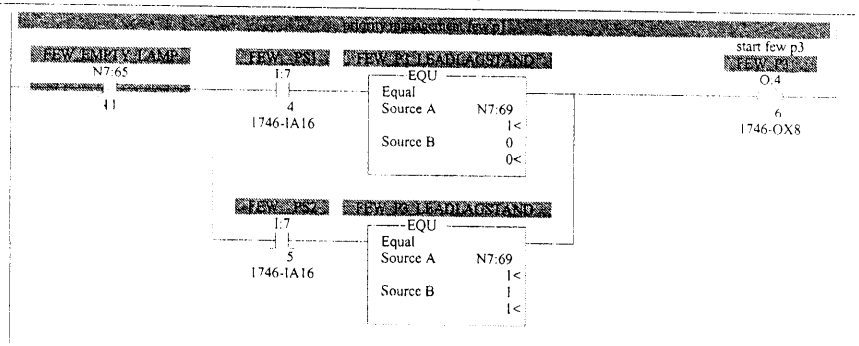


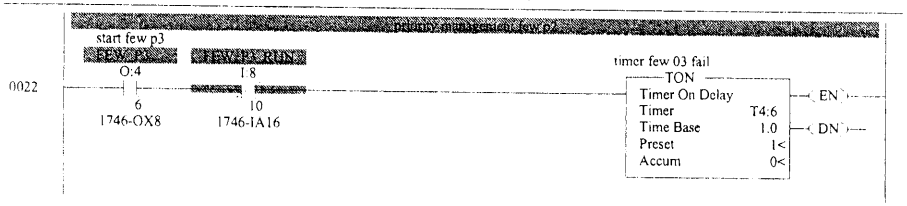
LAD 8 - FEW TANK --- Total Rungs in File = 28

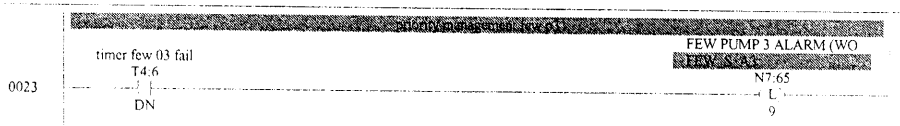



0012
FEW.P1.RUN
I:8
8
1746-IA16
FEW PUMP 1 RUN
FEW.S.P1RUN
N7:65
2
0013
FEW.P2.RUN
I:8
9
1746-IA16
FEW PUMP 2 RUN
FEW.S.P2RUN
N7:65
3
0014
FEW.P3.RUN
I:8
10
1746-IA16
few p3 run
FEW.STATUS4
N7:65
4
0015
FEW.EMPTY.LAMP
N7:65
11
FEW.FS1
I:7
4
1746-IA16
0 lead
1 lag
2 standby
FEW.P1.LEADLAGSTAND
EQU
Equal
Source A N7:67
0<
Source B 0
0<
start few p1
FEW.P1
O:4
4
1746-OX8
FEW.FS2
I:7
5
1746-IA16
FEW.P2.LEADLAGSTAND
EQU
Equal
Source A N7:67
0<
Source B 1
1<
0016
start few p1
FEW.P1
O:4
4
1746-OX8
FEW.P1RUN
I:8
8
1746-IA16
timer few 01 fail
TON
Timer On Delay
Timer T4:4
Time Base 1.0
Preset 1<
Accum 0<
EN
DN
0017
timer few 01 fail
T4:4
DN
FEW PUMP 1 ALARM (WO
FEW.S.A1
N7:65
L
7

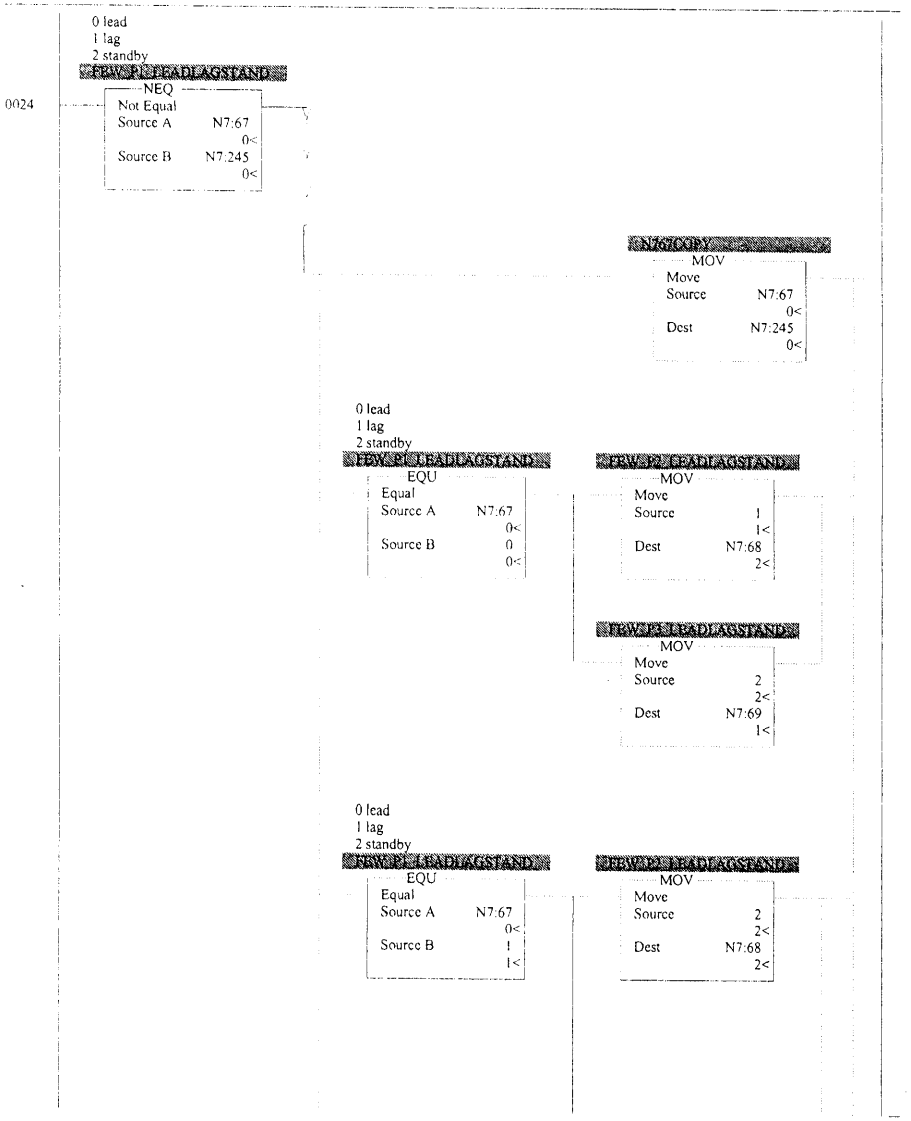

0018
FEW.EMPTY.LAMP
N7:65
11
FEW.FS1
I:7
4
1746-IA16
FEW.P2.LEADLAGSTAND
EQU
Equal
Source A N7:68
2<
Source B 0
0<
start few p2
FEW.P2
O:4
5
1746-OX8
FEW.FS2
I:7
5
1746-IA16
FEW.P2.LEADLAGSTAND
EQU
Equal
Source A N7:68
2<
Source B 1
1<
0019
start few p2
FEW.P2
O:4
5
1746-OX8
FEW.P2.RUN
I:8
9
1746-IA16
timer few 02 fail
TON
Timer On Delay
Timer T4:5
Time Base 1.0
Preset 1<
Accum 0<
EN
DN
0020
timer few 02 fail
T4:5
DN
FEW PUMP 2 ALARM (WO
FEW.S.A2
N7:65
L
8


0021
FEW_EMPTY_LAMP
N7:65
11
FEW_PS1
1:7
4
1746-IA16
FEW_P3_LEADLAGSTAND
EQU
Equal
Source A
N7:69
1<
Source B
0
0<
start few p3
FEW_P3
O:4
6
1746-OX8
FEW_PS2
1:7
5
1746-IA16
FEW_P3_LEADLAGSTAND
EQU
Equal
Source A
N7:69
1<
Source B
1
1<

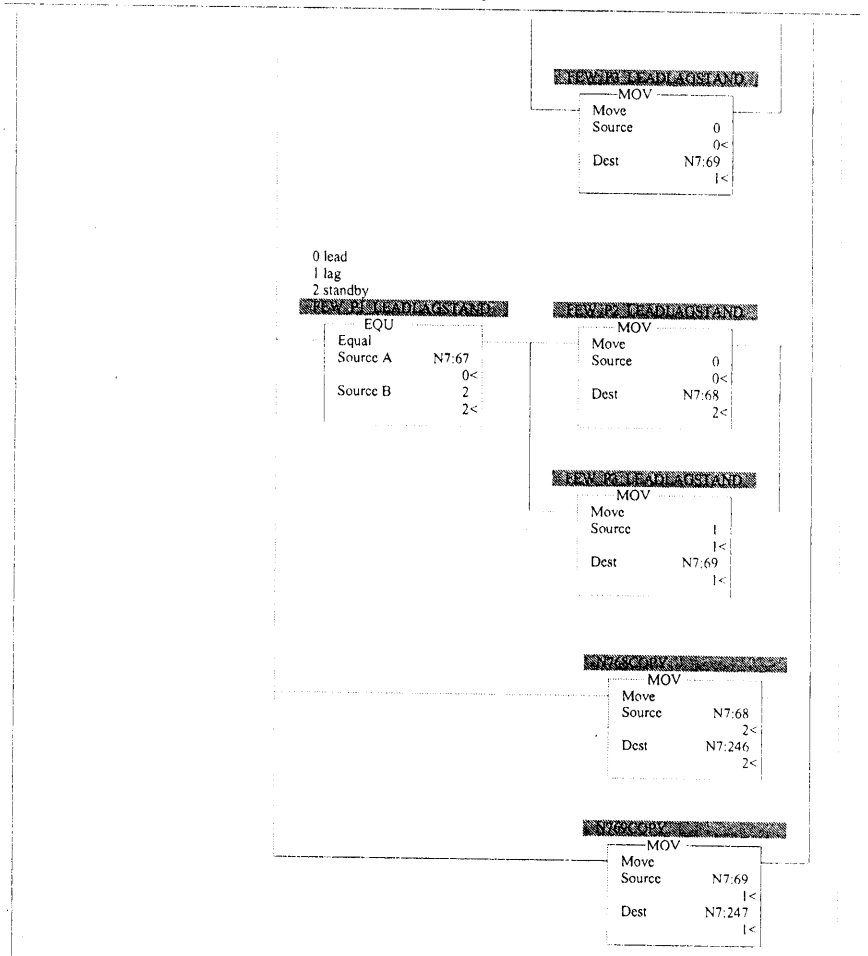

0022
start few p3
FEW_P3
O:4
6
1746-OX8
FEW_P3_RUN
I:8
10
1746-IA16
timer few 03 fail
TON
Timer On Delay
Timer
T4:6
Time Base
1.0
Preset
1<
Accum
0<
EN
DN

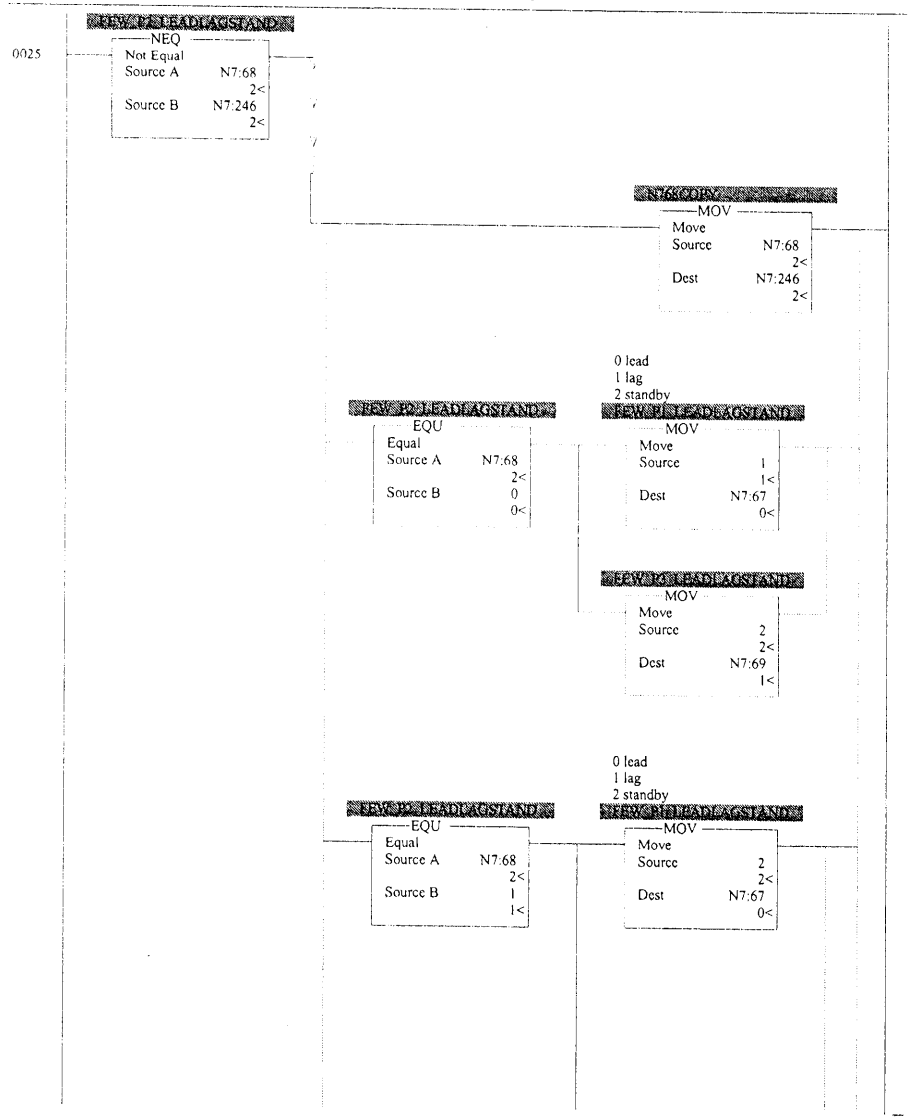

timer few 03 fail
T4:6
DN
FEW PUMP 3 ALARM (WO
N7:65
L
9

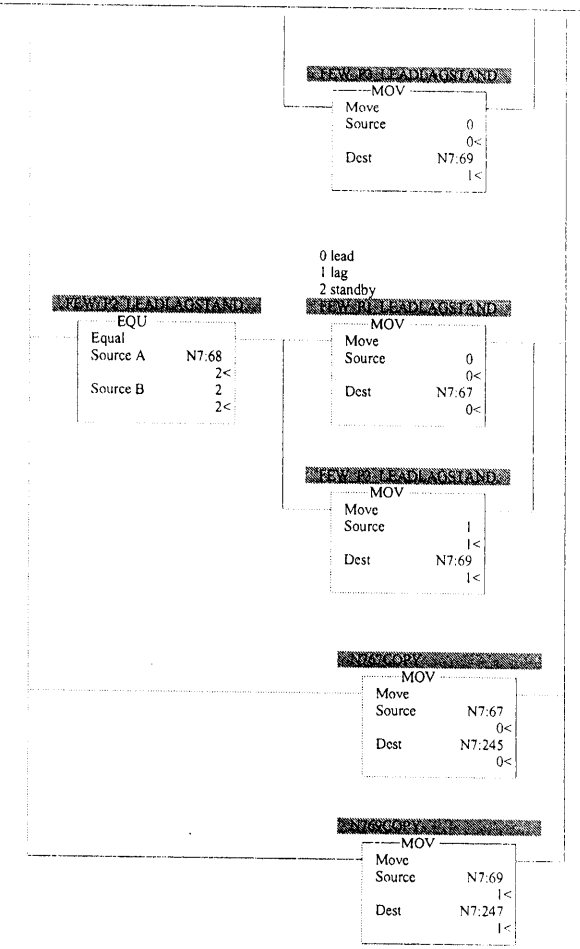
0023

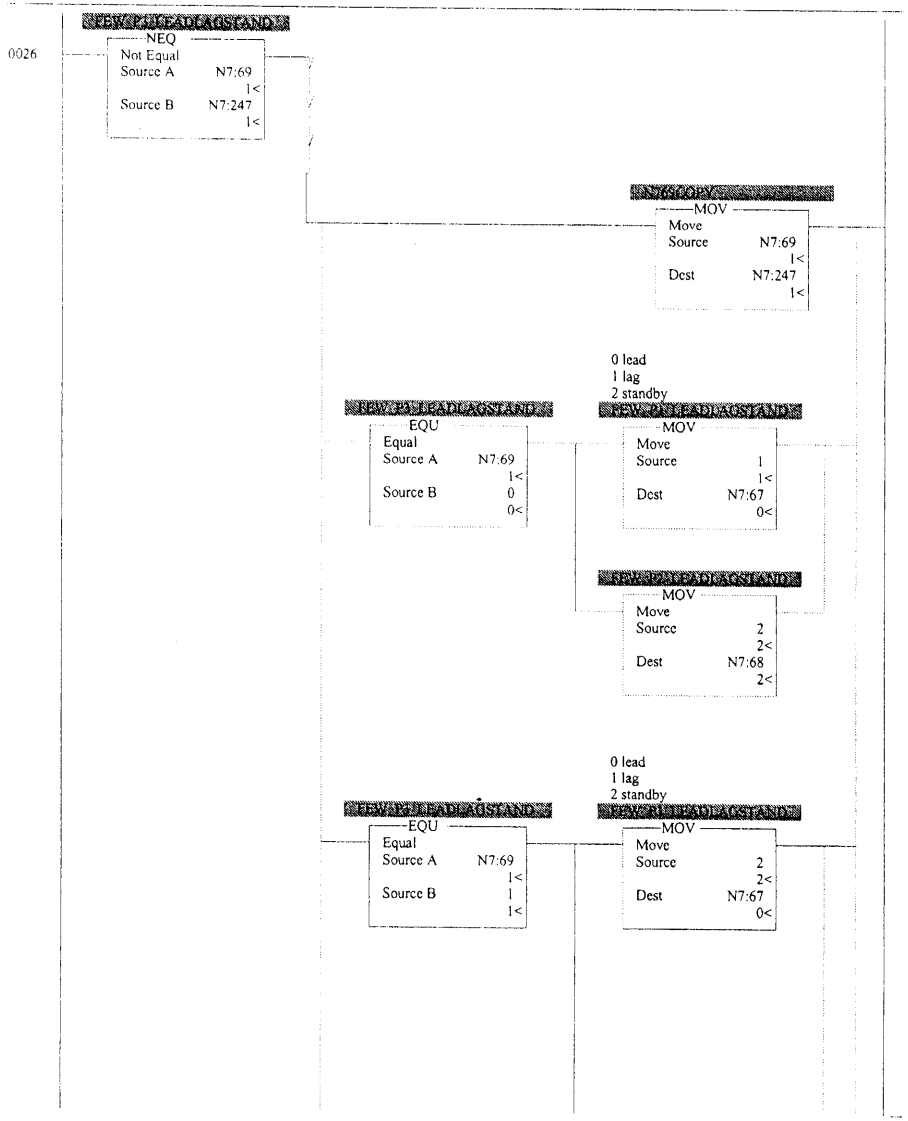

0 lead
1 lag
2 standby
NEQ
Not Equal
Source A N7:67 0<
Source B N7:245 0<
MOV
Move
Source N7:67 0<
Dest N7:245 0<
0 lead
1 lag
2 standby
EQU
Equal
Source A N7:67 0<
Source B 0 0<
MOV
Move
Source 1 1<
Dest N7:68 2<
MOV
Move
Source 2 2<
Dest N7:69 1<
0 lead
1 lag
2 standby
EQU
Equal
Source A N7:67 0<
Source B 1 1<
MOV
Move
Source 2 2<
Dest N7:68 2<

0024

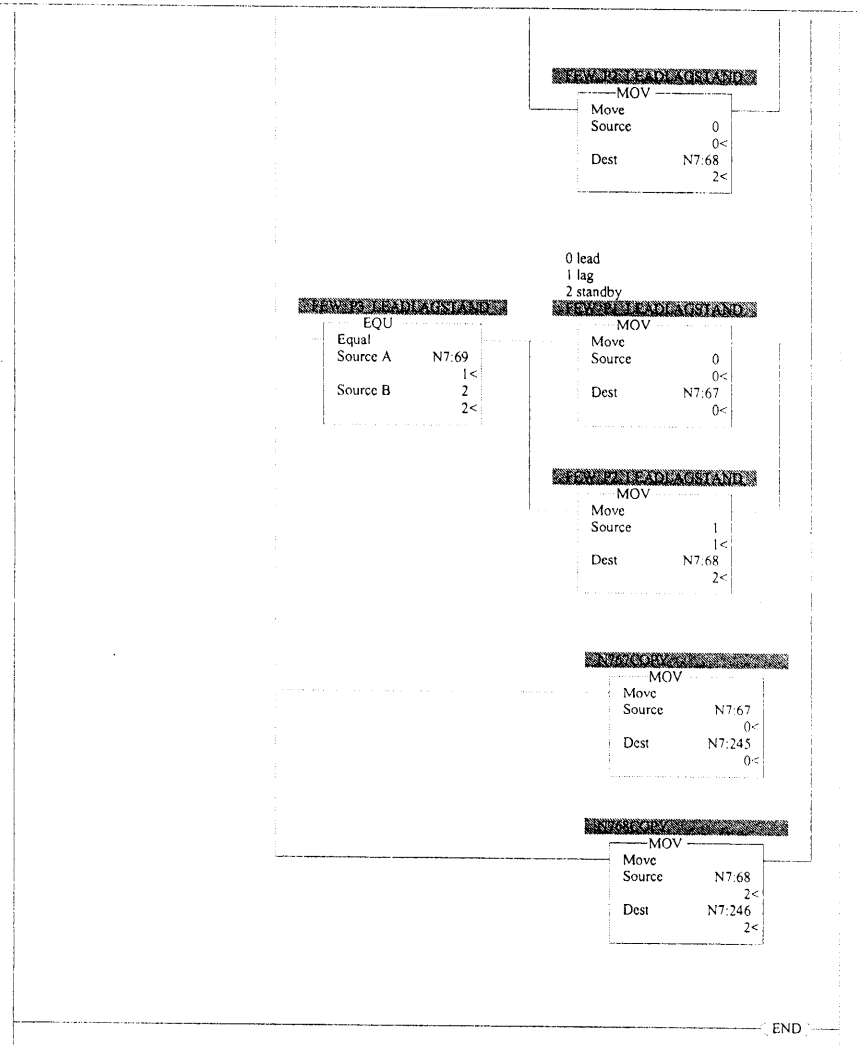

MOV
Move
Source 0
0<
Dest N7:69
1<
0 lead
1 lag
2 standby
EQU
Equal
Source A N7:67
0<
Source B 2
2<
MOV
Move
Source 0
0<
Dest N7:68
2<
MOV
Move
Source 1
1<
Dest N7:69
1<
MOV
Move
Source N7:68
2<
Dest N7:246
2<
MOV
Move
Source N7:69
1<
Dest N7:247
1<


0025
NEQ
Not Equal
Source A N7:68
2<
Source B N7:246
2<
MOV
Move
Source N7:68
2<
Dest N7:246
2<
0 lead
1 lag
2 standby
EQU
Equal
Source A N7:68
2<
Source B 0
0<
MOV
Move
Source 1
1<
Dest N7:67
0<
MOV
Move
Source 2
2<
Dest N7:69
1<
0 lead
1 lag
2 standby
EQU
Equal
Source A N7:68
2<
Source B 1
1<
MOV
Move
Source 2
2<
Dest N7:67
0<

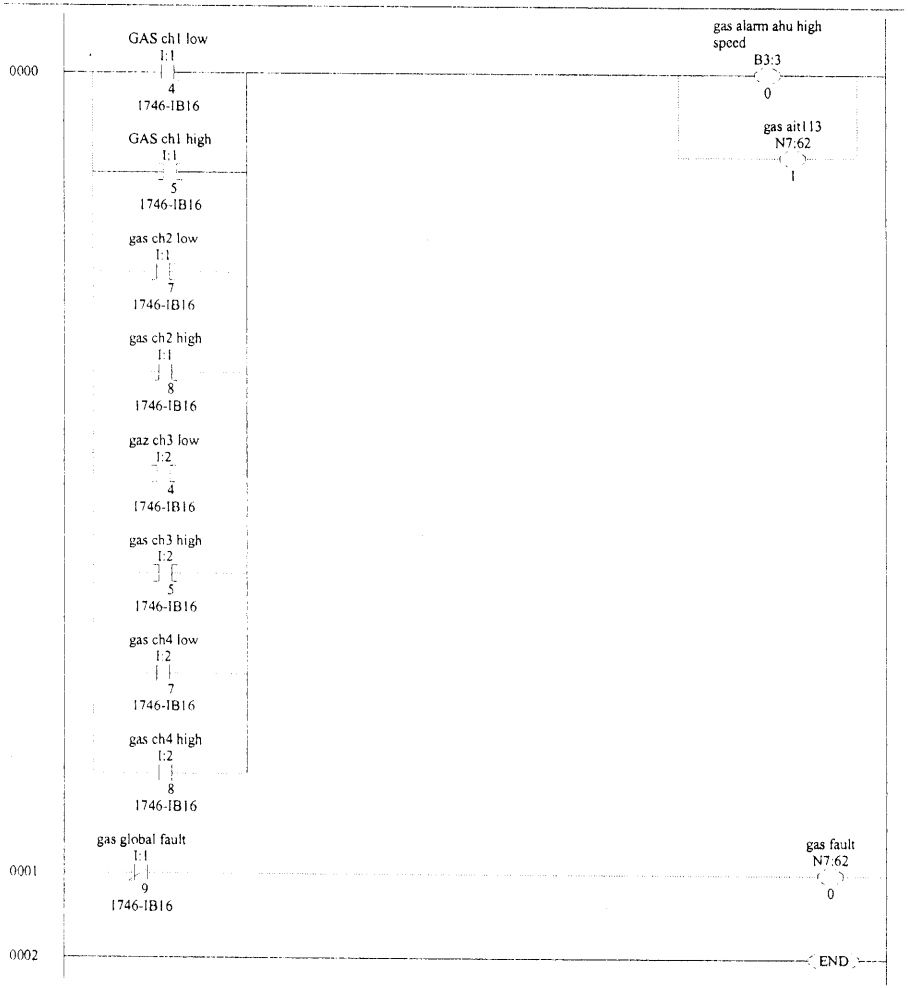

MOV
Move
Source 0
0<
Dest N7:69
1<
0 lead
1 lag
2 standby
EQU
Equal
Source A N7:68
2<
Source B 2
2<
MOV
Move
Source 0
0<
Dest N7:67
0<
MOV
Move
Source 1
1<
Dest N7:69
1<
MOV
Move
Source N7:67
0<
Dest N7:245
0<
MOV
Move
Source N7:69
1<
Dest N7:247
1<


0026
NEQ
Not Equal
Source A N7:69
1<
Source B N7:247
1<
MOV
Move
Source N7:69
1<
Dest N7:247
1<
0 lead
1 lag
2 standby
EQU
Equal
Source A N7:69
1<
Source B 0
0<
MOV
Move
Source 1
1<
Dest N7:67
0<
MOV
Move
Source 2
2<
Dest N7:68
2<
0 lead
1 lag
2 standby
EQU
Equal
Source A N7:69
1<
Source B 1
1<
MOV
Move
Source 2
2<
Dest N7:67
0<

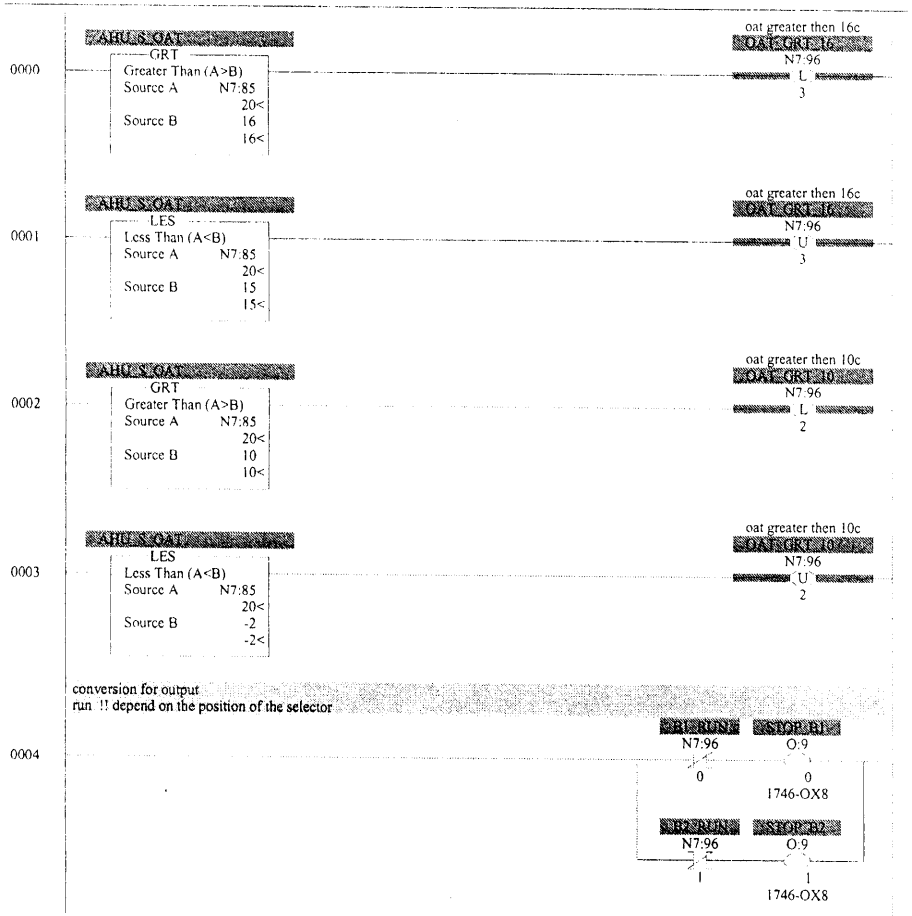
LAD 8 - FEW TANK --- Total Rungs in File = 28

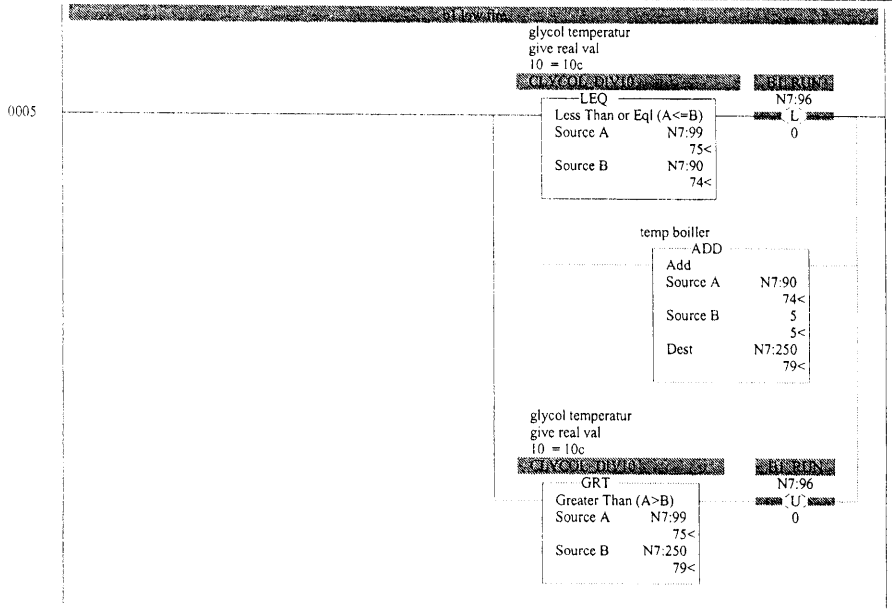


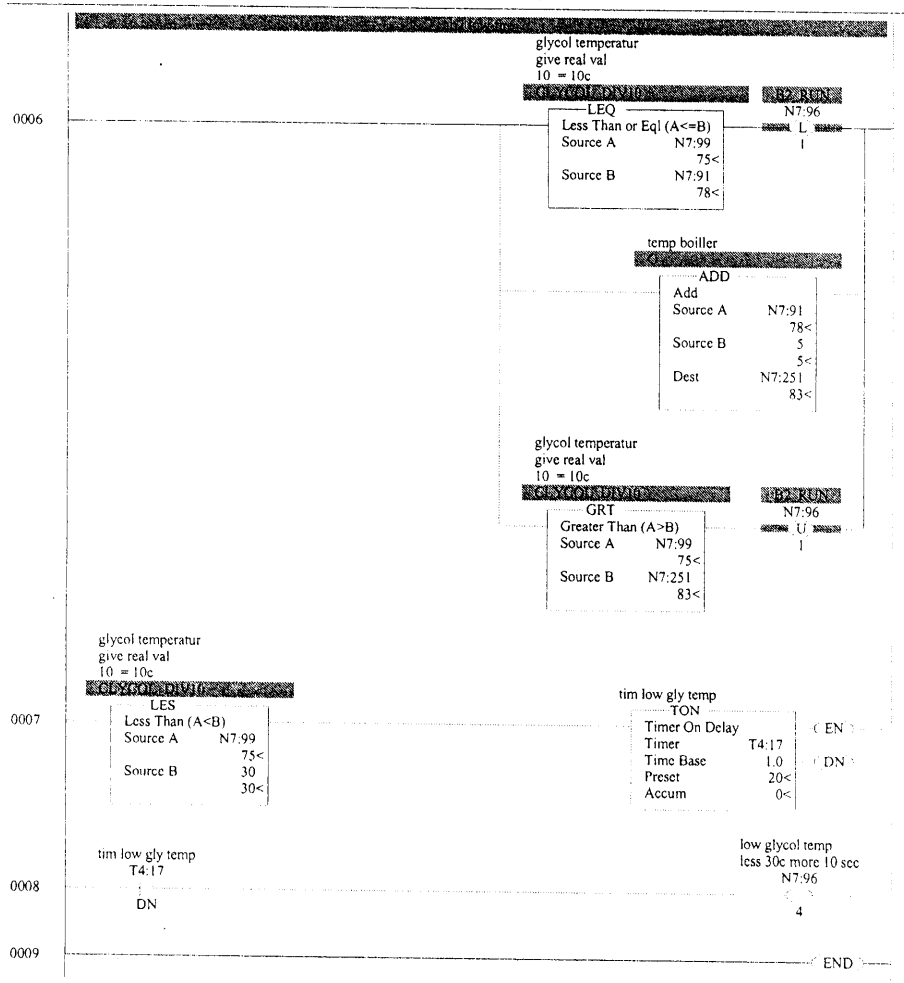
LAD 9 - GAS ALARM --- Total Rungs in File = 3

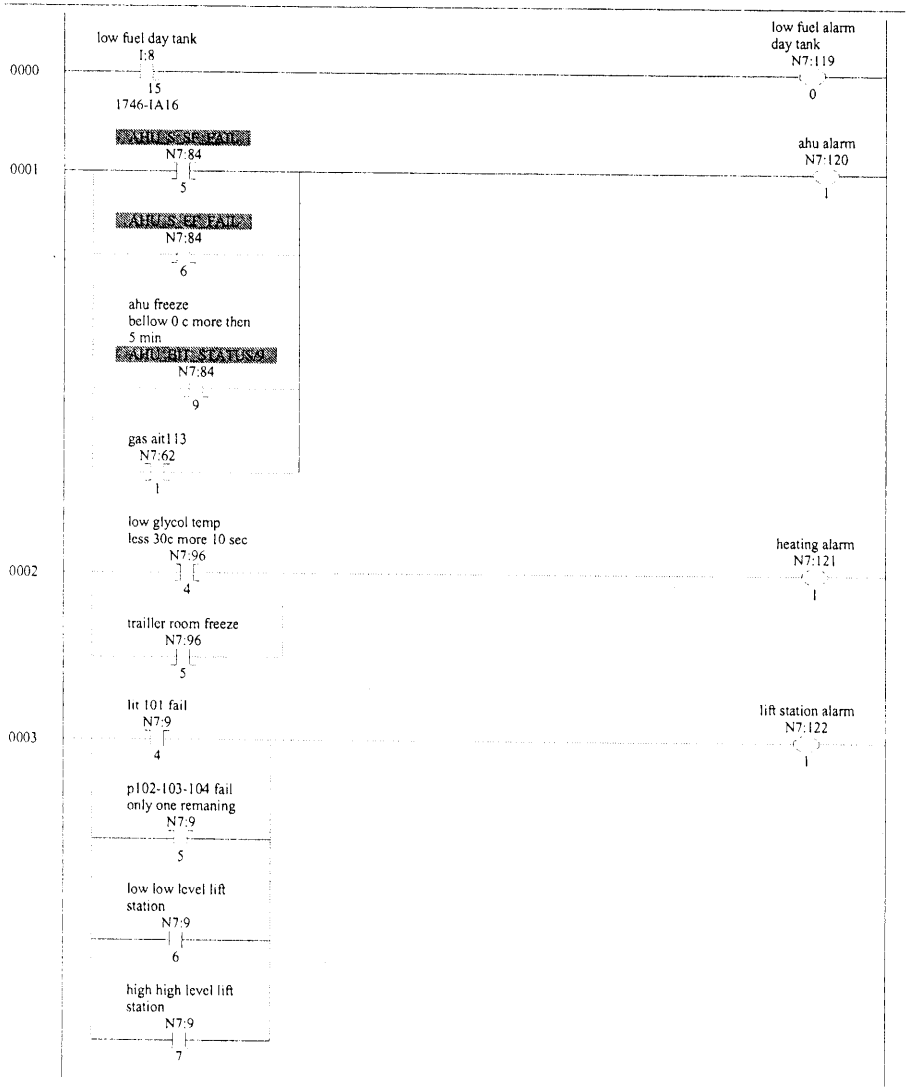


151


0000
AHU_S_OAT
GRT
Greater Than (A>B)
Source A N7:85 20<
Source B 16 16<
oat greater then 16c
OAT_GRT_16c
N7:96
L
3
0001
AHU_S_OAT
LES
Less Than (A<B)
Source A N7:85 20<
Source B 15 15<
oat greater then 16c
OAT_GRT_16c
N7:96
U
3
0002
AHU_S_OAT
GRT
Greater Than (A>B)
Source A N7:85 20<
Source B 10 10<
oat greater then 10c
OAT_GRT_10c
N7:96
L
2
0003
AHU_S_OAT
LES
Less Than (A<B)
Source A N7:85 20<
Source B -2 -2<
oat greater then 10c
OAT_GRT_10c
N7:96
U
2
conversion for output
run !! depend on the position of the selector
0004
B1_RUN
N7:96
0
STOP_B1
O:9
0
1746-OX8
B2_RUN
N7:96
1
STOP_B2
O:9
1
1746-OX8


0005
glycol temperatur
give real val
10 = 10c
B1_RUN
N7:96
L
0
LEQ
Less Than or Eql (A<=B)
Source A N7:99 75<
Source B N7:90 74<
temp boiller
ADD
Add
Source A N7:90 74<
Source B 5 5<
Dest N7:250 79<
glycol temperatur
give real val
10 = 10c
B1_RUN
N7:96
U
0
GRT
Greater Than (A>B)
Source A N7:99 75<
Source B N7:250 79<


glycol temperatur
give real val
10 = 10c
B2_RUN
N7:96
0006
LEQ
Less Than or Eql (A<=B)
Source A N7:99 75<
Source B N7:91 78<
temp boiller
ADD
Add
Source A N7:91 78<
Source B 5 5<
Dest N7:251 83<
glycol temperatur
give real val
10 = 10c
B2_RUN
N7:96
GRT
Greater Than (A>B)
Source A N7:99 75<
Source B N7:251 83<
glycol temperatur
give real val
10 = 10c
0007
LES
Less Than (A<B)
Source A N7:99 75<
Source B 30 30<
tim low gly temp
TON
Timer On Delay
Timer T4:17
Time Base 1.0
Preset 20<
Accum 0<
EN
DN
tim low gly temp
T4:17
0008
DN
low glycol temp
less 30c more 10 sec
N7:96
4
0009
END


low fuel day tank
I:8
15
1746-IA16
low fuel alarm
day tank
N7:119
0
0000
AHU_S_SC_FAIL
N7:84
5
ahu alarm
N7:120
1
0001
AHU_S_SC_FAIL
N7:84
6
ahu freeze
bellow 0 c more then
5 min
AHU_HIT_STATUS_C
N7:84
9
gas ait113
N7:62
1
low glycol temp
less 30c more 10 sec
N7:96
4
heating alarm
N7:121
1
0002
trailler room freeze
N7:96
5
lit 101 fail
N7:9
4
lift station alarm
N7:122
1
0003
p102-103-104 fail
only one remaning
N7:9
5
low low level lift
station
N7:9
6
high high level lift
station
N7:9
7

0004

both screw screen fail
N7:48
0

prim screen alarm
N7:123
1

prim screen level > 800 lahh+lit102
N7:48
1

lit 102 fail less 3.5ma
N7:48
2

0005

primary filter filter alarm vfd fail
N7:100
6

prim filter alarm
N7:124
1

primary filter auger alarm vfd fail
N7:100
8

primary filter fail lamp
O:12
10
1746-OW16

primary filter blower fan alarm
N7:100
10

0006

FEW GLOBAL ALARM
N7:65
11

Few global Alarm
N7:125
1

VERY LOW FEW LEVEL
N7:65
12

ALL PUMP FAIL
N7:65
13

0007

ahu alarm
N7:120
1

global ahu enable
N7:120
0

tim building alarm lag
TON
Timer On Delay
Timer T4:43
Time Base 1.0
Preset 60<
Accum 0<
EN
DN

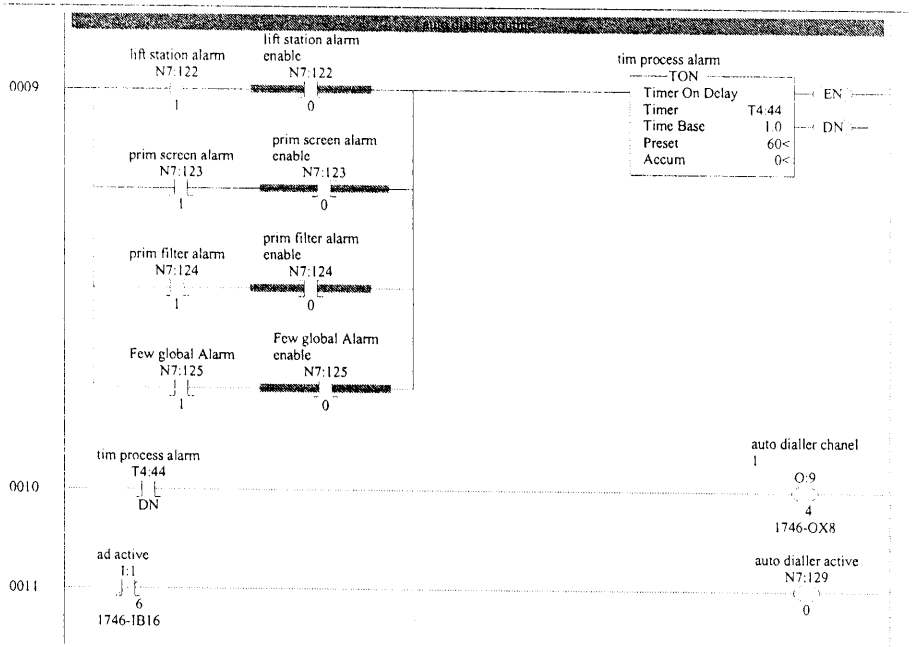
heating alarm
N7:121
1

heating alarm enable
N7:121
0

0008

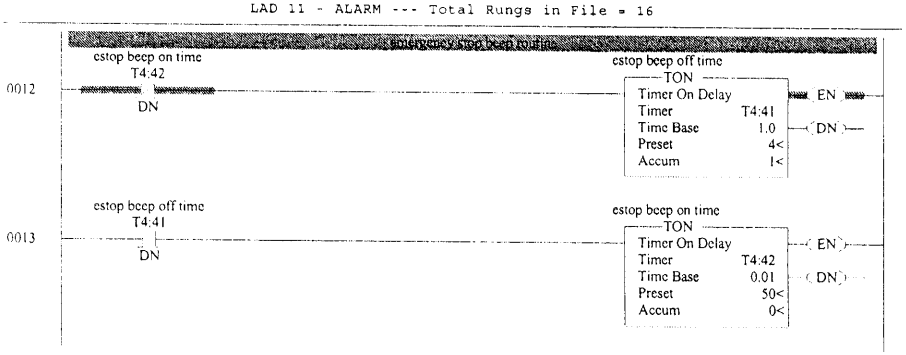
tim building alarm lag
T4:43
DN

auto dialler chanel 2
O:9
5
1746-OX8

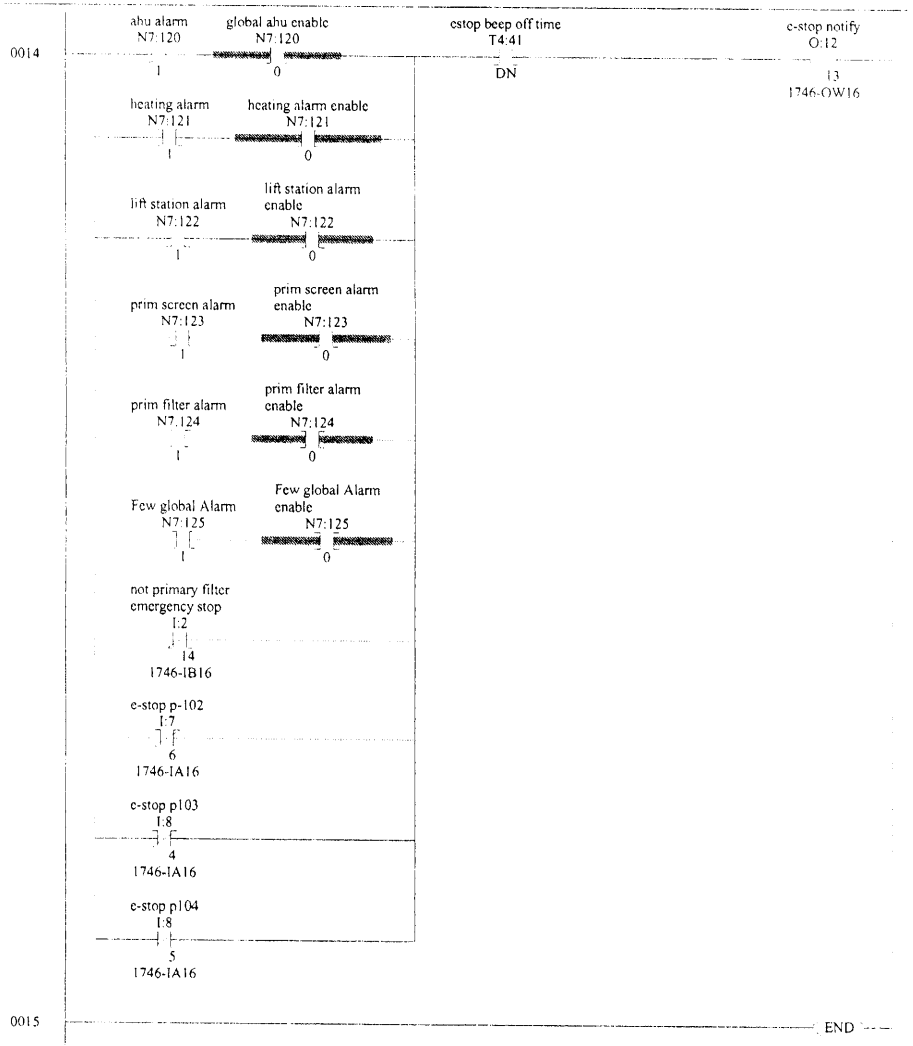


YFB-WWTP-JULLY12-06.RSS

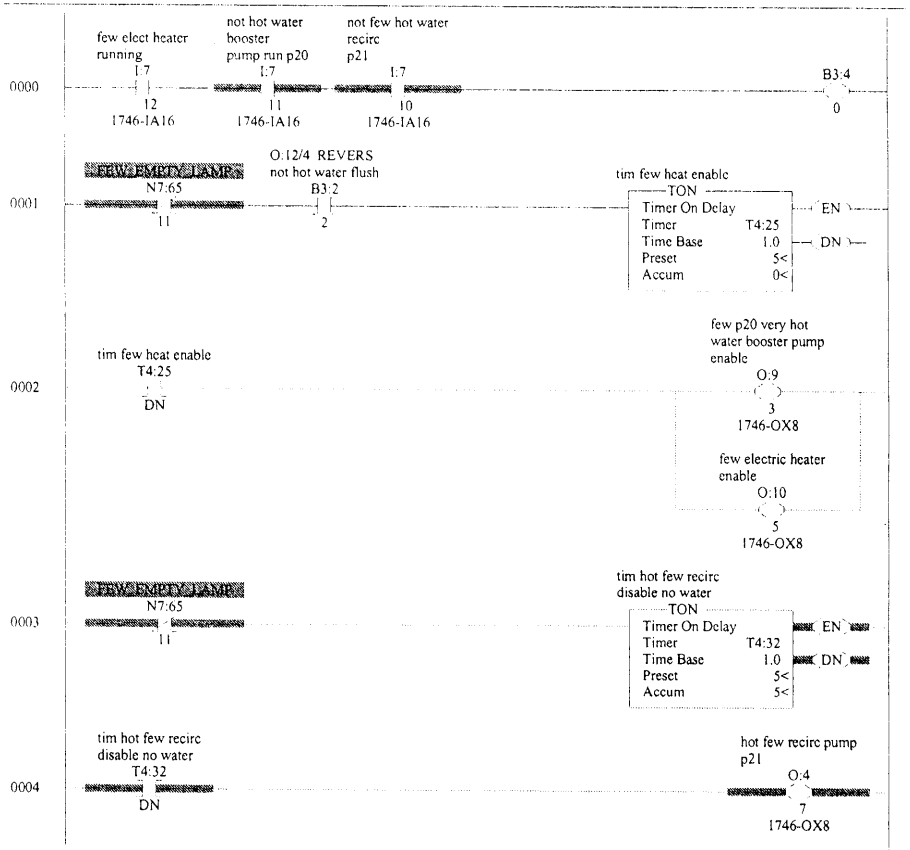
LAD 11 - ALARM --- Total Rungs in File = 16

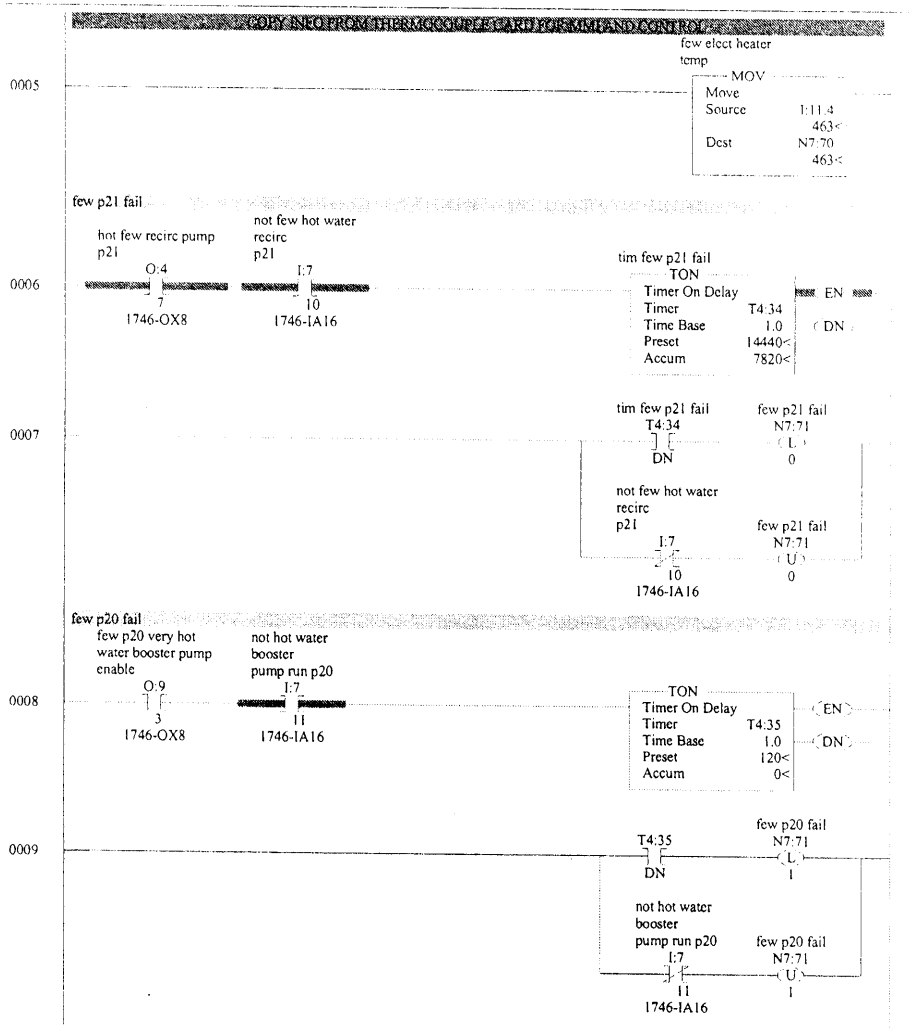


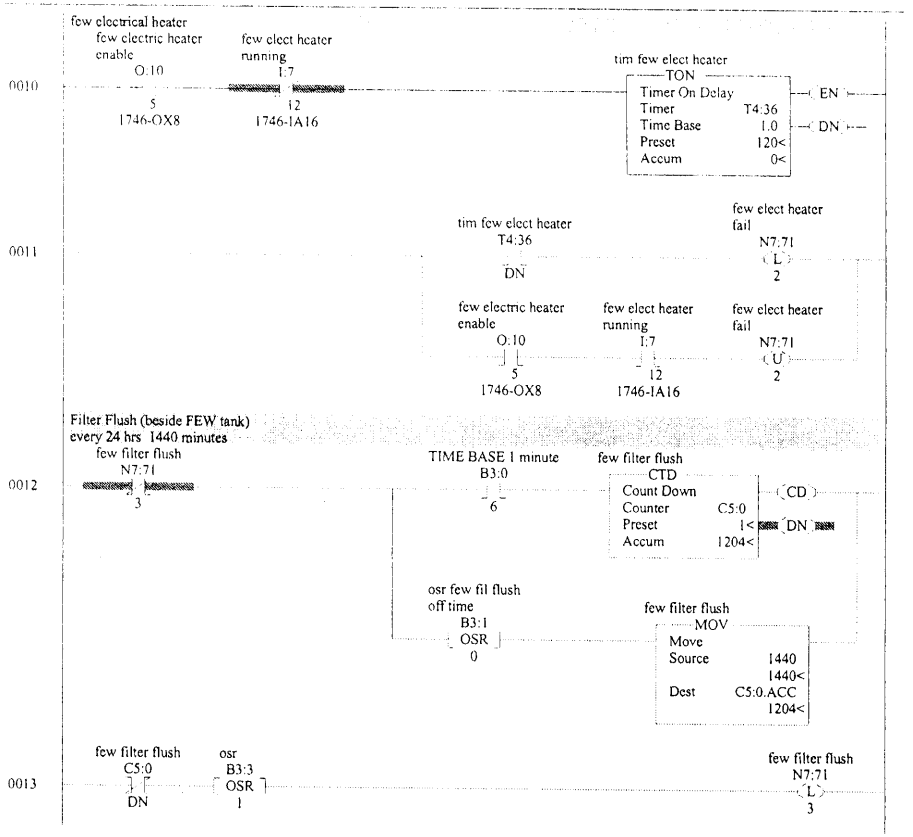
LAD 11 - ALARM --- Total Rungs in File = 16



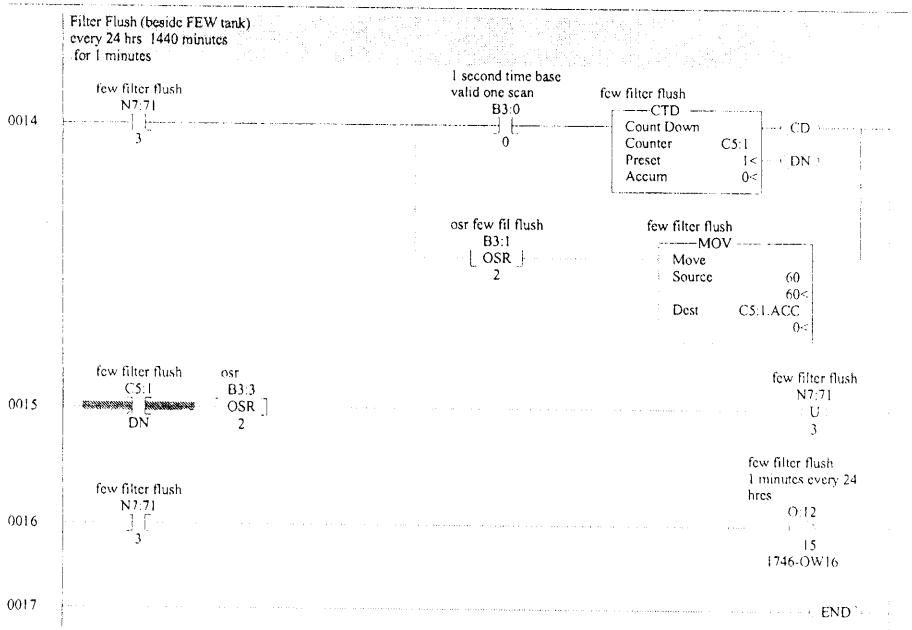
LAD 12 - FEW HEAT --- Total Rungs in File = 18




COPY INFO FROM THERMOCOUPLE CARD FOR MM AND CONTROL
0005
few elect heater temp
MOV
Move
Source I:11.4 463<
Dest N7:70 463<
few p21 fail
0006
hot few recirc pump p21
O:4
7
1746-OX8
not few hot water recirc p21
I:7
10
1746-IA16
tim few p21 fail
TON
Timer On Delay
Timer T4:34
Time Base 1.0
Preset 14440<
Accum 7820<
EN
DN
0007
tim few p21 fail
T4:34
DN
few p21 fail
N7:71
L
0
not few hot water recirc p21
I:7
10
1746-IA16
few p21 fail
N7:71
U
0
few p20 fail
0008
few p20 very hot water booster pump enable
O:9
3
1746-OX8
not hot water booster pump run p20
I:7
11
1746-IA16
TON
Timer On Delay
Timer T4:35
Time Base 1.0
Preset 120<
Accum 0<
EN
DN
0009
T4:35
DN
few p20 fail
N7:71
L
1
not hot water booster pump run p20
I:7
11
1746-IA16
few p20 fail
N7:71
U
1


0010
few electrical heater
few electric heater enable
O:10
5
1746-OX8
few elect heater running
I:7
12
1746-IA16
tim few elect heater
TON
Timer On Delay
Timer T4:36
Time Base 1.0
Preset 120<
Accum 0<
EN
DN
0011
tim few elect heater
T4:36
DN
few elect heater fail
N7:71
L
2
few electric heater enable
O:10
5
1746-OX8
few elect heater running
I:7
12
1746-IA16
few elect heater fail
N7:71
U
2
Filter Flush (beside FEW tank)
every 24 hrs 1440 minutes
0012
few filter flush
N7:71
3
TIME BASE 1 minute
B3:0
6
few filter flush
CTD
Count Down
Counter C5:0
Preset 1<
Accum 1204<
CD
DN
osr few fil flush off time
B3:1
OSR
0
few filter flush
MOV
Move
Source 1440 1440<
Dest C5:0.ACC 1204<
0013
few filter flush
C5:0
DN
osr
B3:3
OSR
1
few filter flush
N7:71
L
3

LAD 12 - FEW HEAT --- Total Rungs in File = 18



Data File O0 (bin) -- OUTPUT

Offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
O:3.0									0	1	0	0	1	0	0	1	1746-OX8 - 8-Output Isolated Relay
O:4.0									1	0	0	0	0	0	0	0	1746-OX8 - 8-Output Isolated Relay
O:5.0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
O:5.1	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
O:5.2	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
O:5.3	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
O:5.4	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
O:5.5	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
O:5.6	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
O:5.7	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
O:5.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
O:5.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
O:5.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
O:5.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
O:6.0	0	1	1	0	1	0	0	1	0	1	0	1	0	1	0	0	1746-NO4I - Analog 4 Ch. Current Output
O:6.1	0	0	0	1	1	0	0	0	0	1	1	0	0	0	1	0	1746-NO4I - Analog 4 Ch. Current Output
O:6.2	0	0	0	1	1	0	0	0	0	1	1	0	0	0	1	0	1746-NO4I - Analog 4 Ch. Current Output
O:6.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NO4I - Analog 4 Ch. Current Output
O:9.0									0	1	0	0	0	0	0	0	1746-OX8 - 8-Output Isolated Relay
O:10.0									0	1	0	1	0	1	0	1	1746-OX8 - 8-Output Isolated Relay
O:11.0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1746-NT8 - Analog 8 Ch Thermocouple Inp
O:11.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1746-NT8 - Analog 8 Ch Thermocouple Inp
O:11.2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1746-NT8 - Analog 8 Ch Thermocouple Inp
O:11.3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1746-NT8 - Analog 8 Ch Thermocouple Inp
O:11.4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1746-NT8 - Analog 8 Ch Thermocouple Inp
O:11.5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1746-NT8 - Analog 8 Ch Thermocouple Inp
O:11.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NT8 - Analog 8 Ch Thermocouple Inp
O:11.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NT8 - Analog 8 Ch Thermocouple Inp
O:12.0	0	0	0	0	0	0	1	1	1	0	1	1	0	1	0	1	1746-OW16 - 16-Output (RLY) 240 VAC
O:13.0	0	0	1	0	0	0	1	1	0	0	0	1	1	1	0	0	1746-NO4I - Analog 4 Ch. Current Output
O:13.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NO4I - Analog 4 Ch. Current Output
O:13.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NO4I - Analog 4 Ch. Current Output
O:13.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NO4I - Analog 4 Ch. Current Output
O:14.0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
O:14.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
O:14.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
O:14.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
O:14.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
O:14.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
O:14.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
O:14.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
O:14.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
O:14.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
O:14.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
O:14.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl

Data File I1 (bin) -- INPUT

Offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
I:1.0	1	0	0	1	0	1	1	0	0	1	0	0	1	0	1	1	1746-IB16 - 16-Input (SINK) 24 VDC
I:2.0	0	1	1	1	0	1	0	0	0	0	0	0	1	0	0	1	1746-IB16 - 16-Input (SINK) 24 VDC
I:5.0	0	1	0	0	0	0	1	0	1	1	1	0	1	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
I:5.1	0	0	0	0	1	1	1	1	1	0	0	0	1	0	0	1	1746-NI8 - Analog 8 Channel Input - Cl
I:5.2	0	0	1	0	0	0	0	0	0	1	0	1	1	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
I:5.3	0	0	0	0	1	1	1	1	1	0	0	1	0	1	1	0	1746-NI8 - Analog 8 Channel Input - Cl
I:5.4	0	0	1	0	1	0	0	1	0	1	0	1	1	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
I:5.5	0	0	1	1	0	0	1	1	1	0	1	1	0	0	0	1	1746-NI8 - Analog 8 Channel Input - Cl
I:5.6	0	0	0	1	0	0	1	1	0	1	0	1	0	0	1	0	1746-NI8 - Analog 8 Channel Input - Cl
I:5.7	0	0	1	0	1	0	0	0	0	1	1	1	1	0	1	0	1746-NI8 - Analog 8 Channel Input - Cl
I:5.8	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
I:5.9	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
I:5.10	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
I:5.11	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
I:5.12	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
I:5.13	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
I:5.14	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
I:5.15	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
I:7.0	1	1	1	0	1	1	0	0	1	1	0	0	1	0	1	1	1746-IA16 - 16-Input 100/120 VAC
I:8.0	0	1	1	0	1	0	0	0	0	0	1	1	1	0	1	1	1746-IA16 - 16-Input 100/120 VAC
I:11.0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	1746-NT8 - Analog 8 Ch Thermocouple Inp
I:11.1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	0	1746-NT8 - Analog 8 Ch Thermocouple Inp
I:11.2	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	1	1746-NT8 - Analog 8 Ch Thermocouple Inp
I:11.3	0	0	0	0	0	0	1	0	1	1	1	0	1	1	0	0	1746-NT8 - Analog 8 Ch Thermocouple Inp
I:11.4	0	0	0	0	0	0	0	1	1	1	0	0	1	1	1	1	1746-NT8 - Analog 8 Ch Thermocouple Inp
I:11.5	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	0	1746-NT8 - Analog 8 Ch Thermocouple Inp
I:11.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NT8 - Analog 8 Ch Thermocouple Inp
I:11.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NT8 - Analog 8 Ch Thermocouple Inp
I:14.0	0	0	1	0	1	0	0	0	1	1	0	0	0	1	1	0	1746-NI8 - Analog 8 Channel Input - Cl
I:14.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
I:14.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
I:14.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
I:14.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
I:14.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
I:14.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
I:14.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
I:14.8	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	1	1746-NI8 - Analog 8 Channel Input - Cl
I:14.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
I:14.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
I:14.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
I:14.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
I:14.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
I:14.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl
I:14.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1746-NI8 - Analog 8 Channel Input - Cl

Data File S2 (hex) -- STATUS

First Pass S:1/15 = No
Index Register S:24 = 0
Free Running Clock S:4 = 1111-1010-1100-0101
Index Across Data Files S:2/3 = No
CIF Addressing Mode S:2/8 = 0
Online Edits S:33/11 - S:33/12 = No online edits exist

Day of the Week S:53
DD / M
Date S:39-37 = 13 /
HH : MM
Time S:40-42 = 13 :

OS Catalog Number S:57 = 501
OS Series S:58 = C
OS FRS S:59 = 6
Processor Catalog Number S:60 = 551
Processor Series S:61 = B
Processor FRN S:62 = 4
Ethernet Daughterboard Series S:9 = 2
Ethernet Daughterboard FRN S:10 = 50

User Program Type S:63 = 2049
User Program Functionality Index S:64 =
User RAM Size S:66 = 16
OS Memory Size S:66 = 512

Maximum (x10 ms) S:22 = 2
Average (x10 ms) S:23 = 1
Current (x10 ms) S:3 (low byte) = 1
Watchdog (x10 ms) S:3 (high byte) = 10
Last 1ms Scan Time S:35 = 9
Scan Toggle Bit S:33/9 = 0
Time Base Selection S:33/13 = 0

Math Overflow Selected S:2/14 = 0
Overflow Trap S:5/0 = 0
Carry S:0/0 = 0
Overflow S:0/1 = 0
Zero Bit S:0/2 = 0
Sign Bit S:0/3 = 0
Floating Point Flag Disable S:34/2 = 0

Math Register (lo word) S:13 = 60
Math Register (high word) S:14-S:13
Math Register (32 Bit) S:14-S:13 =

Processor Mode S:1/0- S:1/4 = Remote Run
Comms Active S:1/7 = 1
Incoming Cmd Pending S:2/5 = 0
Msg Reply Pending S:2/6 = 0
DH485 Gateway Disable Bit S:34/0 = 0
DF1 Gateway Enable Bit S:34/5 = 0

Outgoing Msg Cmd Pending S:2/7 = 0
Comms Servicing Sel S:2/15 = 1
Msg Servicing Sel S:33/7 = 0

Suspend Code S:7 = 0
Suspend File S:8 = 0
Compiled For Single Step S:2/4 = Yes

Test Single Step Breakpoint
Rung # S:18 = 0
File # S:19 = 0

Fault/Powerdown
Fault/Powerdown (Rung #) S:20 = 0
(File #) S:21 = 0

Test Single Step
Rung # S:16 = 0
File # S:17 = 2

Fault Override At Power Up S:1/8 = 0
Startup Protection Fault S:1/9 = 0
Major Error Halt S:1/13 = 0
Overflow Trap S:5/0 = 0
Control Register Error S:5/2 = 0
Major Error Executing User
Fault Rtn. S:5/3 = 0
M0/M1 Referenced On Disabled
Slot S:5/4 = 0
Battery Low S:5/11 = 0
Fault/Powerdown (Rung #) S:20 = 0
(File #) S:21 = 0

ASCII String Manipulation error S:5
Fault Routine S:29 = 0
Major Error S:6 = 0h

Error Description:

Setpoint (x10ms) S:30 = 0
File Number S:31 = 0
10 uS Time Stamp S:43 = 0
Pending Bit S:2/0 = 0
Enable Bit S:2/1 = 1

Resolution Select Bit S:2/10 = 0
Executing Bit S:2/2 = 0
Overflow Bit S:5/10 = 0
Lost S:36/9 = 0
Interrrupt Latency Control S:33/8 =

Forces Enabled S:1/5 = No
Forces Installed S:1/6 = No

Data File B3 (bin) -- BINARY

Offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(Symbol) Description
B3:0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	1	0	
B3:1	0	0	1	0	0	1	1	0	0	1	0	0	0	0	0	1	
B3:2	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	
B3:3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
B3:4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
B3:5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	

Data File T4 -- TIMER

Offset	EN	TT	DN	BASE	PRE	ACC	(Symbol) Description
T4:0	1	1	0	1.0 sec	18	13	1/100 hhs base
T4:1	0	0	0	1.0 sec	18	0	1/100 h base
T4:2	0	0	0	1.0 sec	7200	0	sscr wash duty
T4:3	0	0	0	1.0 sec	60	0	sscr wash period
T4:4	0	0	0	1.0 sec	1	0	timer few 01 fail
T4:5	0	0	0	1.0 sec	1	0	timer few 02 fail
T4:6	0	0	0	1.0 sec	1	0	timer few 03 fail
T4:7	0	0	0	.01 sec	50	50	tim ahu on
T4:8	0	0	0	.01 sec	50	0	tim ahu
T4:9	0	0	0	.01 sec	50	0	ahu ls
T4:10	1	0	1	1.0 sec	30	30	tim 1 minute
T4:11	1	1	0	1.0 sec	30	11	tim 1 minute
T4:12	0	0	0	1.0 sec	439	0	tim ahu defrost
T4:13	0	0	0	1.0 sec	1	0	ahu sf fail
T4:14	0	0	0	1.0 sec	1	0	ahu ef fail
T4:15	0	0	0	1.0 sec	2	0	
T4:16	0	0	0	1.0 sec	300	0	tim ahu freeze
T4:17	0	0	0	1.0 sec	20	0	tim low gly temp
T4:18	0	0	0	1.0 sec	3	0	tim alarm high screw level
T4:19	0	0	0	1.0 sec	2	0	
T4:20	0	0	0	1.0 sec	600	0	ahu pre defrost time
T4:21	1	0	1	1.0 sec	3	3	tim full potable water
T4:22	0	0	0	1.0 sec	30	0	tim few empty
T4:23	0	0	0	1.0 sec	120	0	tim lshh104
T4:24	0	0	0	1.0 sec	120	0	tim auto prim fil
T4:25	0	0	0	1.0 sec	5	0	tim few heat enable
T4:26	1	1	0	.01 sec	50	10	tim 1 sec time base
T4:27	0	0	0	.01 sec	50	0	tim 1 sec time base
T4:28	0	0	0	1.0 sec	30	0	tim sscr level auto wash
T4:29	0	0	0	1.0 sec	30	0	
T4:30	0	0	0	1.0 sec	1	0	tim prifil blower fan fail
T4:31	0	0	0	1.0 sec	1	0	prim filter blower fail
T4:32	1	0	1	1.0 sec	5	5	tim hot few recirc disable no water
T4:33	1	0	1	1.0 sec	5	5	few ovwerflow
T4:34	1	1	0	1.0 sec	14440	7820	tim few p21 fail
T4:35	0	0	0	1.0 sec	120	0	
T4:36	0	0	0	1.0 sec	120	0	tim few elect heater
T4:37	0	0	0	1.0 sec	1	0	tim sscr 105 fail
T4:38	0	0	0	1.0 sec	1	0	
T4:39	0	0	0	1.0 sec	30	0	tim very low few
T4:40	0	0	0	1.0 sec	600	0	tim few pump fail
T4:41	1	1	0	1.0 sec	4	1	estop beep off time
T4:42	0	0	0	.01 sec	50	0	estop beep on time
T4:43	0	0	0	1.0 sec	60	0	tim building alarm lag
T4:44	0	0	0	1.0 sec	60	0	tim process alarm

Data File C5 -- COUNTER

Offset	CU	CD	DN	OV	UN	UA	PRE	ACC	(Symbol) Description
C5:0	0	0	1	0	0	0	1	1204	few filter flush
C5:1	0	0	0	0	0	0	1	0	few filter flush
C5:2	0	0	1	0	0	0	1	67	hot hater screen flush max time w/o flush
C5:3	0	0	0	0	0	0	1	0	hot hater screen flush time
C5:4	0	0	1	0	0	0	1	402	cold water screen flush off time
C5:5	0	0	0	0	0	0	1	0	cold water bottum flush on time

Data File R6 -- CONTROL

Offset	EN	EU	DN	EM	ER	UL	IN	FD	LEN	POS	(Symbol) Description
R6:0	0	0	0	0	0	0	0	0	0	0	

Data File N7 (dec) -- INTEGER

Offset	0	1	2	3	4	5	6	7	8	9
N7:0	409	-812	9	2	83	3400	3200	600	400	1
N7:10	19	82	89	83	0	0	0	0	2	0
N7:20	17	0	0	0	1	10	0	0	100	0
N7:30	17	0	87	0	2	0	0	30	4888	364
N7:40	0	41	1483	2190	1032	58	462	75	0	120
N7:50	1	0	300	450	74	0	0	0	0	0
N7:60	0	0	0	0	0	0	1343	0	2	1
N7:70	463	48	0	0	0	748	199	0	600	0
N7:80	207	15	206	3	10	20	1	1	-40	439
N7:90	74	78	59	41	0	0	15	206	50	75
N7:100	-7508	1	5	5	12	3	2	200	70	305
N7:110	15	47	61	15	206	402	0	0	0	0
N7:120	1	1	1	1	1	1	0	0	0	0
N7:130	0	0	0	0	0	0	0	0	0	0
N7:140	0	0	0	0	0	0	0	0	0	0
N7:150	0	0	0	0	0	0	0	0	0	0
N7:160	0	0	0	0	0	0	0	0	0	0
N7:170	0	0	0	0	0	0	0	0	0	0
N7:180	0	0	0	0	0	0	0	0	0	0
N7:190	10	0	0	0	0	0	0	0	0	0
N7:200	0	8263	0	400	0	0	0	0	0	0
N7:210	0	0	0	0	0	0	0	0	0	0
N7:220	0	0	0	0	0	0	0	0	0	0
N7:230	0	0	0	0	0	0	0	0	0	0
N7:240	0	1	2	0	0	0	2	1	0	0
N7:250	79	83	64	46						

Data File F8 -- FLOAT

Offset	0	1	2	3	4
F8:0	4.19	-0.8666297	793.0349	895.598	1166.113
F8:5	699.2209	304.6961	361.0611	459.7974	442.6807
F8:10	34.72018	6.700058	70.7067	3024.63	3024.63
F8:15	958.9944	1133.425	11.18016	0	0
F8:20	0.03646667	385.7378			

Data File N10 (dec) -- ROUTINGTAB

Offset	0	1	2	3	4	5	6	7	8	9
N10:0	-16216	201	-16216	202	0	0	0	0	0	0
N10:10	0	0	0	0	0	0	0	0	0	0
N10:20	0	0	0	0	0	0	0	0	0	0
N10:30	0	0	0	0	0	0	0	0	0	0
N10:40	0	0	0	0	0	0	0	0	0	0
N10:50	0	0	0	0	0	0	0	0	0	0
N10:60	0	0	0	0	0	0	0	0	0	0
N10:70	0	0	0	0	0	0	0	0	0	0
N10:80	0	0	0	0	0	0	0	0	0	0
N10:90	0	0	0	0	0	0	0	0	0	0
N10:100	0	0	0	0	0	0	0	0	0	0
N10:110	0	0	0	0	0	0	0	0	0	0
N10:120	0	0	0	0	0	0	0	0		

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Data File N11 (dec) -- STRING -- mmi

Offset	0	1	2	3	4	5	6	7	8	9
N11:0	3845	3845	3845	3845	3845	3845	3845	3845	0	0
N11:10	0	0	-32767	-32767	-32767	-32767	-32767	-32767	0	0
N11:20	3077	0	0	0	0	0	0	0	0	0
N11:30	0	0								

Data File N20 (dec) -- CH1 Diag

Offset	0	1	2	3	4	5	6	7	8	9
N20:0	0	0	437	-23522	437	-23527	0	0	0	0
N20:10	0	0	0	0	-22299	6872	9166	-31899	365	6195
N20:20	453	2604	0	0	0	0	0	0	0	0
N20:30	0	0	0	0	0	0	0	471	0	178
N20:40	0	1041	0	0	2	0	-17378	-25279	-16216	200
N20:50	2	2	0	16	2	0	0	0	0	0
N20:60	0	0	0	0	0	0	0	0	0	0
N20:70	0	0	0	0	0	0	0	0	0	0
N20:80	0	0	0	0	0	0	0	0	0	0
N20:90	0	0	0	0	0	0	0	0	0	0
N20:100	0	0	0	0	0	0	0	0	0	0
N20:110	0	0	0	0	0	0	0	0	0	0
N20:120	0	0	0	0	0	0	0	0	0	0
N20:130	0	0	0	0	0	0	0	0	0	0
N20:140	0	0	0	0	0	0	0	0	0	0
N20:150	0	0	0	0	0	0	0	0	0	0
N20:160	0	0	0	0	0	0	0	0	0	0
N20:170	0	0	0	0	0	0	0	0	0	0
N20:180	0	0	0	0	0	0	0	0	0	0
N20:190	0	0	0	0	0	0	0	0	0	0
N20:200	0	0	0	0	0	0	0	0	0	0
N20:210	0	0	0	0	0	0	0	0	0	0
N20:220	0	0	0	0	0	0	0	0	0	0
N20:230	0	0	0	0	0	0	0	0	0	0
N20:240	0	0	0	0	0	0	0	0	0	0
N20:250	0	0	0	0	0	0				

Data File N21 (dec) -- PID LEN 23

Offset	0	1	2	3	4	5	6	7	8	9
N21:0	-32735	0	7680	1	1	0	0	0	0	200
N21:10	0	0	0	1023	8263	-583	0	13	-28517	2
N21:20	1136	15677	7680							

Address (Symbol) = Value [Description]


```
O:3/0         - {P102START}
                OTE - File #5 LIFTSTATIO - 17
O:3/1         - {P104START}
                OTE - File #5 LIFTSTATIO - 27
O:3/3         - {SSCR106RUN} wash selenoid sscr 106
                OTE - File #6 PRIM SCRN - 13
                XIC - File #6 PRIM SCRN - 4
                XIO - File #6 PRIM SCRN - 15
O:3/4         - {P103START}
                OTE - File #5 LIFTSTATIO - 22
O:3/6         - {SSCR105RUN} sscr 105 output run
                OTE - File #6 PRIM SCRN - 12
                XIC - File #6 PRIM SCRN - 2
                XIO - File #6 PRIM SCRN - 15
O:3/7         - {LEAKALARMSESET} MINICAS LEEK ALARM RESET
                OTE - File #5 LIFTSTATIO - 35
O:4/0         - few low level red lamp on
                OTE - File #8 FEW TANK - 4
O:4/1         - few full level blue lamp
                OTE - File #8 FEW TANK - 5
O:4/2         - {HORNFEW} horn few plus selenoid valve to dump few water outside when potable
                OTE - File #8 FEW TANK - 8
O:4/4         - {FEW_P1} start few p1
                OTE - File #8 FEW TANK - 15
                XIC - File #8 FEW TANK - 16
O:4/5         - {FEW_P2} start few p2
                OTE - File #8 FEW TANK - 18
                XIC - File #8 FEW TANK - 19
O:4/6         - {FEW_P3} start few p3
                OTE - File #8 FEW TANK - 21
                XIC - File #8 FEW TANK - 22
O:4/7         - hot few recirc pump p21
                OTE - File #12 FEW HEAT - 4
                XIC - File #12 FEW HEAT - 6
O:5.0         - COP - File #2 MAIN - 2
FILE O:5.0 LEN:12 - COP - File #2 MAIN - 2
O:6.0         - {SC_102} raw waste water speed set point analog out 4-20ma int 6242-31208
                MOV - File #5 LIFTSTATIO - 15
                SCP - File #5 LIFTSTATIO - 15
O:6.1         - {SC_104} raw waste water speed set point
                MOV - File #5 LIFTSTATIO - 25
                SCP - File #5 LIFTSTATIO - 24, 25
O:6.2         - {SC_103} raw waste water speed set point
                MOV - File #5 LIFTSTATIO - 20
                SCP - File #5 LIFTSTATIO - 20
O:6.3         - ahu-3 coil control valve
                SCP - File #4 AHU - 6
O:9/0         - {STOP_B1}
                OTE - File #10 BOILLERS - 4
O:9/1         - {STOP_B2}
                OTE - File #10 BOILLERS - 4
O:9/3         - few p20 very hot water booster pump enable
                OTE - File #12 FEW HEAT - 2
                XIC - File #12 FEW HEAT - 8
O:9/4         - auto dialler chanel 1
                OTE - File #11 ALARM - 10
O:9/5         - auto dialler chanel 2
                OTE - File #11 ALARM - 8
O:9/6         - ahu unit on lamp
                OTE - File #4 AHU - 15
                XIC - File #4 AHU - 28
O:9/7         - defrost damper
                OTE - File #4 AHU - 27
O:10/0        - ahu3 sf run low
                OTE - File #4 AHU - 18
                XIC - File #4 AHU - 19, 20
O:10/1        - ahu3 sf run high
```

```
                OTE - File #4 AHU - 18
                XIC - File #4 AHU - 19, 20
O:10/2        - ahu3 ef run low
                OTE - File #4 AHU - 18
                XIC - File #4 AHU - 21, 22
O:10/3        - ahu3 ef run high
                OTE - File #4 AHU - 18
                XIC - File #4 AHU - 21, 22
O:10/4        - fresh air intake outdoor air damper
                OTE - File #4 AHU - 16
O:10/5        - few electric heater enable
                OTE - File #12 FEW HEAT - 2
                XIC - File #12 FEW HEAT - 10, 11
O:10/6        - exhaust air damper
                OTE - File #4 AHU - 16
O:11.0        - COP - File #2 MAIN - 1
FILE O:11.0 LEN:8 - COP - File #2 MAIN - 1
O:12/0        - prim filt auger vfd start
                OTE - File #7 PRIM FILT - 21
O:12/1        - prim filt auger vfd fault
                OTE - File #7 PRIM FILT - 30
O:12/2        - prim filt drive vfd start
                OTE - File #7 PRIM FILT - 23
                XIO - File #7 PRIM FILT - 19, 25
O:12/3        - prim filt drive vfd fault reset
                OTE - File #7 PRIM FILT - 30
O:12/4        - hot water flush
                OTE - File #7 PRIM FILT - 24
O:12/5        - cold water flush POWER = CLOSE VALVE
                OTE - File #7 PRIM FILT - 18
O:12/6        - cold water bottom flush valve POWER = CLOSE SO OPEN PRESSVALVE
                OTE - File #7 PRIM FILT - 17
                XIO - File #7 PRIM FILT - 18
O:12/7        - prim blower start
                OTE - File #7 PRIM FILT - 23
                XIC - File #7 PRIM FILT - 37
O:12/8        - prim blower fan start
                OTE - File #7 PRIM FILT - 23
                XIC - File #7 PRIM FILT - 34
O:12/9        - primary filter run lamp
                OTE - File #7 PRIM FILT - 23
O:12/10       - primary filter fail lamp
                OTE - File #11 ALARM - 5
                XIO - File #7 PRIM FILT - 23
O:12/11       - {SV_106} wash selenoid sscr 105
                OTE - File #6 PRIM SCRN - 12
                XIC - File #6 PRIM SCRN - 10
O:12/12       - {SV_105} wash selenoid sscr 106
                OTE - File #6 PRIM SCRN - 13
                XIC - File #6 PRIM SCRN - 11
O:12/13       - e-stop notify
                OTE - File #11 ALARM - 14
O:12/15       - few filter flush 1 minutes every 24 hres
                OTE - File #12 FEW HEAT - 16
O:13.0        - {PRIMFIL_BELT_SPD} primary filter belt speed
                SCP - File #7 PRIM FILT - 7, 25
O:14.0        - COP - File #2 MAIN - 0
FILE O:14.0 LEN:12 - COP - File #2 MAIN - 0
I:1/0         - {P102_AUTO} raw sewer
                XIC - File #5 LIFTSTATIO - 14
I:1/1         - {P102_RUN} raw sewer
                XIC - File #3 TIME BASE - 10
                      File #5 LIFTSTATIO - 14
I:1/2         - {P102_FAULT} raw sewer
                XIC - File #5 LIFTSTATIO - 14
I:1/3         - {P102_LEAK} raw sewer
                XIO - File #5 LIFTSTATIO - 14
```



```
I:1/4         - GAS ch1 low
                XIC - File #9 GAS ALARM - 0
I:1/5         - GAS ch1 high
                XIC - File #9 GAS ALARM - 0
I:1/6         - ad active
                XIO - File #11 ALARM - 11
I:1/7         - gas ch2 low
                XIC - File #9 GAS ALARM - 0
I:1/8         - gas ch2 high
                XIC - File #9 GAS ALARM - 0
I:1/9         - gas global fault
                XIO - File #9 GAS ALARM - 1
I:1/10        - prim filter vfd run
                XIC - File #7 PRIM FILT - 23, 28
I:1/11        - prim filter belt drive fail
                XIC - File #7 PRIM FILT - 29
I:1/12        - {P103_AUTO}
                XIC - File #5 LIFTSTATIO - 19
I:1/13        - {P103_RUN}
                XIC - File #3 TIME BASE - 10
                      File #5 LIFTSTATIO - 19
I:1/14        - {P103_FAULT}
                XIC - File #5 LIFTSTATIO - 19
I:1/15        - {P103_LEAK}
                XIO - File #5 LIFTSTATIO - 19
I:2/0         - {P104_AUTO}
                XIC - File #5 LIFTSTATIO - 23
I:2/1         - {P104_RUN}
                XIC - File #3 TIME BASE - 10
                      File #5 LIFTSTATIO - 23
I:2/2         - {P104_FAULT}
                XIC - File #5 LIFTSTATIO - 23
I:2/3         - {P104_LEAK}
                XIO - File #5 LIFTSTATIO - 23
I:2/4         - gaz ch3 low
                XIC - File #9 GAS ALARM - 0
I:2/5         - gas ch3 high
                XIC - File #9 GAS ALARM - 0
I:2/7         - gas ch4 low
                XIC - File #9 GAS ALARM - 0
I:2/8         - gas ch4 high
                XIC - File #9 GAS ALARM - 0
I:2/10        - prim filter auger vfd run
                XIC - File #7 PRIM FILT - 26
I:2/11        - prim filter auger drive fail
                XIC - File #7 PRIM FILT - 27
I:2/12        - lahh  103 prim screen hh level
                XIO - File #6 PRIM SCRN - 7
I:2/13        - lshh 104 lift station hh level
                XIO - File #5 LIFTSTATIO - 9, 11
I:2/14        - not primary filter emergency stop
                XIC - File #7 PRIM FILT - 17, 21, 23, 33
                XIO - File #11 ALARM - 14
I:5.0         - {SI_102} p-102 raw wastewater speed indication
                SCP - File #5 LIFTSTATIO - 16
I:5.1         - {SI_104} p-104 raw wastewater speed indication
                SCP - File #5 LIFTSTATIO - 26
I:5.2         - {FI_101} raw waste water flow indication
                SCP - File #5 LIFTSTATIO - 3
I:5.3         - {SI_103} p 103 raw waste water speed indication
                SCP - File #5 LIFTSTATIO - 21
I:5.4         - {LI_101} lit 101 waste water lift station level indication
                SCP - File #5 LIFTSTATIO - 0, 1
                LES - File #5 LIFTSTATIO - 2
I:5.5         - {LIT_102} screening chamber level indication
                SCP - File #6 PRIM SCRN - 0, 1
                LES - File #6 PRIM SCRN - 9
```


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```
I:5.6       - {LI_501} lit 501 (few) final effluent water tank level indication
              SCP - File #8 FEW TANK - 0
I:5.7       - primary filter level
              SCP - File #7 PRIM FILT - 1
I:7/0       - {YS_105} sscr 105 auto
              XIO - File #6 PRIM SCRN - 10
I:7/1       - {MM_105} sscr 105 run
              XIC - File #3 TIME BASE - 10
                    File #6 PRIM SCRN - 3, 10
              XIO - File #6 PRIM SCRN - 2
I:7/2       - {YA_105} sscr 105 fault
              XIC - File #6 PRIM SCRN - 10
I:7/3       - {WA_105_} sscr 105 high torque
              XIO - File #6 PRIM SCRN - 10
I:7/4       - {FEW__PS1}
              XIC - File #8 FEW TANK - 9, 10, 15, 18, 21
I:7/5       - {FEW__PS2}
              XIC - File #8 FEW TANK - 9, 10, 15, 18, 21
I:7/6       - e-stop p-102
              XIC - File #5 LIFTSTATIO - 14
              XIO - File #11 ALARM - 14
I:7/7       - {AHU_AUTO} auto
              XIC - File #4 AHU - 7, 27
I:7/8       - {AHU_HIGH_SPEED} high speed
              XIC - File #4 AHU - 8, 10, 14
              XIO - File #4 AHU - 12
I:7/9       - {AHU_LOW_SPEED} low speed
              XIC - File #4 AHU - 8, 12, 14
              XIO - File #4 AHU - 10
I:7/10      - not few hot water recirc p21
              XIC - File #3 TIME BASE - 10
                    File #12 FEW HEAT - 0, 6
              XIO - File #12 FEW HEAT - 7
I:7/11      - not hot water booster pump run p20
              XIC - File #3 TIME BASE - 10
                    File #12 FEW HEAT - 0, 8
              XIO - File #12 FEW HEAT - 9
I:7/12      - few elect heater running
              XIC - File #3 TIME BASE - 10
                    File #12 FEW HEAT - 0, 11
              XIO - File #12 FEW HEAT - 10
I:7/13      - ptoable water blue lamp
              XIC - File #8 FEW TANK - 6
I:7/14      - {BLDGLAMP1} bldg lamp on
              XIC - File #4 AHU - 17
I:7/15      - {BLDGLAMP2} building lamp on
              XIC - File #4 AHU - 17
I:8/0       - {YS_106} sscr 106 auto
              XIO - File #6 PRIM SCRN - 11
I:8/1       - {MM_106} sscr 106 run
              XIC - File #3 TIME BASE - 10
                    File #6 PRIM SCRN - 5, 11
              XIO - File #6 PRIM SCRN - 4
I:8/2       - {YA_106} sscr 106 fault
              XIC - File #6 PRIM SCRN - 11
I:8/3       - {WA_106} sscr 106 high torque
              XIO - File #6 PRIM SCRN - 11
I:8/4       - e-stop p103
              XIC - File #5 LIFTSTATIO - 19
              XIO - File #11 ALARM - 14
I:8/5       - e-stop p104
              XIC - File #5 LIFTSTATIO - 23
              XIO - File #11 ALARM - 14
I:8/6       - mcc ahu3 sf not running
              XIC - File #4 AHU - 19, 20
              XIO - File #4 AHU - 0, 15, 16, 19
I:8/7       - mcc ahu3 ef not running
```



```
              XIC - File #4 AHU - 21, 22
              XIO - File #4 AHU - 0, 15, 16, 21
I:8/8       - {FEW_P1_RUN}
              XIC - File #8 FEW TANK - 12
              XIO - File #8 FEW TANK - 16
I:8/9       - {FEW_P2_RUN}
              XIC - File #8 FEW TANK - 13
              XIO - File #8 FEW TANK - 19
I:8/10      - {FEW_P3_RUN}
              XIC - File #8 FEW TANK - 14
              XIO - File #8 FEW TANK - 22
I:8/11      - primary filter on switch
              XIC - File #7 PRIM FILT - 17, 21, 23
I:8/12      - filter reset button
              XIC - File #7 PRIM FILT - 30, 40
I:8/13      - prim fil blower  run
              XIC - File #7 PRIM FILT - 31, 39
              XIO - File #7 PRIM FILT - 37
I:8/14      - prim fil blower fan run
              XIC - File #7 PRIM FILT - 32, 36
              XIO - File #7 PRIM FILT - 34
I:8/15      - low fuel day tank
              XIC - File #11 ALARM - 0
I:11.0      - {AHU3_SAT} ahu3 supply air temperature
              MOV - File #4 AHU - 1
I:11.1      - {AHU3_EAT} ahu3 exhaust air temperature
              MOV - File #4 AHU - 1
I:11.2      - {AHU3_OAT} ahu3 outside air temperature
              MOV - File #4 AHU - 1
I:11.3      - MOV - File #4 AHU - 1
I:11.4      - few elect heater temp
              MOV - File #12 FEW HEAT - 5
I:11.5      - trailler room temperature
              MOV - File #4 AHU - 1
I:14.0      - primary compressor pressur
              SCP - File #7 PRIM FILT - 3
S:1/15      - First Pass
              XIC - File #2 MAIN - 0, 1, 2
S:4/0       - XIC - File #3 TIME BASE - 15
S:4/5       - XIC - File #3 TIME BASE - 13
S:4/6       - XIC - File #7 PRIM FILT - 1, 3
S:4/8       - XIC - File #3 TIME BASE - 11
                    File #8 FEW TANK - 0
S:5/0       - Overflow Trap
              OTU - File #2 MAIN - 13
B3:0/0      - 1 second time base valid one scan
              OTE - File #3 TIME BASE - 7
              XIC - File #5 LIFTSTATIO - 5
                    File #12 FEW HEAT - 14
B3:0/1      - osr few
              OSR - File #7 PRIM FILT - 1
B3:0/2      - OSR - File #3 TIME BASE - 15
B3:0/3      - XIC - File #2 MAIN - 13
                    File #3 TIME BASE - 12, 14, 16
B3:0/4      - OSR - File #3 TIME BASE - 13
B3:0/5      - OSR - File #3 TIME BASE - 11
B3:0/6      - TIME BASE 1 minute
              OTE - File #3 TIME BASE - 4
              XIC - File #7 PRIM FILT - 9, 11, 13, 15
                    File #12 FEW HEAT - 12
B3:0/7      - OSR - File #8 FEW TANK - 0
B3:0/8      - lshh 104 latch for time delay (lift station emerg pump run)
              OTL - File #5 LIFTSTATIO - 11
              OTU - File #5 LIFTSTATIO - 13
              XIC - File #5 LIFTSTATIO - 12, 15, 17, 20, 22, 25, 27, 30
                    File #7 PRIM FILT - 5
B3:0/9      - OSR - File #5 LIFTSTATIO - 15
```

```
B3:0/10      - OSR - File #5 LIFTSTATIO - 20
B3:0/11      - OSR - File #5 LIFTSTATIO - 25
B3:0/12      - OSR - File #7 PRIM FILT - 7
B3:0/13      - osr prifil
               OSR - File #7 PRIM FILT - 3
B3:0/14      - alayays on
               OTE - File #3 TIME BASE - 8
               XIC - File #6 PRIM SCRN - 12, 13
               XIO - File #3 TIME BASE - 9
B3:0/15      - alaways off
               OTE - File #3 TIME BASE - 9
B3:1/0       - osr few fil flush off time
               OSR - File #12 FEW HEAT - 12
B3:1/1       - osr wash cycle sscr
               OSR - File #6 PRIM SCRN - 24
B3:1/2       - osr few fil flush
               OSR - File #12 FEW HEAT - 14
B3:1/3       - OSR - File #7 PRIM FILT - 40
B3:1/4       - osr ahu
               OSR - File #4 AHU - 11
B3:1/5       - osr ahu
               OSR - File #4 AHU - 13
B3:1/6       - osr pri fil
               OSR - File #7 PRIM FILT - 9
B3:1/7       - osr prim fil
               OSR - File #7 PRIM FILT - 10
B3:1/8       - osr pri fil
               OSR - File #7 PRIM FILT - 11
B3:1/9       - osr pri fil
               OSR - File #7 PRIM FILT - 12
B3:1/10      - osr prim fil
               OSR - File #7 PRIM FILT - 13
B3:1/11      - osr prim fil
               OSR - File #7 PRIM FILT - 14
B3:1/12      - osr prim fil
               OSR - File #7 PRIM FILT - 15
B3:1/13      - osr prim fil
               OSR - File #7 PRIM FILT - 16
B3:1/14      - osr prim fil
               OSR - File #7 PRIM FILT - 19
B3:1/15      - osr prim fil
               OSR - File #7 PRIM FILT - 20
B3:2/0       - {OSR}
               OSR - File #7 PRIM FILT - 22
B3:2/1       - OSR - File #3 TIME BASE - 4
B3:2/2       - O:12/4  REVERS not hot water flush
               OTE - File #7 PRIM FILT - 23
               XIC - File #12 FEW HEAT - 1
               XIO - File #7 PRIM FILT - 24
B3:2/3       - osr prim fil
               OSR - File #7 PRIM FILT - 6
B3:2/4       - OSR - File #3 TIME BASE - 7
B3:2/5       - osr prifil count wash
               OSR - File #7 PRIM FILT - 41
B3:3/0       - gas alarm ahu high speed
               OTE - File #9 GAS ALARM - 0
               XIC - File #4 AHU - 17
B3:3/1       - osr
               OSR - File #12 FEW HEAT - 13
B3:3/2       - osr
               OSR - File #12 FEW HEAT - 15
B3:4/0       - OTE - File #12 FEW HEAT - 0
B3:44/0      - sscr auto wash time latch
               OTL - File #6 PRIM SCRN - 8, 16
               OTU - File #6 PRIM SCRN - 18
               XIC - File #6 PRIM SCRN - 12, 13, 17
B3:44/1      - sscr auto wash level latch screw
```



```
               OTL - File #6 PRIM SCRN - 19
               OTU - File #6 PRIM SCRN - 23
               XIC - File #6 PRIM SCRN - 12, 13
B3:44/2      - sscr auto wash level latch wash
               OTL - File #6 PRIM SCRN - 21
               OTU - File #6 PRIM SCRN - 23
               XIC - File #6 PRIM SCRN - 12, 13, 22, 24
T4:0         - 1/100 hhs base
               TON - File #3 TIME BASE - 0
T4:0/DN      - XIC - File #3 TIME BASE - 1
T4:1         - 1/100 h base
               TON - File #3 TIME BASE - 1
T4:1/DN      - XIC - File #3 TIME BASE - 10
                     File #4 AHU - 0
                     File #7 PRIM FILT - 0
               XIO - File #3 TIME BASE - 0
T4:2         - sscr wash duty
               TON - File #6 PRIM SCRN - 15
T4:2/DN      - XIC - File #6 PRIM SCRN - 16
T4:2.PRE     - MUL - File #6 PRIM SCRN - 14
T4:3         - sscr wash period
               TON - File #6 PRIM SCRN - 17
T4:3/DN      - XIC - File #6 PRIM SCRN - 18
T4:3.PRE     - MUL - File #6 PRIM SCRN - 14
T4:4         - timer few 01 fail
               TON - File #8 FEW TANK - 16
T4:4/DN      - XIC - File #8 FEW TANK - 17
T4:5         - timer few 02 fail
               TON - File #8 FEW TANK - 19
T4:5/DN      - XIC - File #8 FEW TANK - 20
T4:6         - timer few 03 fail
               TON - File #8 FEW TANK - 22
T4:6/DN      - XIC - File #8 FEW TANK - 23
T4:7         - tim ahu on
               TOF - File #4 AHU - 8
T4:7/DN      - XIC - File #4 AHU - 9
T4:8         - tim ahu
               TON - File #4 AHU - 10
T4:8/DN      - XIC - File #4 AHU - 11
T4:9         - ahu ls
               TON - File #4 AHU - 12
T4:9/DN      - XIC - File #4 AHU - 13
T4:10        - tim 1 minute
               TON - File #3 TIME BASE - 2
T4:10/DN     - tim 1 minute
               XIC - File #3 TIME BASE - 3, 4
T4:11        - tim 1 minute
               TON - File #3 TIME BASE - 3
T4:11/DN     - XIO - File #3 TIME BASE - 2
T4:12        - tim ahu defrost
               TON - File #4 AHU - 23
T4:12/DN     - XIC - File #4 AHU - 26
T4:12.PRE    - MOV - File #4 AHU - 23
T4:13        - ahu sf fail
               TON - File #4 AHU - 20
T4:13/DN     - XIC - File #4 AHU - 20
T4:14        - ahu ef fail
               TON - File #4 AHU - 22
T4:14/DN     - XIC - File #4 AHU - 22
T4:15        - TON - File #7 PRIM FILT - 19
T4:15/DN     - XIC - File #7 PRIM FILT - 20
T4:15.PRE    - MOV - File #7 PRIM FILT - 19
T4:16        - tim ahu freeze
               TON - File #4 AHU - 28
T4:16/DN     - XIC - File #4 AHU - 29
T4:17        - tim low gly temp
               TON - File #10 BOILLERS - 7
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T4:17/DN	- XIC	File #10 BOILLERS - 8
T4:18	- tim	alarm high screw level
	TON	File #6 PRIM SCRN - 7
T4:18/DN	- XIC	File #6 PRIM SCRN - 8
T4:19	- TON	File #5 LIFTSTATIO - 9
T4:19/DN	- XIC	File #5 LIFTSTATIO - 10
T4:20	- ahu	pre defrost time
	TON	File #4 AHU - 24
T4:20/DN	- XIC	File #4 AHU - 25
T4:20.PRE	- MOV	File #4 AHU - 24
T4:21	- tim	full potable water
	TON	File #8 FEW TANK - 7
T4:21/DN	- XIO	File #8 FEW TANK - 8
T4:22	- tim	few empty
	TON	File #8 FEW TANK - 3
T4:22/DN	- XIC	File #8 FEW TANK - 4
T4:23	- tim	lshh104
	TON	File #5 LIFTSTATIO - 12
T4:23/DN	- XIC	File #5 LIFTSTATIO - 13
T4:24	- tim	auto prim fil
	TON	File #7 PRIM FILT - 8
T4:24/DN	- XIC	File #7 PRIM FILT - 8
T4:25	- tim	few heat enable
	TON	File #12 FEW HEAT - 1
T4:25/DN	- XIC	File #12 FEW HEAT - 2
T4:26	- tim	1 sec time base
	TON	File #3 TIME BASE - 5
T4:26/DN	- XIC	File #3 TIME BASE - 6, 7
T4:27	- tim	1 sec time base
	TON	File #3 TIME BASE - 6
T4:27/DN	- XIO	File #3 TIME BASE - 5
T4:28	- tim	sscr level auto wash
	TON	File #6 PRIM SCRN - 20
T4:28/DN	- XIC	File #6 PRIM SCRN - 21
T4:29	- TON	File #6 PRIM SCRN - 22
T4:29/DN	- XIC	File #6 PRIM SCRN - 23
T4:30	- tim	prifil blower fan fail
	TON	File #7 PRIM FILT - 34
T4:30/DN	- XIC	File #7 PRIM FILT - 35
T4:31	- prim	filter blower fail
	TON	File #7 PRIM FILT - 37
T4:31/DN	- XIC	File #7 PRIM FILT - 38
T4:32	- tim	hot few recirc disable no water
	TON	File #12 FEW HEAT - 3
T4:32/DN	- XIC	File #12 FEW HEAT - 4
T4:33	- few	ovwerflow
	TON	File #8 FEW TANK - 6
T4:33/DN	- XIC	File #8 FEW TANK - 7, 8
T4:34	- tim	few p21 fail
	TON	File #12 FEW HEAT - 6
T4:34/DN	- XIC	File #12 FEW HEAT - 7
T4:35	- TON	File #12 FEW HEAT - 8
T4:35/DN	- XIC	File #12 FEW HEAT - 9
T4:36	- tim	few elect heater
	TON	File #12 FEW HEAT - 10
T4:36/DN	- XIC	File #12 FEW HEAT - 11
T4:37	- tim	sscr 105 fail
	TON	File #6 PRIM SCRN - 2
T4:37/DN	- XIC	File #6 PRIM SCRN - 3
T4:38	- TON	File #6 PRIM SCRN - 4
T4:38/DN	- XIC	File #6 PRIM SCRN - 5
T4:39	- tim	very low few
	TON	File #8 FEW TANK - 1
T4:39/DN	- XIC	File #8 FEW TANK - 2
T4:40	- tim	few pump fail
	TON	File #8 FEW TANK - 10
T4:40/DN	- XIC	File #8 FEW TANK - 11

T4:41	- estop	beep off time
	TON	File #11 ALARM - 12
T4:41/DN	- XIC	File #11 ALARM - 13, 14
T4:42	- estop	beep on time
	TON	File #11 ALARM - 13
T4:42/DN	- XIO	File #11 ALARM - 12
T4:43	- tim	building alarm lag
	TON	File #11 ALARM - 7
T4:43/DN	- XIC	File #11 ALARM - 8
T4:44	- tim	process alarm
	TON	File #11 ALARM - 9
T4:44/DN	- XIC	File #11 ALARM - 10
C5:0	- few	filter flush
	CTD	File #12 FEW HEAT - 12
C5:0/DN	- XIO	File #12 FEW HEAT - 13
C5:0.ACC	- MOV	File #12 FEW HEAT - 12
C5:1	- few	filter flush
	CTD	File #12 FEW HEAT - 14
C5:1/DN	- XIO	File #12 FEW HEAT - 15
C5:1.ACC	- MOV	File #12 FEW HEAT - 14
C5:2	- hot	hater screen flush max time w/o flush
	CTD	File #7 PRIM FILT - 9
C5:2/DN	- XIO	File #7 PRIM FILT - 10
C5:2.ACC	- MUL	File #7 PRIM FILT - 9
C5:3	- hot	hater screen flush time
	CTD	File #7 PRIM FILT - 11
C5:3/DN	- XIO	File #7 PRIM FILT - 12
C5:3.ACC	- MOV	File #7 PRIM FILT - 11
C5:4	- cold	water screen flush off time
	CTD	File #7 PRIM FILT - 13
C5:4/DN	- XIO	File #7 PRIM FILT - 14
C5:4.ACC	- MUL	File #7 PRIM FILT - 13
C5:5	- cold	water bottum flush on time
	CTD	File #7 PRIM FILT - 15
C5:5/DN	- XIO	File #7 PRIM FILT - 16
C5:5.ACC	- cold	water bottum flush on time
	MOV	File #7 PRIM FILT - 15
N7:0	- {SIM_SIN}	
	MOV	File #3 TIME BASE - 16
	ADD	File #3 TIME BASE - 15
	DIV	File #3 TIME BASE - 17
	GRT	File #3 TIME BASE - 16
N7:1	- {SIM_SIN_OUT}	
	MUL	File #3 TIME BASE - 19
N7:2	- {SIM_FAST_RAMP}	
	MOV	File #3 TIME BASE - 14
	ADD	File #3 TIME BASE - 13
	GRT	File #3 TIME BASE - 14
N7:3	- MOV	File #3 TIME BASE - 12
	ADD	File #3 TIME BASE - 11
	GRT	File #3 TIME BASE - 12
N7:4	- {TEMPRAW1}	math temp raw
	MOV	File #5 LIFTSTATIO - 31, 33, 34
	SCP	File #5 LIFTSTATIO - 31
	GRT	File #5 LIFTSTATIO - 31
	LES	File #5 LIFTSTATIO - 31
N7:5	- {RAWLAGSTART}	lag start
	MOV	File #5 LIFTSTATIO - 29
N7:6	- {RAWLEADSTART}	lead start
	MOV	File #5 LIFTSTATIO - 29
	SCP	File #5 LIFTSTATIO - 31
N7:7	- {RAWLAGSTOP}	lag stop
	MOV	File #5 LIFTSTATIO - 29
	SCP	File #5 LIFTSTATIO - 31
	LES	File #5 LIFTSTATIO - 30
N7:8	- {RAWLEADSTOP}	lead stop
	MOV	File #5 LIFTSTATIO - 29

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                LES - File #5 LIFTSTATIO - 30
N7:9/0          - {RAWLEADLATCH}
                OTL - File #5 LIFTSTATIO - 30
                OTU - File #5 LIFTSTATIO - 30
                XIC - File #5 LIFTSTATIO - 33
N7:9/1          - {RAWLAGLATCH}
                OTL - File #5 LIFTSTATIO - 30
                OTU - File #5 LIFTSTATIO - 30
                XIC - File #5 LIFTSTATIO - 34
N7:9/2          - fit total teset fit102 flow totaliser reset
                XIC - File #5 LIFTSTATIO - 6
N7:9/4          - lit 101 fail
                OTE - File #5 LIFTSTATIO - 2
                XIC - File #11 ALARM - 3
N7:9/5          - p102-103-104 fail only one remaning
                OTE - File #5 LIFTSTATIO - 7
                XIC - File #11 ALARM - 3
N7:9/6          - low low level lift station
                OTE - File #5 LIFTSTATIO - 8
                XIC - File #11 ALARM - 3
N7:9/7          - high high level lift station
                OTE - File #5 LIFTSTATIO - 10
                XIC - File #11 ALARM - 3
N7:10/0         - {P102_S_AUTO} s status UNDER PLC CONTROL
                OTE - File #5 LIFTSTATIO - 14
N7:10/1         - {P102_S_RUNNING} s status
                OTE - File #5 LIFTSTATIO - 14
N7:10/2         - {P102_S_FAULT} s status
                OTE - File #5 LIFTSTATIO - 14
                XIC - File #5 LIFTSTATIO - 7
                XIO - File #5 LIFTSTATIO - 19, 23
N7:10/3         - {P102_S_LEEK} s status
                OTE - File #5 LIFTSTATIO - 14
N7:10/4         - {P102_A_0HAND} a -> action pv->plc 1AUTO 0HAND
                XIC - File #5 LIFTSTATIO - 15, 17
                XIO - File #5 LIFTSTATIO - 15, 17
N7:10/5         - {MINICASRESET} LEEK ALARM RESET
                XIC - File #5 LIFTSTATIO - 35
N7:11           - {P102_S_SPEED} s status (CURRENT)(0-100%)
                SCP - File #5 LIFTSTATIO - 16
                GEQ - File #5 LIFTSTATIO - 17
N7:12           - {P102_A_SPEED} a action (set point) (0-100%)
                MOV - File #5 LIFTSTATIO - 15
                SCP - File #5 LIFTSTATIO - 15
                GRT - File #5 LIFTSTATIO - 17
N7:13           - {P102_E_SPEED} E EXPECTED (AUTO)(0-100%)
                MOV - File #5 LIFTSTATIO - 15, 32, 33, 34
                SCP - File #5 LIFTSTATIO - 15
                GEQ - File #5 LIFTSTATIO - 17
N7:14           - {P102_A_PRIORITY} 0 LEAD, 1LAG 2 STAND
                MOV - File #5 LIFTSTATIO - 14, 18, 36, 37, 38
                EQU - File #5 LIFTSTATIO - 17, 33, 34, 36
                NEQ - File #5 LIFTSTATIO - 36
N7:20/0         - {P103_S_AUTO} s status s status 1UNDER PLC CONTROL
                OTE - File #5 LIFTSTATIO - 19
N7:20/1         - {P103_S_RUNNING} s status
                OTE - File #5 LIFTSTATIO - 19
N7:20/2         - {P103_S_FAULT} s status
                OTE - File #5 LIFTSTATIO - 19
                XIC - File #5 LIFTSTATIO - 7
                XIO - File #5 LIFTSTATIO - 14, 23
N7:20/3         - {P103_S_LEEK} s status
                OTE - File #5 LIFTSTATIO - 19
N7:20/4         - {P103_A_0HAND} a -> action pv->plc
                XIC - File #5 LIFTSTATIO - 20, 22
                XIO - File #5 LIFTSTATIO - 20, 22
N7:21           - {P103_S_SPEED} s status (CURRENT)
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                SCP - File #5 LIFTSTATIO - 21
                GEQ - File #5 LIFTSTATIO - 22
N7:22           - {P103_A_SPEED} a action (set point)
                MOV - File #5 LIFTSTATIO - 20
                SCP - File #5 LIFTSTATIO - 20
                GRT - File #5 LIFTSTATIO - 22
N7:23           - {P103_E_SPEED} E EXPECTED (AUTO)
                MOV - File #5 LIFTSTATIO - 20, 32, 33, 34
                SCP - File #5 LIFTSTATIO - 20
                GEQ - File #5 LIFTSTATIO - 22
N7:24           - {P103_A_PRIORITY} 0 LEAD, 1LAG 2 STAND
                MOV - File #5 LIFTSTATIO - 19, 36, 37, 38
                EQU - File #5 LIFTSTATIO - 22, 33, 34, 37
                NEQ - File #5 LIFTSTATIO - 37
N7:30/0         - {P104_S_AUTO} S status 1UNDER PLC CONTROL
                OTE - File #5 LIFTSTATIO - 23
N7:30/1         - {P104_S_RUNNING} s status
                OTE - File #5 LIFTSTATIO - 23
N7:30/2         - {P104_S_FAULT} s status
                OTE - File #5 LIFTSTATIO - 23
                XIC - File #5 LIFTSTATIO - 7
                XIO - File #5 LIFTSTATIO - 14, 19
N7:30/3         - {P104_S_LEEK} s status
                OTE - File #5 LIFTSTATIO - 23
N7:30/4         - {P104_A_0HAND} a -> action pv->plc
                XIC - File #5 LIFTSTATIO - 25, 27
                XIO - File #5 LIFTSTATIO - 25, 27
N7:31           - {P104_S_SPEED} s status (CURRENT)
                SCP - File #5 LIFTSTATIO - 26
                GEQ - File #5 LIFTSTATIO - 27
N7:32           - {P104_A_SPEED} a action (set point)
                MOV - File #5 LIFTSTATIO - 25
                SCP - File #5 LIFTSTATIO - 24, 25
                GRT - File #5 LIFTSTATIO - 27
N7:33           - {P104_E_SPEED} E EXPECTED (AUTO)
                MOV - File #5 LIFTSTATIO - 25, 32, 33, 34
                SCP - File #5 LIFTSTATIO - 25
                GEQ - File #5 LIFTSTATIO - 27
N7:34           - {P104_A_PRIORITY} 0 LEAD, 1LAG 2 STAND
                MOV - File #5 LIFTSTATIO - 23, 28, 36, 37, 38
                EQU - File #5 LIFTSTATIO - 27, 33, 34, 38
                NEQ - File #5 LIFTSTATIO - 38
N7:41           - {LIT101_S_PR} RAW SEWER LIFT STATION LEVEL IN %
                SCP - File #5 LIFTSTATIO - 0
N7:42           - {LIT101_S_MM} RAW SEWER LIFT STATI LEVEL IN MM
                SCP - File #5 LIFTSTATIO - 1, 31
                GRT - File #5 LIFTSTATIO - 9, 30
                LES - File #5 LIFTSTATIO - 8, 30
N7:43           - {FIT101_FLOW} RAW SEWER FLOW (L/min)
                MOV - File #5 LIFTSTATIO - 4
                DIV - File #5 LIFTSTATIO - 5
                SCP - File #5 LIFTSTATIO - 3
                LES - File #5 LIFTSTATIO - 4
N7:44/0         - {SSCR105_A_0_AUTO} ENABLE AUTOMATIC
                XIC - File #6 PRIM SCRN - 12
                XIO - File #6 PRIM SCRN - 12
N7:44/1         - {SSCR106_A_0_AUTO} ENABLE AUTOMATIC
                XIC - File #6 PRIM SCRN - 13
                XIO - File #6 PRIM SCRN - 13
N7:44/2         - {SSCR105_S_AUTO} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 10
N7:44/3         - {SSCR105_S_RUN} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 10
N7:44/4         - {SSCR105_S_WASH} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 10
N7:44/5         - {SSCR105_S_FAULT} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 10
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                XIC - File #6 PRIM SCRN - 6
                XIO - File #6 PRIM SCRN - 12
N7:44/6       - {SSCR105_S_TORQ} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 10
N7:44/7       - {SSCR105_A_START} SCREW SCREEN START I
                XIC - File #6 PRIM SCRN - 12
N7:44/8       - {SSCR105_A_WASH} SCREW SCREEN START A
                XIC - File #6 PRIM SCRN - 12
N7:44/9       - {SSCR106_S_AUTO} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 11
N7:44/10      - {SSCR106_S_RUN} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 11
N7:44/11      - {SSCR106_S_WASH} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 11
N7:44/12      - {SSCR106_S_FAULT} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 11
                XIC - File #6 PRIM SCRN - 6
                XIO - File #6 PRIM SCRN - 13
N7:44/13      - {SSCR106_S_TORQ} SCREW SCREEN STATUS
                OTE - File #6 PRIM SCRN - 11
N7:44/14      - {SSCR106_A_START} SCREW SCREEN START I
                XIC - File #6 PRIM SCRN - 13
N7:44/15      - {SSCR106_A_WASH} SCREW SCREEN START A
                XIC - File #6 PRIM SCRN - 13
N7:45         - {LIT102_S_PR} SCREW SCREEN CHAMBER LEVEL (0-100%)
                SCP - File #6 PRIM SCRN - 0
N7:46         - {LIT102_S_MM} SCREW SCREEN CHAMBER IN MM 0-820 (LIT-1120MM)
                SCP - File #6 PRIM SCRN - 1
                GRT - File #6 PRIM SCRN - 7, 19
                LES - File #6 PRIM SCRN - 20
N7:47         - {LIFT_MIN_SPD} minimum speed raw sewer pump
                MOV - File #5 LIFTSTATIO - 29, 31
                SCP - File #5 LIFTSTATIO - 31
                GEQ - File #5 LIFTSTATIO - 17, 22, 27
                LES - File #5 LIFTSTATIO - 31
N7:48/0       - both screw screen fail
                OTE - File #6 PRIM SCRN - 6
                XIC - File #11 ALARM - 4
N7:48/1       - prim screen level > 800 lahh+lit102
                OTE - File #6 PRIM SCRN - 7
                XIC - File #11 ALARM - 4
N7:48/2       - lit 102 fail less 3.5ma
                OTE - File #6 PRIM SCRN - 9
                XIC - File #11 ALARM - 4
N7:48/3       - sscr 105 fail (wont start)
                OTL - File #6 PRIM SCRN - 3
                OTU - File #6 PRIM SCRN - 3
                XIC - File #6 PRIM SCRN - 10
N7:48/4       - sscr 106 fail (wont start)
                OTL - File #6 PRIM SCRN - 5
                OTU - File #6 PRIM SCRN - 5
                XIC - File #6 PRIM SCRN - 11
N7:48/15      - count sscr wash cycle reset
                XIC - File #6 PRIM SCRN - 25
N7:49         - {SSCR105_A_TO_RUN} SCREW SCREEN START auto if no run for x
                MUL - File #6 PRIM SCRN - 14
N7:50         - {SSCR105_A_TO_WASH} SCREW SCREEN WASH N sec
                MUL - File #6 PRIM SCRN - 14
N7:53         - {SSCR_A_HIGH_LVL} SCREW SCREEN start high level (mm)
                GRT - File #6 PRIM SCRN - 19
                LES - File #6 PRIM SCRN - 20
N7:54         - count sscr wash cycle
                MOV - File #6 PRIM SCRN - 25
                ADD - File #6 PRIM SCRN - 24
N7:62/0       - gas fault
                OTE - File #9 GAS ALARM - 1
N7:62/1       - gas ait113
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                OTE - File #9 GAS ALARM - 0
                XIC - File #11 ALARM - 1
N7:65/0       - {FEW_S_S1} FEW PUMP STAGE 1 STA
                OTE - File #8 FEW TANK - 9
N7:65/1       - {FEW_S_S2} FEW PUMP STAGE 2 STA
                OTE - File #8 FEW TANK - 9
N7:65/2       - {FEW_S_P1RUN} FEW PUMP 1 RUN
                OTE - File #8 FEW TANK - 12
                XIC - File #3 TIME BASE - 10
N7:65/3       - {FEW_S_P2RUN} FEW PUMP 2 RUN
                OTE - File #8 FEW TANK - 13
                XIC - File #3 TIME BASE - 10
N7:65/4       - few p3 run
                OTE - File #8 FEW TANK - 14
                XIC - File #3 TIME BASE - 10
N7:65/7       - {FEW_S_A1} FEW PUMP 1 ALARM (WO
                OTL - File #8 FEW TANK - 17
N7:65/8       - {FEW_S_A2} FEW PUMP 2 ALARM (WO
                OTL - File #8 FEW TANK - 20
N7:65/9       - {FEW_S_A3} FEW PUMP 3 ALARM (WO
                OTL - File #8 FEW TANK - 23
N7:65/10      - {FEW_FULL_LAMP}
                OTE - File #8 FEW TANK - 5
N7:65/11      - {FEW_EMPTY_LAMP}
                OTE - File #8 FEW TANK - 4
                XIC - File #11 ALARM - 6
                XIO - File #8 FEW TANK - 15, 18, 21
                      File #12 FEW HEAT - 1, 3
N7:65/12      - VERY LOW FEW LEVEL
                OTE - File #8 FEW TANK - 2
                XIC - File #11 ALARM - 6
N7:65/13      - ALL PUMP FAIL
                OTE - File #8 FEW TANK - 11
                XIC - File #11 ALARM - 6
N7:66         - {FEW_S_LEVEL} FEW TANK LEVEL
                SCP - File #8 FEW TANK - 0
                GRT - File #8 FEW TANK - 5
                LES - File #8 FEW TANK - 1, 3
N7:67         - {FEW_P1_LEADLAGSTAND} 0 lead 1 lag 2 standby
                MOV - File #8 FEW TANK - 24, 25, 26
                EQU - File #8 FEW TANK - 15, 24
                NEQ - File #8 FEW TANK - 24
N7:68         - {FEW_P2_LEADLAGSTAND}
                MOV - File #8 FEW TANK - 24, 25, 26
                EQU - File #8 FEW TANK - 18, 25
                NEQ - File #8 FEW TANK - 25
N7:69         - {FEW_P3_LEADLAGSTAND}
                MOV - File #8 FEW TANK - 24, 25, 26
                EQU - File #8 FEW TANK - 21, 26
                NEQ - File #8 FEW TANK - 26
N7:70         - few elect heater temp
                MOV - File #12 FEW HEAT - 5
N7:71/0       - few p21 fail
                OTL - File #12 FEW HEAT - 7
                OTU - File #12 FEW HEAT - 7
N7:71/1       - few p20 fail
                OTL - File #12 FEW HEAT - 9
                OTU - File #12 FEW HEAT - 9
N7:71/2       - few elect heater fail
                OTL - File #12 FEW HEAT - 11
                OTU - File #12 FEW HEAT - 11
N7:71/3       - few filter flush
                OTL - File #12 FEW HEAT - 13
                OTU - File #12 FEW HEAT - 15
                XIC - File #12 FEW HEAT - 14, 16
                XIO - File #12 FEW HEAT - 12
N7:75         - {BOIL_S_TEMP} HEATING SYSTEM CUREN
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                MOV - File #4 AHU - 1
                DIV - File #4 AHU - 1
N7:76         - {OAT_S_TEMP} OUTSIDE AIR  TEMPERA
                MOV - File #4 AHU - 1
                DIV - File #4 AHU - 1
N7:78         - ahu pre defrost time
                MOV - File #4 AHU - 24
N7:79         - {AHU_S_MV} AHU_S_MV
                SCP - File #4 AHU - 5
N7:80         - {AHU_S_SAT} AHU-3 SUPPLY AIR TEM
                MOV - File #4 AHU - 1
                SCP - File #4 AHU - 3
                LES - File #4 AHU - 28
N7:81         - {AHU_A_SATSET} AHU-3 SUPPLY AIR TEM
                SCP - File #4 AHU - 2
N7:82         - {AHU_S_EAT} AHU-3 EXHAUST AIR temperature
                MOV - File #4 AHU - 1
                LES - File #4 AHU - 24
N7:83         - {AHU_H_O_A} 0 OFF 1 STAND BY 2 LS REMOTE 3 LS LIGHT 4 HS REMOTE 5 HS GAS-- 6 f
                MOV - File #4 AHU - 17
                EQU - File #4 AHU - 18
                NEQ - File #4 AHU - 18
N7:84/1       - ahu3 auto
                OTE - File #4 AHU - 7
                XIC - File #4 AHU - 17
                XIO - File #4 AHU - 17, 30
N7:84/2       - ahu3 hand
                OTE - File #4 AHU - 9
                XIC - File #4 AHU - 17
                XIO - File #4 AHU - 17, 30
N7:84/3       - 1- ahu3 high speed 0- ahu low speed
                OTL - File #4 AHU - 11
                OTU - File #4 AHU - 13
                XIC - File #4 AHU - 17
                XIO - File #4 AHU - 17
N7:84/4       - ahu defrost mmi info
                OTE - File #4 AHU - 27
N7:84/5       - {AHU_S_SF_FAIL}
                OTE - File #4 AHU - 20
                XIC - File #11 ALARM - 1
N7:84/6       - {AHU_S_EF_FAIL}
                OTE - File #4 AHU - 22
                XIC - File #11 ALARM - 1
N7:84/7       - ahu auto defrost latch
                OTL - File #4 AHU - 25
                OTU - File #4 AHU - 26
                XIC - File #4 AHU - 23, 27
N7:84/8       - selector remote ahu defrost
                OTE - File #4 AHU - 14
                XIC - File #4 AHU - 27
N7:84/9       - ahu freeze bellow 0 c more then 5 min
                OTL - File #4 AHU - 29
                OTU - File #4 AHU - 30
                XIC - File #4 AHU - 17
                      File #11 ALARM - 1
N7:85         - {AHU_S_OAT}
                DIV - File #4 AHU - 1
                GRT - File #10 BOILLERS - 0, 2
                LES - File #10 BOILLERS - 1, 3
N7:86         - {AHU_SF_STATUS} 0-off 1-low speed 2 high speed
                MOV - File #4 AHU - 19
N7:87         - {AHU_EF_STATUS} 0-off 1-low speed 2 high speed
                MOV - File #4 AHU - 21
N7:88         - {AHU_A_DEFROST_TEMP}
                LES - File #4 AHU - 24
N7:89         - {AHU_A_DEFROST_DELAY}
                MOV - File #4 AHU - 23
```



```
N7:90         - {B1_START_LEVEL} b1 start set point
                ADD - File #10 BOILLERS - 5
                LEQ - File #10 BOILLERS - 5
N7:91         - {B2_START_LEVEL}
                ADD - File #10 BOILLERS - 6
                LEQ - File #10 BOILLERS - 6
N7:96/0       - {B1_RUN}
                OTL - File #10 BOILLERS - 5
                OTU - File #10 BOILLERS - 5
                XIO - File #10 BOILLERS - 4
N7:96/1       - {B2_RUN}
                OTL - File #10 BOILLERS - 6
                OTU - File #10 BOILLERS - 6
                XIO - File #10 BOILLERS - 4
N7:96/2       - {OAT_GRT_10} oat greater then 10c
                OTL - File #10 BOILLERS - 2
                OTU - File #10 BOILLERS - 3
N7:96/3       - {OAT_GRT_16} oat greater then 16c
                OTL - File #10 BOILLERS - 0
                OTU - File #10 BOILLERS - 1
N7:96/4       - low glycol temp less 30c more 10 sec
                OTE - File #10 BOILLERS - 8
                XIC - File #11 ALARM - 2
N7:96/5       - trailler room freeze
                OTE - File #4 AHU - 31
                XIC - File #11 ALARM - 2
N7:97         - trailler room tempreature
                MOV - File #4 AHU - 1
                LES - File #4 AHU - 31
N7:98         - temp trailler room set alarm
                LES - File #4 AHU - 31
N7:99         - {CLYCOL_DIV10} glycol temperatur give real val 10  = 10c
                DIV - File #4 AHU - 1
                GRT - File #10 BOILLERS - 5, 6
                LES - File #10 BOILLERS - 7
                LEQ - File #10 BOILLERS - 5, 6
N7:100/0      - start hot water auto low speed screen flush
                OTL - File #7 PRIM FILT - 10
                OTU - File #7 PRIM FILT - 12
                XIC - File #7 PRIM FILT - 7, 11, 22, 23
                XIO - File #7 PRIM FILT - 9
N7:100/1      - start cold water bottom flush
                OTL - File #7 PRIM FILT - 14
                OTU - File #7 PRIM FILT - 16
                XIC - File #7 PRIM FILT - 15, 17
                XIO - File #7 PRIM FILT - 13
N7:100/2      - dewatering conveyor enable
                OTL - File #7 PRIM FILT - 4, 22
                OTU - File #7 PRIM FILT - 20
                XIC - File #7 PRIM FILT - 21
N7:100/3      - primary filter blower run
                OTE - File #7 PRIM FILT - 31
                XIC - File #7 PRIM FILT - 0
N7:100/4      - blower  fail
                OTL - File #7 PRIM FILT - 38
                OTU - File #7 PRIM FILT - 39, 40
N7:100/5      - primary filter filter run
                OTE - File #7 PRIM FILT - 28
                XIC - File #7 PRIM FILT - 0
N7:100/6      - primary filter filter alarm vfd fail
                OTE - File #7 PRIM FILT - 29
                XIC - File #11 ALARM - 5
                XIO - File #7 PRIM FILT - 23
N7:100/7      - primary filter auger run
                OTE - File #7 PRIM FILT - 26
                XIC - File #7 PRIM FILT - 0
N7:100/8      - primary filter auger alarm vfd fail
```

```
                OTE - File #7 PRIM FILT - 27
                XIC - File #11 ALARM - 5
N7:100/9        - primary filter blower fan run
                OTE - File #7 PRIM FILT - 32
N7:100/10       - primary filter blower fan alarm
                OTL - File #7 PRIM FILT - 35
                OTU - File #7 PRIM FILT - 36, 40
                XIC - File #11 ALARM - 5
                XIO - File #7 PRIM FILT - 23
N7:100/11       - hot water flush in progress
                OTE - File #7 PRIM FILT - 23
                XIC - File #7 PRIM FILT - 41
N7:100/12       - cold water flush in progress
                OTE - File #7 PRIM FILT - 17
N7:100/13       - not mmi Emergency stop pressed
                OTE - File #7 PRIM FILT - 33
N7:100/14       - {PRIMFIL_ON} primfil unit on
                OTE - File #7 PRIM FILT - 23
N7:100/15       - {PRIFIL_BELTRUN} prim filter belt ask run
                OTL - File #7 PRIM FILT - 4
                OTU - File #7 PRIM FILT - 4
                XIC - File #7 PRIM FILT - 23
N7:101/0        - filter belt speed 0 hand 1 auto (auto reset 2 minutes)
                OTL - File #7 PRIM FILT - 8
                XIC - File #7 PRIM FILT - 7
                XIO - File #7 PRIM FILT - 7, 8, 23
N7:101/1        - {AUGER_HAND} auger 1hand 0auto
                XIC - File #7 PRIM FILT - 21
N7:101/2        - prifil_wash reset
                XIC - File #7 PRIM FILT - 42
N7:101/10       - {PRIFIL_HSFLUSH} start high speed flush
                OTL - File #7 PRIM FILT - 5, 6
                OTU - File #7 PRIM FILT - 12
                XIC - File #7 PRIM FILT - 11, 23
                XIO - File #7 PRIM FILT - 7, 9
N7:102          - hot water screen flush max time w/o flush left
                MUL - File #7 PRIM FILT - 9
N7:103          - hot hater screen flush time
                MOV - File #7 PRIM FILT - 11
N7:104          - cold water bottum flush off time
                MUL - File #7 PRIM FILT - 13
N7:105          - cold water bottum flush on time
                MOV - File #7 PRIM FILT - 15
N7:106          - dewatering conveyor on time
                MOV - File #7 PRIM FILT - 19
N7:107          - {PRIFIL_BELTSTART} belt screen zero speed
                SCP - File #7 PRIM FILT - 1
                GRT - File #7 PRIM FILT - 4
N7:108          - {PRIFIL_BELTSTOP} belt screen full speed
                LES - File #7 PRIM FILT - 4
N7:109          - {PRIFIL_WASHBEGLVL} wash cycle start level
                GRT - File #7 PRIM FILT - 6
N7:110          - actual filter belt speed
                MOV - File #7 PRIM FILT - 25
                SCP - File #7 PRIM FILT - 25
N7:111          - {PRIFIL_WASHSPD} filter belt wash speed
                SCP - File #7 PRIM FILT - 7
N7:112          - {PRIFIL_MANSPD} manual belt set speed from mmi
                MOV - File #7 PRIM FILT - 7
                SCP - File #7 PRIM FILT - 7
N7:113          - {PRIFIL_CALCSPD} calculated belt speed function of level via mmi
                MOV - File #7 PRIM FILT - 2, 7
                SCP - File #7 PRIM FILT - 1, 7
                GRT - File #7 PRIM FILT - 2
                LES - File #7 PRIM FILT - 2
N7:114          - {PRIFIL_LVLMM} primary filter level scaled in mm
                SCP - File #7 PRIM FILT - 1
```


15.1


```
                GRT - File #7 PRIM FILT - 4, 6
                LES - File #7 PRIM FILT - 4
N7:115          - {PRIFIL_COMP_PRESS} primary filter compressor pressure
                SCP - File #7 PRIM FILT - 3
N7:116          - prifil_wash_count
                MOV - File #7 PRIM FILT - 42
                ADD - File #7 PRIM FILT - 41
N7:119/0        - low fuel alarm day tank
                OTE - File #11 ALARM - 0
N7:120/0        - global ahu enable
                XIC - File #11 ALARM - 7, 14
N7:120/1        - ahu alarm
                OTE - File #11 ALARM - 1
                XIC - File #11 ALARM - 7, 14
N7:121/0        - heating alarm enable
                XIC - File #11 ALARM - 7, 14
N7:121/1        - heating alarm
                OTE - File #11 ALARM - 2
                XIC - File #11 ALARM - 7, 14
N7:122/0        - lift station alarm enable
                XIC - File #11 ALARM - 9, 14
N7:122/1        - lift station alarm
                OTE - File #11 ALARM - 3
                XIC - File #11 ALARM - 9, 14
N7:123/0        - prim screen alarm enable
                XIC - File #11 ALARM - 9, 14
N7:123/1        - prim screen alarm
                OTE - File #11 ALARM - 4
                XIC - File #11 ALARM - 9, 14
N7:124/0        - prim filter alarm enable
                XIC - File #11 ALARM - 9, 14
N7:124/1        - prim filter alarm
                OTE - File #11 ALARM - 5
                XIC - File #11 ALARM - 9, 14
N7:125/0        - Few global Alarm enable
                XIC - File #11 ALARM - 9, 14
N7:125/1        - Few global Alarm
                OTE - File #11 ALARM - 6
                XIC - File #11 ALARM - 9, 14
N7:129/0        - auto dialler active
                OTE - File #11 ALARM - 11
N7:201          - PID - File #4 AHU - 4
                SCP - File #4 AHU - 3
N7:202          - PID - File #4 AHU - 4
                SCP - File #4 AHU - 5, 6
N7:240          - {COPY_N7_14}
                MOV - File #5 LIFTSTATIO - 36, 37, 38
                NEQ - File #5 LIFTSTATIO - 36
N7:241          - {COPY_N7_24}
                MOV - File #5 LIFTSTATIO - 36, 37, 38
                NEQ - File #5 LIFTSTATIO - 37
N7:242          - {COPY_N7_34}
                MOV - File #5 LIFTSTATIO - 36, 37, 38
                NEQ - File #5 LIFTSTATIO - 38
N7:245          - {N767COPY}
                MOV - File #8 FEW TANK - 24, 25, 26
                NEQ - File #8 FEW TANK - 24
N7:246          - {N768COPY}
                MOV - File #8 FEW TANK - 24, 25, 26
                NEQ - File #8 FEW TANK - 25
N7:247          - {N769COPY}
                MOV - File #8 FEW TANK - 24, 25, 26
                NEQ - File #8 FEW TANK - 26
N7:250          - temp boiller
                ADD - File #10 BOILLERS - 5
                GRT - File #10 BOILLERS - 5
N7:251          - {0} temp boiller
```

```
                ADD - File #10 BOILLERS - 6
                GRT - File #10 BOILLERS - 6
F8:0          - build sinus
                DIV - File #3 TIME BASE - 17
                SIN - File #3 TIME BASE - 18
F8:1          - build sinus
                MUL - File #3 TIME BASE - 19
                SIN - File #3 TIME BASE - 18
F8:2          - {BLOWER_TTSN} prim filter blower ttsn
                ADD - File #7 PRIM FILT - 0
F8:3          - {PRIFIL_TTSN} prim filter filter ttsn
                ADD - File #7 PRIM FILT - 0
F8:4          - {PRIFIL_AUGER_TTSN} prim filter auger ttsn
                ADD - File #7 PRIM FILT - 0
F8:5          - {P102_S_TTSN}
                ADD - File #3 TIME BASE - 10
F8:6          - {P103_S_TTSN}
                ADD - File #3 TIME BASE - 10
F8:7          - {P104_S_TTSN}
                ADD - File #3 TIME BASE - 10
F8:8          - {SSCR105_TTSN}
                ADD - File #3 TIME BASE - 10
F8:9          - {SSCR106_TTSN}
                ADD - File #3 TIME BASE - 10
F8:10         - {FEW_P1_TTSN}
                ADD - File #3 TIME BASE - 10
F8:11         - {FEW_P2_TTSN}
                ADD - File #3 TIME BASE - 10
F8:12         - {FEW_P3_TTSN}
                ADD - File #3 TIME BASE - 10
F8:13         - {AHU_SF_TTSN}
                ADD - File #4 AHU - 0
F8:14         - {AHU_EF_TTSN}
                ADD - File #4 AHU - 0
F8:15         - few p21 recirc pump
                ADD - File #3 TIME BASE - 10
F8:16         - few p20 recirc pump
                ADD - File #3 TIME BASE - 10
F8:17         - few electric heater heating
                ADD - File #3 TIME BASE - 10
F8:20         - total volume m3 temp var
                ADD - File #5 LIFTSTATIO - 5
                DIV - File #5 LIFTSTATIO - 5
F8:21         - {FIT_TOTALM3} total volume totaliser m3
                MOV - File #5 LIFTSTATIO - 6
                ADD - File #5 LIFTSTATIO - 5
N10:0         -     - Channel Configuration - Channel  1:Route Table File
FILE N10:0 LEN:128 -      - Channel Configuration - Channel  1:Route Table File
N11:0         - COP - File #2 MAIN - 2
FILE N11:0 LEN:12 - COP - File #2 MAIN - 2
N11:12        - COP - File #2 MAIN - 1
FILE N11:12 LEN:8 - COP - File #2 MAIN - 1
N11:20        - COP - File #2 MAIN - 0
FILE N11:20 LEN:12 - COP - File #2 MAIN - 0
N20:0         -     - Channel Configuration - Channel  1:Diagnostic File
FILE N20:0 LEN:256 -      - Channel Configuration - Channel  1:Diagnostic File
N21:0         - {N21} pid ahu3
                PID - File #4 AHU - 4
FILE N21:0 LEN:23 - PID - File #4 AHU - 4
N21:2         - SCP - File #4 AHU - 2
FILE N21:2 LEN:21 - PID - File #4 AHU - 4
U:3           - JSR - File #2 MAIN - 3
U:4           - JSR - File #2 MAIN - 4
U:5           - JSR - File #2 MAIN - 5
U:6           - JSR - File #2 MAIN - 6
U:7           - JSR - File #2 MAIN - 7
U:8           - JSR - File #2 MAIN - 8
```



```
U:9           - JSR - File #2 MAIN - 9
U:10          - JSR - File #2 MAIN - 10
U:11          - JSR - File #2 MAIN - 11
U:12          - JSR - File #2 MAIN - 12
```

Data File O0 -- OUTPUT Usage

Offset	FW	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
O:3.0										X	X		X	X		X	X	1746-OX8 - 8-Output Isolated Relay
O:4.0										X	X	X	X		X	X	X	1746-OX8 - 8-Output Isolated Relay
O:5.0	F																	1746-NI8 - Analog 8 Channel Input
O:5.1	F																	1746-NI8 - Analog 8 Channel Input
O:5.2	F																	1746-NI8 - Analog 8 Channel Input
O:5.3	F																	1746-NI8 - Analog 8 Channel Input
O:5.4	F																	1746-NI8 - Analog 8 Channel Input
O:5.5	F																	1746-NI8 - Analog 8 Channel Input
O:5.6	F																	1746-NI8 - Analog 8 Channel Input
O:5.7	F																	1746-NI8 - Analog 8 Channel Input
O:5.8	F																	1746-NI8 - Analog 8 Channel Input
O:5.9	F																	1746-NI8 - Analog 8 Channel Input
O:5.10	F																	1746-NI8 - Analog 8 Channel Input
O:5.11	F																	1746-NI8 - Analog 8 Channel Input
O:6.0	W																	1746-NO4I - Analog 4 Ch. Current Ou
O:6.1	W																	1746-NO4I - Analog 4 Ch. Current Ou
O:6.2	W																	1746-NO4I - Analog 4 Ch. Current Ou
O:6.3	W																	1746-NO4I - Analog 4 Ch. Current Ou
O:9.0										X	X	X	X	X		X	X	1746-OX8 - 8-Output Isolated Relay
O:10.0											X	X	X	X	X	X	X	1746-OX8 - 8-Output Isolated Relay
O:11.0	F																	1746-NT8 - Analog 8 Ch Thermocouple
O:11.1	F																	1746-NT8 - Analog 8 Ch Thermocouple
O:11.2	F																	1746-NT8 - Analog 8 Ch Thermocouple
O:11.3	F																	1746-NT8 - Analog 8 Ch Thermocouple
O:11.4	F																	1746-NT8 - Analog 8 Ch Thermocouple
O:11.5	F																	1746-NT8 - Analog 8 Ch Thermocouple
O:11.6	F																	1746-NT8 - Analog 8 Ch Thermocouple
O:11.7	F																	1746-NT8 - Analog 8 Ch Thermocouple
O:12.0		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	1746-OW16 - 16-Output (RLY) 240 VAC
O:13.0	W																	1746-NO4I - Analog 4 Ch. Current Ou
O:13.1																		1746-NO4I - Analog 4 Ch. Current Ou
O:13.2																		1746-NO4I - Analog 4 Ch. Current Ou
O:13.3																		1746-NO4I - Analog 4 Ch. Current Ou
O:14.0	F																	1746-NI8 - Analog 8 Channel Input
O:14.1	F																	1746-NI8 - Analog 8 Channel Input
O:14.2	F																	1746-NI8 - Analog 8 Channel Input
O:14.3	F																	1746-NI8 - Analog 8 Channel Input
O:14.4	F																	1746-NI8 - Analog 8 Channel Input
O:14.5	F																	1746-NI8 - Analog 8 Channel Input
O:14.6	F																	1746-NI8 - Analog 8 Channel Input
O:14.7	F																	1746-NI8 - Analog 8 Channel Input
O:14.8	F																	1746-NI8 - Analog 8 Channel Input
O:14.9	F																	1746-NI8 - Analog 8 Channel Input
O:14.10	F																	1746-NI8 - Analog 8 Channel Input
O:14.11	F																	1746-NI8 - Analog 8 Channel Input

Data File I1 -- INPUT Usage

Offset	FW	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
I:1.0		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1746-IB16 - 16-Input (SINK) 24 VDC
I:2.0			X	X	X	X	X		X	X		X	X	X	X	X	X	1746-IB16 - 16-Input (SINK) 24 VDC
I:5.0	W																	1746-NI8 - Analog 8 Channel Input
I:5.1	W																	1746-NI8 - Analog 8 Channel Input
I:5.2	W																	1746-NI8 - Analog 8 Channel Input
I:5.3	W																	1746-NI8 - Analog 8 Channel Input
I:5.4	W																	1746-NI8 - Analog 8 Channel Input
I:5.5	W																	1746-NI8 - Analog 8 Channel Input
I:5.6	W																	1746-NI8 - Analog 8 Channel Input
I:5.7	W																	1746-NI8 - Analog 8 Channel Input
I:5.8																		1746-NI8 - Analog 8 Channel Input
I:5.9																		1746-NI8 - Analog 8 Channel Input
I:5.10																		1746-NI8 - Analog 8 Channel Input
I:5.11																		1746-NI8 - Analog 8 Channel Input
I:5.12																		1746-NI8 - Analog 8 Channel Input
I:5.13																		1746-NI8 - Analog 8 Channel Input
I:5.14																		1746-NI8 - Analog 8 Channel Input
I:5.15																		1746-NI8 - Analog 8 Channel Input
I:7.0		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1746-IA16 - 16-Input 100/120 VAC
I:8.0		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1746-IA16 - 16-Input 100/120 VAC
I:11.0	W																	1746-NT8 - Analog 8 Ch Thermocouple
I:11.1	W																	1746-NT8 - Analog 8 Ch Thermocouple
I:11.2	W																	1746-NT8 - Analog 8 Ch Thermocouple
I:11.3	W																	1746-NT8 - Analog 8 Ch Thermocouple
I:11.4	W																	1746-NT8 - Analog 8 Ch Thermocouple
I:11.5	W																	1746-NT8 - Analog 8 Ch Thermocouple
I:11.6																		1746-NT8 - Analog 8 Ch Thermocouple
I:11.7																		1746-NT8 - Analog 8 Ch Thermocouple
I:14.0	W																	1746-NI8 - Analog 8 Channel Input
I:14.1																		1746-NI8 - Analog 8 Channel Input
I:14.2																		1746-NI8 - Analog 8 Channel Input
I:14.3																		1746-NI8 - Analog 8 Channel Input
I:14.4																		1746-NI8 - Analog 8 Channel Input
I:14.5																		1746-NI8 - Analog 8 Channel Input
I:14.6																		1746-NI8 - Analog 8 Channel Input
I:14.7																		1746-NI8 - Analog 8 Channel Input
I:14.8																		1746-NI8 - Analog 8 Channel Input
I:14.9																		1746-NI8 - Analog 8 Channel Input
I:14.10																		1746-NI8 - Analog 8 Channel Input
I:14.11																		1746-NI8 - Analog 8 Channel Input
I:14.12																		1746-NI8 - Analog 8 Channel Input
I:14.13																		1746-NI8 - Analog 8 Channel Input
I:14.14																		1746-NI8 - Analog 8 Channel Input
I:14.15																		1746-NI8 - Analog 8 Channel Input

Data File S2 -- STATUS Usage

Offset	0	1	2	3	4	5	6	7	8	9
S:0	.	X	.	.	X	X	.	.	.	.
S:10	.	.	.	.	.	.	.	.	.	.
S:20	.	.	.	.	.	.	.	.	.	.
S:30	.	.	.	.	.	.	.	.	.	.
S:40	.	.	.	.	.	.	.	.	.	.
S:50	.	.	.	.	.	.	.	.	.	.
S:60	.	.	.	.	.	.	.	.	.	.
S:70	.	.	.	.	.	.	.	.	.	.
S:80	.	.	.							

Data File B3 -- BINARY Usage

Offset	FW	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(Symbol) Description
B3:0		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
B3:1		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
B3:2		.	.	.	.	.	.	.	.	.	.	X	X	X	X	X	X	
B3:3		.	.	.	.	.	.	.	.	.	.	.	.	.	X	X	X	
B3:4		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	
B3:5		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:6		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:7		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:8		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:9		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:10		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:11		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:12		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:13		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:14		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:15		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:16		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:17		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:18		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:19		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:20		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:21		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:22		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:23		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:24		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:25		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:26		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:27		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:28		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:29		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:30		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:31		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:32		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:33		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:34		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:35		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:36		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:37		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:38		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:39		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:40		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:41		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:42		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:43		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
B3:44		.	.	.	.	.	.	.	.	.	.	.	.	.	X	X	X	

Data File T4 -- TIMER Usage

Offset	FW	EN	TT	DN	BASE	PRE	ACC	(Symbol) Description
T4:0	W	.	.	X	.	.	.	1/100 hhs base
T4:1	W	.	.	X	.	.	.	1/100 h base
T4:2	W	.	.	X	.	X	.	sscr wash duty
T4:3	W	.	.	X	.	X	.	sscr wash period
T4:4	W	.	.	X	.	.	.	timer few 01 fail
T4:5	W	.	.	X	.	.	.	timer few 02 fail
T4:6	W	.	.	X	.	.	.	timer few 03 fail
T4:7	W	.	.	X	.	.	.	tim ahu on
T4:8	W	.	.	X	.	.	.	tim ahu
T4:9	W	.	.	X	.	.	.	ahu ls
T4:10	W	.	.	X	.	.	.	tim 1 minute
T4:11	W	.	.	X	.	.	.	tim 1 minute
T4:12	W	.	.	X	.	X	.	tim ahu defrost
T4:13	W	.	.	X	.	.	.	ahu sf fail
T4:14	W	.	.	X	.	.	.	ahu ef fail
T4:15	W	.	.	X	.	X	.	
T4:16	W	.	.	X	.	.	.	tim ahu freeze
T4:17	W	.	.	X	.	.	.	tim low gly temp
T4:18	W	.	.	X	.	.	.	tim alarm high screw level
T4:19	W	.	.	X	.	.	.	
T4:20	W	.	.	X	.	X	.	ahu pre defrost time
T4:21	W	.	.	X	.	.	.	tim full potable water
T4:22	W	.	.	X	.	.	.	tim few empty
T4:23	W	.	.	X	.	.	.	tim lshh104
T4:24	W	.	.	X	.	.	.	tim auto prim fil
T4:25	W	.	.	X	.	.	.	tim few heat enable
T4:26	W	.	.	X	.	.	.	tim 1 sec time base
T4:27	W	.	.	X	.	.	.	tim 1 sec time base
T4:28	W	.	.	X	.	.	.	tim sscr level auto wash
T4:29	W	.	.	X	.	.	.	
T4:30	W	.	.	X	.	.	.	tim prifil blower fan fail
T4:31	W	.	.	X	.	.	.	prim filter blower fail
T4:32	W	.	.	X	.	.	.	tim hot few recirc disable no water
T4:33	W	.	.	X	.	.	.	few ovwerflow
T4:34	W	.	.	X	.	.	.	tim few p21 fail
T4:35	W	.	.	X	.	.	.	
T4:36	W	.	.	X	.	.	.	tim few elect heater
T4:37	W	.	.	X	.	.	.	tim sscr 105 fail
T4:38	W	.	.	X	.	.	.	
T4:39	W	.	.	X	.	.	.	tim very low few
T4:40	W	.	.	X	.	.	.	tim few pump fail
T4:41	W	.	.	X	.	.	.	estop beep off time
T4:42	W	.	.	X	.	.	.	estop beep on time
T4:43	W	.	.	X	.	.	.	tim building alarm lag
T4:44	W	.	.	X	.	.	.	tim process alarm

Data File C5 -- COUNTER Usage

Offset	FW	CU	CD	DN	OV	UN	UA	PRE	ACC	(Symbol) Description
C5:0	W	.	.	X	.	.	.	.	X	few filter flush
C5:1	W	.	.	X	.	.	.	.	X	few filter flush
C5:2	W	.	.	X	.	.	.	.	X	hot hater screen flush max time w/o flush
C5:3	W	.	.	X	.	.	.	.	X	hot hater screen flush time
C5:4	W	.	.	X	.	.	.	.	X	cold water screen flush off time
C5:5	W	.	.	X	.	.	.	.	X	cold water bottum flush on time

15.1

Data File R6 -- CONTROL Usage

Offset	FW	EN	EU	DN	EM	ER	UL	IN	FD	LEN	POS	(Symbol)	Description
R6:0	.	.	.	.	.	.	.	.	.	.	.		

Data File N7 -- INTEGER Usage

Offset	0	1	2	3	4	5	6	7	8	9
N7:0	X	X	X	X	X	X	X	X	X	X
N7:10	X	X	X	X	X	.	.	.	.	.
N7:20	X	X	X	X	X	.	.	.	.	.
N7:30	X	X	X	X	X	.	.	.	.	.
N7:40	.	X	X	X	X	X	X	X	X	X
N7:50	X	.	.	X	X	.	.	.	.	.
N7:60	.	.	X	.	.	X	X	X	X	X
N7:70	X	X	.	.	.	X	X	.	X	X
N7:80	X	X	X	X	X	X	X	X	X	X
N7:90	X	X	.	.	.	.	X	X	X	X
N7:100	X	X	X	X	X	X	X	X	X	X
N7:110	X	X	X	X	X	X	X	.	.	X
N7:120	X	X	X	X	X	X	.	.	.	X
N7:130	.	.	.	.	.	.	.	.	.	.
N7:140	.	.	.	.	.	.	.	.	.	.
N7:150	.	.	.	.	.	.	.	.	.	.
N7:160	.	.	.	.	.	.	.	.	.	.
N7:170	.	.	.	.	.	.	.	.	.	.
N7:180	.	.	.	.	.	.	.	.	.	.
N7:190	.	.	.	.	.	.	.	.	.	.
N7:200	.	X	X	.	.	.	.	.	.	.
N7:210	.	.	.	.	.	.	.	.	.	.
N7:220	.	.	.	.	.	.	.	.	.	.
N7:230	.	.	.	.	.	.	.	.	.	.
N7:240	X	X	X	.	.	X	X	X	.	.
N7:250	X	X	.	.						

Data File F8 -- FLOAT Usage

Offset	0	1	2	3	4
F8:0	X	X	X	X	X
F8:5	X	X	X	X	X
F8:10	X	X	X	X	X
F8:15	X	X	X	.	.
F8:20	X	X			

Data File N10 -- ROUTINGTAB Usage

Offset	0	1	2	3	4	5	6	7	8	9
N10:0	X	X	X	X	X	X	X	X	X	X
N10:10	X	X	X	X	X	X	X	X	X	X
N10:20	X	X	X	X	X	X	X	X	X	X
N10:30	X	X	X	X	X	X	X	X	X	X
N10:40	X	X	X	X	X	X	X	X	X	X
N10:50	X	X	X	X	X	X	X	X	X	X
N10:60	X	X	X	X	X	X	X	X	X	X
N10:70	X	X	X	X	X	X	X	X	X	X
N10:80	X	X	X	X	X	X	X	X	X	X
N10:90	X	X	X	X	X	X	X	X	X	X
N10:100	X	X	X	X	X	X	X	X	X	X
N10:110	X	X	X	X	X	X	X	X	X	X
N10:120	X	X	X	X	X	X	X	X		

Data File N11 -- STRING Usage

Offset	0	1	2	3	4	5	6	7	8	9
N11:0	X	X	X	X	X	X	X	X	X	X
N11:10	X	X	X	X	X	X	X	X	X	X
N11:20	X	X	X	X	X	X	X	X	X	X
N11:30	X	X								

Data File N20 -- CH1 Diag Usage

Offset	0	1	2	3	4	5	6	7	8	9
N20:0	X	X	X	X	X	X	X	X	X	X
N20:10	X	X	X	X	X	X	X	X	X	X
N20:20	X	X	X	X	X	X	X	X	X	X
N20:30	X	X	X	X	X	X	X	X	X	X
N20:40	X	X	X	X	X	X	X	X	X	X
N20:50	X	X	X	X	X	X	X	X	X	X
N20:60	X	X	X	X	X	X	X	X	X	X
N20:70	X	X	X	X	X	X	X	X	X	X
N20:80	X	X	X	X	X	X	X	X	X	X
N20:90	X	X	X	X	X	X	X	X	X	X
N20:100	X	X	X	X	X	X	X	X	X	X
N20:110	X	X	X	X	X	X	X	X	X	X
N20:120	X	X	X	X	X	X	X	X	X	X
N20:130	X	X	X	X	X	X	X	X	X	X
N20:140	X	X	X	X	X	X	X	X	X	X
N20:150	X	X	X	X	X	X	X	X	X	X
N20:160	X	X	X	X	X	X	X	X	X	X
N20:170	X	X	X	X	X	X	X	X	X	X
N20:180	X	X	X	X	X	X	X	X	X	X
N20:190	X	X	X	X	X	X	X	X	X	X
N20:200	X	X	X	X	X	X	X	X	X	X
N20:210	X	X	X	X	X	X	X	X	X	X
N20:220	X	X	X	X	X	X	X	X	X	X
N20:230	X	X	X	X	X	X	X	X	X	X
N20:240	X	X	X	X	X	X	X	X	X	X
N20:250	X	X	X	X	X	X				

Data File N21 -- PID LEN 23 Usage

Offset	0	1	2	3	4	5	6	7	8	9
N21:0	X	X	X	X	X	X	X	X	X	X
N21:10	X	X	X	X	X	X	X	X	X	X
N21:20	X	X	X							

Address/Symbol Database

Address	Symbol	Scope	Description
B3:0			
B3:0/0			1 second time base valid one scan
B3:0/1			osr few
B3:0/2			
B3:0/4			
B3:0/5			
B3:0/6			TIME BASE 1 minute
B3:0/7			
B3:0/8			lshh 104 latch for time delay (lift station emerg pump run)
B3:0/13			osr prifil
B3:0/14			alayays on
B3:0/15			alaways off
B3:1/0			osr few fil flush off time
B3:1/1			osr wash cycle sscr
B3:1/2			osr few fil flush
B3:1/4			osr ahu
B3:1/5			osr ahu
B3:1/6			osr pri fil
B3:1/7			osr prim fil
B3:1/8			osr pri fil
B3:1/9			osr pri fil
B3:1/10			osr prim fil
B3:1/11			osr prim fil
B3:1/12			osr prim fil
B3:1/13			osr prim fil
B3:1/14			osr prim fil
B3:1/15			osr prim fil
B3:2			
B3:2/0	OSR	Global	
B3:2/2			O:12/4 REVERS not hot water flush
B3:2/3			osr prim fil
B3:2/5			osr prifil count wash
B3:3/0			gas alarm ahu high speed
B3:3/1			osr
B3:3/2			osr
B3:3/6			
B3:44/0			sscr auto wash time latch
B3:44/1			sscr auto wash level latch screw
B3:44/2			sscr auto wash level latch wash
C5:0			few filter flush
C5:1			few filter fluah
C5:2			hot hater screen flush max time w/o flush
C5:2.ACC			
C5:2/DN			
C5:3			hot hater screen flush time
C5:3.ACC			
C5:3/DN			
C5:4			cold water screen flush off time
C5:4.ACC			
C5:5			cold water bottum flush on time
C5:5.ACC			cold water bottum flush on time
F8:0			build sinus
F8:1			build sinus
F8:2	BLOWER_TTSN	Global	prim filter blower ttsn
F8:3	PRIFIL_TTSN	Global	prim filter filter ttsn
F8:4	PRIFIL_AUGER_TTSN	Global	prim filter auger ttsn
F8:5	P102_S_TTSN	Global	
F8:6	P103_S_TTSN	Global	
F8:7	P104_S_TTSN	Global	
F8:8	SSCR105_TTSN	Global	
F8:9	SSCR106_TTSN	Global	
F8:10	FEW_P1_TTSN	Global	
F8:11	FEW_P2_TTSN	Global	
F8:12	FEW_P3_TTSN	Global	
F8:13	AHU_SF_TTSN	Global	
F8:14	AHU_EF_TTSN	Global	
F8:15			few p21 recirc pump
F8:16			few p20 recirc pump
F8:17			few electric heater heating
F8:20			total volume m3 temp var
F8:21	FIT_TOTALM3	Global	total volume totaliser m3
I:1/0	P102_AUTO	Global	raw sewer
I:1/1	P102_RUN	Global	raw sewer
I:1/2	P102_FAULT	Global	raw sewer
I:1/3	P102_LEAK	Global	raw sewer
I:1/4			GAS ch1 low
I:1/5			GAS ch1 high
I:1/6			ad active
I:1/7			gas ch2 low

Address	Symbol	Scope	Description
I:1/8			
I:1/9			gas ch2 high
I:1/10			gas global fault
I:1/11			prim filter vfd run
I:1/12	P103_AUTO	Global	prim filter belt drive fail
I:1/13	P103_RUN	Global	
I:1/14	P103_FAULT	Global	
I:1/15	P103_LEAK	Global	
I:2/0	P104_AUTO	Global	
I:2/1	P104_RUN	Global	
I:2/2	P104_FAULT	Global	
I:2/3	P104_LEAK	Global	
I:2/4			gaz ch3 low
I:2/5			gas ch3 high
I:2/7			gas ch4 low
I:2/8			gas ch4 high
I:2/10			prim filter auger vfd run
I:2/11			prim filter auger drive fail
I:2/12			lahh 103 prim screen hh level
I:2/13			lahh 104 lift station hh level
I:2/14			not primary filter emergency stop
I:5.0	SI_102	Global	p-102 raw wastewater speed indication
I:5.1	SI_104	Global	p-104 raw wastewater speed indication
I:5.2	FI_101	Global	raw waste water flow indication
I:5.3	SI_103	Global	p 103 raw waste water speed indication
I:5.4	LI_101	Global	lit 101 waste water lift station level indication
I:5.5	LIT_102	Global	screening chamber level indication
I:5.6	LI_501	Global	lit 501 (few) final effluent water tank level indication
I:5.7			primary filter level
I:7.0			
I:7/0	YS_105	Global	sscr 105 auto
I:7/1	MM_105	Global	sscr 105 run
I:7/2	YA_105	Global	sscr 105 fault
I:7/3	WA_105_	Global	sscr 105 high torque
I:7/4	FEW__PS1	Global	
I:7/5	FEW__PS2	Global	
I:7/6			e-stop p-102
I:7/7	AHU_AUTO	Global	auto
I:7/8	AHU_HIGH_SPEED	Global	high speed
I:7/9	AHU_LOW_SPEED	Global	low speed
I:7/10			not few hot water recirc p21
I:7/11			not hot water booster pump run p20
I:7/12			few elect heater running
I:7/13			ptoable water blue lamp
I:7/14	BLDGLAMP1	Global	bldg lamp on
I:7/15	BLDGLAMP2	Global	building lamp on
I:8/0	YS_106	Global	sscr 106 auto
I:8/1	MM_106	Global	sscr 106 run
I:8/2	YA_106	Global	sscr 106 fault
I:8/3	WA_106	Global	sscr 106 high torque
I:8/4			e-stop p103
I:8/5			e-stop p104
I:8/6			mcc ahu3 sf not running
I:8/7			mcc ahu3 ef not running
I:8/8	FEW_P1_RUN	Global	
I:8/9	FEW_P2_RUN	Global	
I:8/10	FEW_P3_RUN	Global	
I:8/11			primary filter on switch
I:8/12			filter reset button
I:8/13			prim fil blower run
I:8/14			prim fil blower fan run
I:8/15			low fuel day tank
I:11.0	AHU3_SAT	Global	ahu3 supply air temperature
I:11.1	AHU3_EAT	Global	ahu3 exhaust air temperature
I:11.2	AHU3_OAT	Global	ahu3 outside air temperature
I:11.3			
I:11.4			few elect heater temp
I:11.5			trailler room temperature
I:14.0			primary compressor pressur
N7:0	SIM_SIN	Global	
N7:1	SIM_SIN_OUT	Global	
N7:2	SIM_FAST_RAMP	Global	
N7:4	TEMPRAW1	Global	math temp raw
N7:5	RAWLAGSTART	Global	lag start
N7:6	RAWLEADSTART	Global	lead start
N7:7	RAWLAGSTOP	Global	lag stop
N7:8	RAWLEADSTOP	Global	lead stop
N7:9			
N7:9/0	RAWLEADLATCH	Global	

Address	Symbol	Scope	Description
N7:9/1	RAWLAGLATCH	Global	
N7:9/2			fit total teset fit102 flow totaliser reset
N7:9/4			lit 101 fail
N7:9/5			p102-103-104 fail only one remaning
N7:9/6			low low level lift station
N7:9/7			high high level lift station
N7:10	P102_STATUS	Global	
N7:10/0	P102_S_AUTO	Global	s status UNDER PLC CONTROL
N7:10/1	P102_S_RUNNING	Global	s status
N7:10/2	P102_S_FAULT	Global	s status
N7:10/3	P102_S_LEEK	Global	s status
N7:10/4	P102_A_0HAND	Global	a -> action pv->plc 1AUTO 0HAND
N7:10/5	MINICASRESET	Global	LEEK ALARM RESET
N7:11	P102_S_SPEED	Global	s status (CURRENT)(0-100%)
N7:12	P102_A_SPEED	Global	a action (set point) (0-100%)
N7:13	P102_E_SPEED	Global	E EXPECTED (AUTO)(0-100%)
N7:14	P102_A_PRIORITY	Global	0 LEAD, 1LAG 2 STAND
N7:15			
N7:20	P103_STATUS	Global	
N7:20/0	P103_S_AUTO	Global	s status s status 1UNDER PLC CONTROL
N7:20/1	P103_S_RUNNING	Global	s status
N7:20/2	P103_S_FAULT	Global	s status
N7:20/3	P103_S_LEEK	Global	s status
N7:20/4	P103_A_0HAND	Global	a -> action pv->plc
N7:21	P103_S_SPEED	Global	a status (CURRENT)
N7:22	P103_A_SPEED	Global	a action (set point)
N7:23	P103_E_SPEED	Global	E EXPECTED (AUTO)
N7:24	P103_A_PRIORITY	Global	0 LEAD, 1LAG 2 STAND
N7:30	P104_STATUS	Global	
N7:30/0	P104_S_AUTO	Global	S status 1UNDER PLC CONTROL
N7:30/1	P104_S_RUNNING	Global	s status
N7:30/2	P104_S_FAULT	Global	s status
N7:30/3	P104_S_LEEK	Global	s status
N7:30/4	P104_A_0HAND	Global	a -> action pv->plc
N7:31	P104_S_SPEED	Global	s status (CURRENT)
N7:32	P104_A_SPEED	Global	a action (set point)
N7:33	P104_E_SPEED	Global	E EXPECTED (AUTO)
N7:34	P104_A_PRIORITY	Global	0 LEAD, 1LAG 2 STAND
N7:41	LIT101_S_PR	Global	RAW SEWER LIFT STATION LEVEL IN %
N7:42	LIT101_S_MM	Global	RAW SEWER LIFT STATI LEVEL IN MM
N7:43	FIT101_FLOW	Global	RAW SEWER FLOW (L/min)
N7:44	SSCR_STATUS	Global	
N7:44/0	SSCR105_A_0_AUTO	Global	ENABLE AUTOMATIC
N7:44/1	SSCR106_A_0_AUTO	Global	ENABLE AUTOMATIC
N7:44/2	SSCR105_S_AUTO	Global	SCREW SCREEN STATUS
N7:44/3	SSCR105_S_RUN	Global	SCREW SCREEN STATUS
N7:44/4	SSCR105_S_WASH	Global	SCREW SCREEN STATUS
N7:44/5	SSCR105_S_FAULT	Global	SCREW SCREEN STATUS
N7:44/6	SSCR105_S_TORQ	Global	SCREW SCREEN STATUS
N7:44/7	SSCR105_A_START	Global	SCREW SCREEN START I
N7:44/8	SSCR105_A_WASH	Global	SCREW SCREEN START A
N7:44/9	SSCR106_S_AUTO	Global	SCREW SCREEN STATUS
N7:44/10	SSCR106_S_RUN	Global	SCREW SCREEN STATUS
N7:44/11	SSCR106_S_WASH	Global	SCREW SCREEN STATUS
N7:44/12	SSCR106_S_FAULT	Global	SCREW SCREEN STATUS
N7:44/13	SSCR106_S_TORQ	Global	SCREW SCREEN STATUS
N7:44/14	SSCR106_A_START	Global	SCREW SCREEN START I
N7:44/15	SSCR106_A_WASH	Global	SCREW SCREEN START A
N7:45	LIT102_S_PR	Global	SCREW SCREEN CHAMBER LEVEL (0-100%)
N7:46	LIT102_S_MM	Global	SCREW SCREEN CHAMBER IN MM 0-820 (LIT-1120MM)
N7:47	LIFT_MIN_SPD	Global	minimum speed raw sewer pump
N7:48/0			both screw screen fail
N7:48/1			prim screen level > 800 lahh+lit102
N7:48/2			lit 102 fail less 3.5ma
N7:48/3			sscr 105 fail (wont start)
N7:48/4			sscr 106 fail (wont start)
N7:48/15			count sscr wash cycle reset
N7:49	SSCR105_A_TO_RUN	Global	SCREW SCREEN START auto if no run for x
N7:50	SSCR105_A_TO_WASH	Global	SCREW SCREEN WASH N sec
N7:53	SSCR_A_HIGH_LVL	Global	SCREW SCREEN start high level (mm)
N7:54			count sscr wash cycle
N7:62/0			gas fault
N7:62/1			gas ait113
N7:65	FEW_STATUS	Global	
N7:65/0	FEW_S_S1	Global	FEW PUMP STAGE 1 STA
N7:65/1	FEW_S_S2	Global	FEW PUMP STAGE 2 STA
N7:65/2	FEW_S_P1RUN	Global	FEW PUMP 1 RUN
N7:65/3	FEW_S_P2RUN	Global	FEW PUMP 2 RUN
N7:65/4			few p1 run

Address	Symbol	Scope	Description
N7:65/7	FEW_S_A1	Global	FEW PUMP 1 ALARM (WO
N7:65/8	FEW_S_A2	Global	FEW PUMP 2 ALARM (WO
N7:65/9	FEW_S_A3	Global	FEW PUMP 3 ALARM (WO
N7:65/10	FEW_FULL_LAMP	Global	
N7:65/11	FEW_EMPTY_LAMP	Global	
N7:65/12			VERY LOW FEW LEVEL
N7:65/13			ALL PUMP FAIL
N7:66	FEW_S_LEVEL	Global	FEW TANK LEVEL
N7:67	FEW_P1_LEADLAGSTAND	Global	0 lead 1 lag 2 standby
N7:68	FEW_P2_LEADLAGSTAND	Global	
N7:69	FEW_P3_LEADLAGSTAND	Global	
N7:70			few elect heater temp
N7:71			
N7:71/0			few p21 fail
N7:71/1			few p20 fail
N7:71/2			few elect heater fail
N7:71/3			few filter flush
N7:75	BOIL_S_TEMP	Global	HEATING SYSTEM CUREN
N7:76	OAT_S_TEMP	Global	OUTSIDE AIR TEMPERA
N7:78			ahu pre defrost time
N7:79	AHU_S_MV	Global	AHU_S_MV
N7:80	AHU_S_SAT	Global	AHU-3 SUPPLY AIR TEM
N7:81	AHU_A_SATSET	Global	AHU-3 SUPPLY AIR TEM
N7:82	AHU_S_EAT	Global	AHU-3 EXHAUST AIR temperature
N7:83	AHU_H_O_A	Global	0 OFF 1 STAND BY 2 LS REMOTE 3 LS LIGHT 4 HS REMOTE 5 HS GAS-- 6 fail
N7:84	AHU_BIT_STATUS	Global	
N7:84/1			ahu3 auto
N7:84/2			ahu3 hand
N7:84/3			1- ahu3 high speed 0- ahu low speed
N7:84/4			ahu defrost mmi info
N7:84/5	AHU_S_SF_FAIL	Global	
N7:84/6	AHU_S_EF_FAIL	Global	
N7:84/7			ahu auto defrost latch
N7:84/8			selector remote ahu defrost
N7:84/9			ahu freeze bellow 0 c more then 5 min
N7:85	AHU_S_OAT	Global	
N7:86	AHU_SF_STATUS	Global	0-off 1-low speed 2 high speed
N7:87	AHU_EF_STATUS	Global	0-off 1-low speed 2 high speed
N7:88	AHU_A_DEFROST_TEMP	Global	
N7:89	AHU_A_DEFROST_DELAY	Global	
N7:90	B1_START_LEVEL	Global	b1 start set point
N7:91	B2_START_LEVEL	Global	
N7:92	B1_START_SUMMER	Global	
N7:93	B2_START_SUMMER	Global	
N7:96/0	B1_RUN	Global	
N7:96/1	B2_RUN	Global	
N7:96/2	OAT_GRT_10	Global	oat greater then 10c
N7:96/3	OAT_GRT_16	Global	oat greater then 16c
N7:96/4			low glycol temp less 30c more 10 sec
N7:96/5			trailler room freeze
N7:97			trailler room tempreature
N7:98			temp trailler room set alarm
N7:99	CLYCOL_DIV10	Global	glycol temperatur give real val 10 = 10c
N7:100/0			start hot water auto low speed screen flush
N7:100/1			start cold water bottom flush
N7:100/2			dewatering conveyor enable
N7:100/3			primary filter blower run
N7:100/4			blower fail
N7:100/5			primary filter filter run
N7:100/6			primary filter filter alarm vfd fail
N7:100/7			primary filter auger run
N7:100/8			primary filter auger alarm vfd fail
N7:100/9			primary filter blower fan run
N7:100/10			primary filter blower fan alarm
N7:100/11			hot water flush in progress
N7:100/12			cold water flush in progress
N7:100/13			not mmi Emergency stop pressed
N7:100/14	PRIMFIL_ON	Global	primfil unit on
N7:100/15	PRIFIL_BELTRUN	Global	prim filter belt ask run
N7:101/0			filter belt speed 0 hand 1 auto (auto reset 2 minutes)
N7:101/1	AUGER_HAND	Global	auger 1hand 0auto
N7:101/2			prifil_wash reset
N7:101/10	PRIFIL_HSFLUSH	Global	start high speed flush
N7:102			hot water screen flush max time w/o flush left
N7:103			hot hater screen flush time
N7:104			cold water bottum flush off time
N7:105			cold water bottum flush on time
N7:106			dewatering conveyor on time
N7:107	PRIFIL_BELTSTART	Global	belt screen zero speed

Address	Symbol	Scope	Description
N7:108	PRIFIL_BELTSTOP	Global	belt screen full speed
N7:109	PRIFIL_WASHBEGLVL	Global	wash cycle start level
N7:110			actual filter belt speed
N7:111	PRIFIL_WASHSPD	Global	filter belt wash speed
N7:112	PRIFIL_MANSPD	Global	manual belt set speed from mmi
N7:113	PRIFIL_CALCSPD	Global	calculated belt speed function of level via mmi
N7:114	PRIFIL_LVLMM	Global	primary filter level scaled in mm
N7:115	PRIFIL_COMP_PRESS	Global	primary filter compressor pressure
N7:116			prifil_wash_count
N7:119/0			low fuel alarm day tank
N7:120/0			global ahu enable
N7:120/1			ahu alarm
N7:121/0			heating alarm enable
N7:121/1			heating alarm
N7:122/0			lift station alarm enable
N7:122/1			lift station alarm
N7:123/0			prim screen alarm enable
N7:123/1			prim screen alarm
N7:124/0			prim filter alarm enable
N7:124/1			prim filter alarm
N7:125/0			Few global Alarm enable
N7:125/1			Few global Alarm
N7:129/0			auto dialler active
N7:201			
N7:202			
N7:240	COPY_N7_14	Global	
N7:241	COPY_N7_24	Global	
N7:242	COPY_N7_34	Global	
N7:245	N767COPY	Global	
N7:246	N768COPY	Global	
N7:247	N769COPY	Global	
N7:250			temp boiller
N7:251	0	Global	temp boiller
N7:252			temp b1
N7:253			temp b2 summer
N21:0	N21	Global	pid ahu3
N21:2			
O:3/0	P102START	Global	
O:3/1	P104START	Global	
O:3/2			
O:3/3	SSCR106RUN	Global	wash selenoid sscr 106
O:3/4	P103START	Global	
O:3/5			e-stop nonyfy
O:3/6	SSCR105RUN	Global	sscr 105 output run
O:3/7	LEAKALARMSESET	Global	MINICAS LEEK ALARM RESET
O:4/0			few low level red lamp on
O:4/1			few full level blue lamp
O:4/2	HORNFEW	Global	horn few plus selenoid valve to dump few water outside when potable water full
O:4/4	FEW_P1	Global	start few p1
O:4/5	FEW_P2	Global	start few p2
O:4/6	FEW_P3	Global	start few p3
O:4/7			hot few recirc pump p21
O:6.0	SC_102	Global	raw waste water speed set point analog out 4-20ma int 6242-31208
O:6.1	SC_104	Global	raw waste water speed set point
O:6.2	SC_103	Global	raw waste water speed set point
O:6.3			ahu-3 coil control valve
O:9/0	STOP_B1	Global	
O:9/1	STOP_B2	Global	
O:9/3			few p20 very hot water booster pump enable
O:9/4			auto dialler chanel 1
O:9/5			auto dialler chanel 2
O:9/6			ahu unit on lamp
O:9/7			defrost damper
O:10/0			ahu3 sf run low
O:10/1			ahu3 sf run high
O:10/2			ahu3 ef run low
O:10/3			ahu3 ef run high
O:10/4			fresh air intake outdoor air damper
O:10/5			few electric heater enable
O:10/6			exhaust air damper
O:12/0			prim filt auger vfd start
O:12/1			prim filt auger vfd fault
O:12/2			prim filt drive vfd start
O:12/3			prim filt drive vfd fault reset
O:12/4			hot water flush
O:12/5			cold water flush POWER = CLOSE VALVE
O:12/6			cold water bottom flush valve POWER = CLOSE SO OPEN PRESSVALVE
O:12/7			prim blower start
O:12/8			prim blower fan start

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Address/Symbol Database

Address	Symbol	Scope	Description
O:12/9			primary filter run lamp
O:12/10			primary filter fail lamp
O:12/11	SV_106	Global	wash selenoid sscr 105
O:12/12	SV_105	Global	wash selenoid sscr 106
O:12/13			e-stop notify
O:12/14			
O:12/15			few filter flush 1 minutes every 24 hres
O:13.0	PRIMFIL_BELT_SPD	Global	primary filter belt speed
S:0			Arithmetic Flags
S:0/0			Processor Arithmetic Carry Flag
S:0/1			Processor Arithmetic Underflow/ Overflow Flag
S:0/2			Processor Arithmetic Zero Flag
S:0/3			Processor Arithmetic Sign Flag
S:1			Processor Mode Status/ Control
S:1/0			Processor Mode Bit 0
S:1/1			Processor Mode Bit 1
S:1/2			Processor Mode Bit 2
S:1/3			Processor Mode Bit 3
S:1/4			Processor Mode Bit 4
S:1/5			Forces Enabled
S:1/6			Forces Present
S:1/7			Comms Active
S:1/8			Fault Override at Powerup
S:1/9			Startup Protection Fault
S:1/10			Load Memory Module on Memory Error
S:1/11			Load Memory Module Always
S:1/12			Load Memory Module and RUN
S:1/13			Major Error Halted
S:1/14			Access Denied
S:1/15			First Pass
S:2/0			STI Pending
S:2/1			STI Enabled
S:2/2			STI Executing
S:2/3			Index Addressing File Range
S:2/4			Saved with Debug Single Step
S:2/5			DH-485 Incoming Command Pending
S:2/6			DH-485 Message Reply Pending
S:2/7			DH-485 Outgoing Message Command Pending
S:2/15			Comms Servicing Selection
S:3			Current Scan Time/ Watchdog Scan Time
S:4			Time Base
S:4/0			
S:4/2			
S:4/7			
S:4/8			
S:4/9			
S:4/10			
S:5/0			Overflow Trap
S:5/2			Control Register Error
S:5/3			Major Err Detected Executing UserFault Routine
S:5/4			M0-M1 Referenced on Disabled Slot
S:5/8			Memory Module Boot
S:5/9			Memory Module Password Mismatch
S:5/10			STI Overflow
S:5/11			Battery Low
S:6			Major Error Fault Code
S:7			Suspend Code
S:8			Suspend File
S:9			Active Nodes
S:10			Active Nodes
S:11			I/O Slot Enables
S:12			I/O Slot Enables
S:13			Math Register
S:14			Math Register
S:15			Node Address/ Baud Rate
S:16			Debug Single Step Rung
S:17			Debug Single Step File
S:18			Debug Single Step Breakpoint Rung
S:19			Debug Single Step Breakpoint File
S:20			Debug Fault/ Powerdown Rung
S:21			Debug Fault/ Powerdown File
S:22			Maximum Observed Scan Time
S:23			Average Scan Time
S:24			Index Register
S:25			I/O Interrupt Pending
S:26			I/O Interrupt Pending
S:27			I/O Interrupt Enabled
S:28			I/O Interrupt Enabled
S:29			User Fault Routine File Number

Address/Symbol Database

Address	Symbol	Scope	Description
S:10			STI Setpoint
S:31			STI File Number
S:32			I/O Interrupt Executing
S:33			Extended Proc Status Control Word
S:33/0			Incoming Command Pending
S:33/1			Message Reply Pending
S:33/2			Outgoing Message Command Pending
S:33/3			Selection Status User/DF1
S:33/4			Communicat Active
S:33/5			Communicat Servicing Selection
S:33/6			Message Servicing Selection Channel 0
S:33/7			Message Servicing Selection Channel 1
S:33/8			Interrupt Latency Control Flag
S:33/9			Scan Toggle Flag
S:33/10			Discrete Input Interrupt Reconfigur Flag
S:33/11			Online Edit Status
S:33/12			Online Edit Status
S:33/13			Scan Time Timebase Selection
S:33/14			DTR Control Bit
S:33/15			DTR Force Bit
S:34			Pass-thru Disabled
S:34/0			Pass-Thru Disabled Flag
S:34/1			DH+ Active Node Table Enable Flag
S:34/2			Floating Point Math Flag Disable,Fl
S:35			Last 1 ms Scan Time
S:36			Extended Minor Error Bits
S:36/8			DII Lost
S:36/9			STI Lost
S:36/10			Memory Module Data File Overwrite Protection
S:37			Clock Calendar Year
S:38			Clock Calendar Month
S:39			Clock Calendar Day
S:40			Clock Calendar Hours
S:41			Clock Calendar Minutes
S:42			Clock Calendar Seconds
S:43			STI Interrupt Time
S:44			I/O Event Interrupt Time
S:45			DII Interrupt Time
S:46			Discrete Input Interrupt- File Number
S:47			Discrete Input Interrupt- Slot Number
S:48			Discrete Input Interrupt- Bit Mask
S:49			Discrete Input Interrupt- Compare Value
S:50			Processor Catalog Number
S:51			Discrete Input Interrupt- Return Number
S:52			Discrete Input Interrupt- Accumulat
S:53			Reserved/ Clock Calendar Day of the Week
S:55			Last DII Scan Time
S:56			Maximum Observed DII Scan Time
S:57			Operating System Catalog Number
S:58			Operating System Series
S:59			Operating System FRN
S:61			Processor Series
S:62			Processor Revision
S:63			User Program Type
S:64			User Program Functional Index
S:65			User RAM Size
S:66			Flash EEPROM Size
S:67			Channel 0 Active Nodes
S:68			Channel 0 Active Nodes
S:69			Channel 0 Active Nodes
S:70			Channel 0 Active Nodes
S:71			Channel 0 Active Nodes
S:72			Channel 0 Active Nodes
S:73			Channel 0 Active Nodes
S:74			Channel 0 Active Nodes
S:75			Channel 0 Active Nodes
S:76			Channel 0 Active Nodes
S:77			Channel 0 Active Nodes
S:78			Channel 0 Active Nodes
S:79			Channel 0 Active Nodes
S:80			Channel 0 Active Nodes
S:81			Channel 0 Active Nodes
S:82			Channel 0 Active Nodes
S:83			DH+ Active Nodes
S:84			DH+ Active Nodes
S:85			DH+ Active Nodes
S:86			DH+ Active Nodes
T4:0			1/100 hhs base
T4:1			1/100 h base

Address	Symbol	Scope	Description
T4:1/DN			
T4:2			sscr wash duty
T4:2/DN			
T4:3			sscr wash period
T4:4			timer few 01 fail
T4:4/DN			
T4:5			timer few 02 fail
T4:6			timer few 03 fail
T4:6/DN			
T4:7			tim ahu on
T4:7/DN			
T4:8			tim ahu
T4:8/DN			
T4:9			ahu ls
T4:9/DN			
T4:10			tim 1 minute
T4:10/DN			tim 1 minute
T4:11			tim 1 minute
T4:11/DN			
T4:12			tim ahu defrost
T4:12/DN			
T4:13			ahu sf fail
T4:13/DN			
T4:14			ahu ef fail
T4:14/DN			
T4:15/DN			
T4:16			tim ahu freeze
T4:16/DN			
T4:17			tim low gly temp
T4:17/DN			
T4:18			tim alarm high screw level
T4:18/DN			
T4:19/DN			
T4:20			ahu pre defrost time
T4:20/DN			
T4:21			tim full potable water
T4:21/DN			
T4:22			tim few empty
T4:22/DN			
T4:23			tim lshh104
T4:23/DN			
T4:24			tim auto prim fil
T4:24/DN			
T4:25			tim few heat enable
T4:25/DN			
T4:26			tim 1 sec time base
T4:27			tim 1 sec time base
T4:28			tim sscr level auto wash
T4:28/DN			
T4:29/DN			
T4:30			tim prifil blower fan fail
T4:30/DN			
T4:31			prim filter blower fail
T4:32			tim hot few recirc disable no water
T4:32/DN			
T4:33			few ovwerflow
T4:33/DN			
T4:34			tim few p21 fail
T4:35			
T4:36			tim few elect heater
T4:37			tim sscr 105 fail
T4:37/DN			
T4:38/DN			
T4:39			tim very low few
T4:39/DN			
T4:40			tim few pump fail
T4:40/DN			
T4:41			estop beep off time
T4:41/DN			
T4:42			estop beep on time
T4:42/DN			
T4:43			tim building alarm lag
T4:43/DN			
T4:44			tim process alarm
T4:44/DN			
U:4			
U:5			
U:6			
U:7			

Address	Symbol	Scope	Description
U:9			
U:10			
U:11			

Instruction Comment Database

Address	Instruction	Description

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Symbol Group Database

Group_Name	Description

Chapter 16 PLANT CONTROL CABLE

MANUFACTURER/DISTRIBUTOR:

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16.1 CONTROL CABLE AND CONNECTOR.

END OF CHAPTER 16

[redacted] JUMP TO Select Site

SEARCH Keyword(s)

1015-16 [redacted]

Advanced Part Number Search

Quick Quote

BROWSE -- Select A Catalog --

CANADA (English)

[redacted]

Part Detail

Quantity: Feet [redacted]

[redacted]

Anixter Part No.	TOS-1015-16/26-0
Manufacturer	ALL GENERIC VENDORS
Manufacturer Part Nos.	-
	-
Description	UL1015 16 26STR TNC PVC BLK 600V 105C MTW CSA TEW

Attributes

UL Style:	UL TYPE AWM, STYLE 1015
Gauge: (AWG)	16 AWG (AMERICAN WIRE GAUGE)
CONDUCTOR: Stranding	26 STRANDS IN EACH CONDUCTOR
Material	TINNED COPPER
INSULATION: Material	PVC-POLYVINYL CHLORIDE
Color	BLACK
Shielded:	NOT SHIELDED
SPEC/STD: UL	UL LISTED TYPE AWM(APPLIANCE WIRING MATERIAL)
CSA	CSA TYPE TEW
Temperature Rating:	105 DEGREES CENTIGRADE (221 F)
Voltage Rating:	600 VOLTS AC OR DC
Product Type:	UL STYLES 1000-1999
Unspsc Code	26121539

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☑ NO EXCEPTIONS TAKEN

☐ MAKE NOTED CORRECTIONS

☐ REVISE & RESUBMIT

☐ REJECTED

DATE Nov 7/05 BY DC

EARTH TECH (CANADA) INC.

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Questions or Feedback

eANIXTER Version 4.47

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TMCX TER ATOR™ Cable Fitting
Installation & M enance Information

COOPER Crouse-Hinds

IF1184

SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE

APPLICATION

TMCX series Terminator cable fittings are designed for use with Type MC jacketed metal clad cable, interlocked armor and continuous corrugated armor and Type TC tray cable in hazardous (classified) locations when installed, in accordance with NEC sections 501-4(a) and (b), 501-5(c)(d) and (e), 502-4(a) and (b), 502-5 and 503-3.

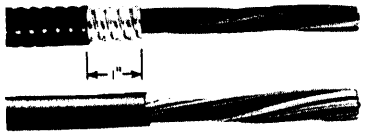
TMCX series Terminator cable fittings are installed to provide a means for passing Type MC (metal clad jacketed cable) and Type TC† (tray cable) into an enclosure, panelboard or other equipment to provide a watertight termination. TMCX series Terminator cable fittings are reusable. The armor stop / sealing chamber serves as an integral union that allows disassembly and reuse without compromising the integrity of the cable or the seal. Once the cable has been sealed, the TMCX can be disassembled to remove the cable and armor stop / sealing chamber from the body.

Ground continuity between cable armor and metal enclosures is inherently maintained with type MC cable. Type TC cable is grounded by a separate ground conductor.

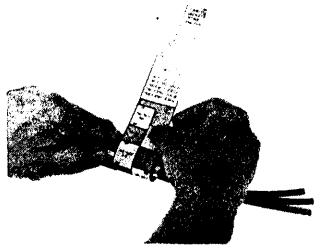
TMCX series Terminator cable fittings are UL listed for hazardous locations (with TSC Epoxy Sealing Compound only) according to UL Standards 514B and 886*. They are suitable for use in NEC Class I, Divisions 1 & 2, Groups A, B, C, D; Class II, Divisions 1 & 2, Groups E, F & G; and Class III, Division 1 & 2 hazardous (classified) locations when installed in accordance with NEC articles 501-4(a) and (b), 501-5(c)(d) and (e), 502-4(a) and (b), 502-5 and 503-3 (See Table 5).

INSTALLATION

1. Remove the jacket (and armor if applicable) from the cable to expose a sufficient length of conductors required for the job. For Type MC cable leave approximately 1" of armor exposed.



2. Using the cable gauge and sizer supplied with the Terminator, measure the exposed cable armor or tray cable outside diameter and select the appropriate cable fitting. Place the bottom of the gauge on the exposed cable armor or sheath and hold the gauge with your thumb. Wrap gauge tightly. The arrows at the bottom of the gauge indicate which catalog number will be required to terminate the cable. In the example shown below a TMCX3112 would be used.



Note: If a cable gauge and sizer is not available, determine the O.D. of the cable armor or cable sheath and chose the appropriate fitting using Table 1.

* TMCX 10402 is UL Listed for use with steel interlock armor cable only.
† 1/2" - 2-1/2" sizes

NPT Size	Cat.No.	Cable Range Over Type MC Armor or Type TC Sheath (inches)
1/2"	TMCX165	.440"-.650"
3/4"	TMCX285	.600"-.850"
1"	TMCX3112	.800"-1.120"
1-1/4"	TMCX4140	1.100"-1.400"
1-1/2"	TMCX5161	1.280"-1.610"
2"	TMCX6206	1.570"-2.060"
2-1/2"	TMCX7247	1.930"-2.470"
3"	TMCX8302	2.450"-3.020"
3-1/2"	TMCX9352	2.950"-3.520"
4"	TMCX10402	3.500"-4.020"

Table 1

3. For Type MC cables: Refer to Table 2 or the steps on the cable gauge and sizer to determine the proper amount of armor to be exposed for assembly. Remove additional jacket if necessary. Inspect the armor and use a file to remove any burrs.



NPT Size	Amount of Cable Armor to be Exposed (Dim. A)
1/2"	1-1/4"
3/4"	1-1/4"
1"	1-3/8"
1-1/4"	1-3/8"
1-1/2"	1-3/8"
2"	1-1/8"
2-1/2"	1-1/8"
3"	1-1/8"
3-1/2"	1-1/8"
4"	1-1/8"

Table 2
Amount of Armor to be Exposed

Note: Refer to the line drawing on the back page for identification of TMCX cable fittings components.

4. Prepare Cable. For Type MC remove all fillers and shielding back to armor. For Type TC remove fillers back to sheath. Disassemble body and armor stop / sealing chamber from fitting. Install body into the enclosure and tighten with wrench. Slide gland nut and intermediate body assembly onto cable as shown below. Separate uninsulated ground conductors back to armor or sheath to allow sealing of individual strands.



5. Type MC Cable: In order to accomodate the variation of cable manufacturing processes, and the cable armor O.D. range of the fitting, a non-metallic armor stop reducer is installed in the armor stop/sealing chamber. If the conductors do not pass through the armor stop reducer, remove the reducer. Make certain that the cable armor is stopped by the armor stop / sealing chamber insert or armor stop reducer.

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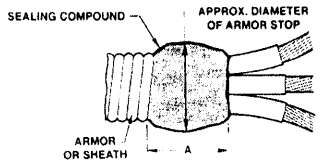
6. Separate conductors and individual strands of ground conductor. Wooden wedges are recommended to hold large conductors apart for compound packing. Mix 2-part epoxy sealing compound provided by kneading and folding until a uniform color is obtained (approximately 2-3 minutes). Refer to Table 3. More compound than is needed for the installation is provided. Use only as much as is needed.

Note: Gloves are not required for installation of sealing compound. However, for those with sensitive skin or for prolonged exposure it is recommended that gloves are worn.

Pack a sufficient amount of compound between inside diameter of armor sheath and conductor filler bundle. See Table 3.

NPT Size	Cat.No.	Amount of Compound Required(oz.)	Amount of Compound Provided(oz.)	Dim. "A"
1/2"	TMCX165	0.25	0.50	1"
3/4"	TMCX285	0.50	1.00	1"
1"	TMCX3112	0.70	1.00	1-1/4"
1-1/4"	TMCX4140	1.50	2.00	1-1/4"
1-1/2"	TMCX5161	1.85	2.00	1-1/2"
2"	TMCX6206	4.50	5.00	2"
2 1/2"	TMCX7247	8.65	9.00	2 1/2"
3"	TMCX8302	15.75	16.00	3"
3-1/2"	TMCX9352	25.55	28.00	3-1/2"
4"	TMCX10402	38.95	41.00	4"

Table 3





Use a hardwood stick or dowel to pack compound in areas not readily accessible to fingers and particularly in the center most areas of the cable. To prevent damage to conductors during packing of the compound, do not use metal tools. Seal end of fillers, and any resulting voids with a layer of compound 1/4" minimum thickness.

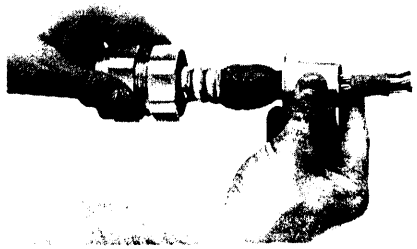
Note: When preparing the seal in cold temperatures, mix sealing compound one tube at a time.

Note: Working life of compound is approximately 30 minutes at 68°F. Working life decreases at elevated temperatures. In cold weather warm components and sealing compound until ready for use by storing in the cab of a truck or inside a pocket. Fitting may be assembled at temperatures as low as 40°F/4°C. Allow assembly to set at 40°F/4°C for 24 hours.

conductors through armor stop chamber.

Note: Duct tape or similar mat helpful when wrapping conductors.

Slide the armor stop / sealing chamber over the epoxy compound and back against the armor or sheath, squeezing compound into leads and back over armor or sheath.



8. Remove excess compound from the large end of the armor stop / sealing chamber to expose the insert taper. This surface must remain clean for the spring to seat properly and provide grounding continuity and pullout strength. After removing excess compound, fill in any voids with additional compound.



9. Pack compound between and around conductors at the small end of the armor stop / sealing chamber to fill any voids. Chamber should remain flush with the end of the armor stop / sealing chamber.

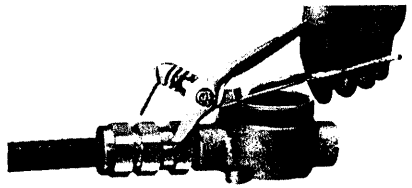
⚠ CAUTION

The outside surface of the armor stop / sealing chamber must remain clean and free of compound and other foreign matter. Immediately wipe any excess compound from the outside surface of the armor stop / sealing chamber. Do not use metal tools as they can damage the surface of the armor stop / sealing chamber.

10. Insert the cable and armor stop / sealing chamber assembly into body.



With armor stop / sealing chamber fully inserted into body, slide intermediate body with gland nut over the armor stop / sealing chamber and thread onto body. Completely tighten intermediate body with wrench. Tighten gland nut on intermediate body to compress bushing for a weathertight seal. Refer to Table 4 for torquing requirements.



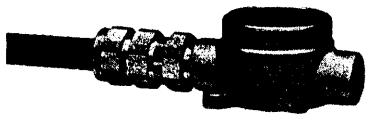
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Dim. NPT	N°cat.	de serrage (lb - po) Corps	Écrou
1/2 po	TMCX165	300	300
3/4 po	TMCX285	500	500
1 po	TMCX3112	700	700
1 1/4 po	TMCX4140	1000	700
1 1/2 po	TMCX5161	1200	700
2 po	TMCX6206	1600	700
2 1/2 po	TMCX7247	1600	700
3 po	TMCX8302	1600	700
3 1/2 po	TMCX9352	1600	700
4 po	TMCX10402	1600	700

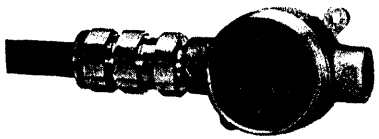
Tableau 4

11. Si l'on utilise un câble de type MC, vérifier la continuité entre l'armure du câble et le boîtier.
12. Si l'on utilise un câble de type MC, vérifier la continuité entre l'armure du câble et le boîtier.





Installation de câble de type MC terminée





Installation de câble de type TC terminée

DÉMONTAGE

Pour démonter un raccord TMCX, se reporter à la figure 1 et aux directives ci-dessous :

1. Couper l'alimentation électrique de l'équipement et défaire tous les raccordements électriques.
2. Desserrer l'écrou d'étanchéité (1) sans le détacher du corps intermédiaire (2).
3. Séparer l'ensemble écrou d'étanchéité et corps intermédiaire (1 et 2) du corps (4).

   N.B. : Si l'ensemble écrou d'étanchéité et corps intermédiaire résiste, insérer un tournevis ou un outil semblable dans la rainure (3) (entre la butée d'armure et le corps) et s'en servir comme levier pour le séparer du corps.

   Faire glisser l'ensemble écrou d'étanchéité et corps intermédiaire sur le câble.
4. Retirer précautionneusement le câble et la butée d'armure / la chambre d'étanchéité du corps en tirant sur le câble ou sur le corps / le boîtier.
5. Le raccord TMCX est prêt à être remonté.

REMONTAGE

⚠ ATTENTION

Avant le remontage, examiner les surfaces du joint conique entre le corps et la butée d'armure / la chambre d'étanchéité. Ces surfaces doivent pouvoir être serrées hermétiquement l'une contre l'autre de manière à former un joint vraiment antidéflagrant. Éliminer la poussière ou les matières étrangères des deux surfaces. Si l'une des deux est égratignée, abîmée, corrodée ou endommagée de quelque façon que ce soit, ne pas procéder au remontage. Remplacer le raccord.

Si les surfaces de la butée d'armure / la chambre d'étanchéité sont en bon état, on peut alors remonter le raccord TMCX. Se reporter aux étapes nos 10 à 12 pour connaître les exigences de remontage et de serrage.

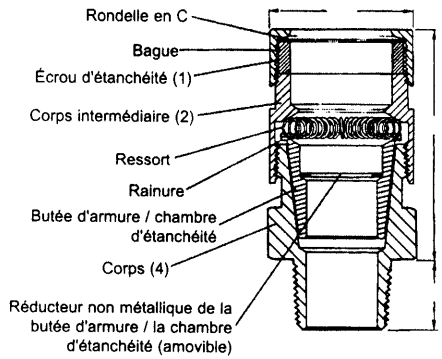


Figura 1

DIMENSIONS

Dim. NPT	N°cat.	Dim. d'armure de câble (type MC) ou de gaine (type TC) correspondantes	A (pouces)	B (pouces)	C (pouces)
1/2 po	TMCX165	0,440 po - 0,650 po	2 5/8	3/4	1 3/8
3/4 po	TMCX285	0,600 po - 0,850 po	2 7/8	25/32	1 5/8
1 po	TMCX3112	0,800 po - 1,120 po	3 1/8	15/16	2
1 1/4 po	TMCX4140	1,100 po - 1,400 po	3 1/8	31/32	2 7/16
1 1/2 po	TMCX5161	1,280 po - 1,610 po	3 3/8	31/32	2 3/4
2 po	TMCX6206	1,570 po - 2,060 po	5-5/16	1	3 1/2
2 1/2 po	TMCX7247	1,930 po - 2,470 po	6-6/16	1 7/16	4
3 po	TMCX8302	2,450 po - 3,020 po	6-11/16	1 7/16	4 7/8
3 1/2 po	TMCX9352	2,950 po - 3,520 po	7-3/4	1 5/8	5 3/8
4 po	TMCX10402	3,500 po - 4,020 po	8-5/16	1 5/8	5 7/8

Table 5 - Conformités

Les raccords de câbles Terminator de la série TMCX sont répertoriés UL pour les emplacements dangereux (avec le ciment d'étanchéité à l'époxy TSC seulement) selon les normes 514B et 886 des UL**. Ils conviennent à l'utilisation dans les emplacements dangereux (classifiés) du NEC conformément aux sections 501-4(a) et (b), 501-5(c)(d) et (e), 502-4(a) et (b), 502-5 et 503-3 du NEC. Le câble pour chemin de câbles ne convient pas à l'utilisation dans les emplacements dangereux (classifiés) de classe III.

Numéro de catalogue	Conformités
TMCX165 TMCX285 TMCX3112 TMCX4140 TMCX5161	Classe I**, divisions 1 et 2, groupes A, B, C, D Classe II, divisions 1 et 2, groupes E, F et G Classe III

Numéro de catalogue	Conformités
TMCX6206 TMCX7247 TMCX8302† TMCX9352† TMCX10402†	Classe I** divisions 1 et 2, groupes A, B, C, D Classe II, divisions 1 et 2, groupes E, F et G Classe III

** Le TMCX10402 n'est répertorié UL que pour utilisation avec un câble à armure articulée en acier.

† Les TMCX8302, -9352 et -10402 ne sont pas répertoriés UL pour utilisation avec les câbles TC.

← La série TMCX est homologuée pour utilisation dans les emplacements dangereux de division 1 quand on l'utilise avec des câbles MC homologués pour utilisation dans les emplacements dangereux de division 1.

Tous les énoncés, de même que tous les renseignements techniques et les recommandations contenus dans le présent document, sont fondés sur une information et des résultats que nous croyons fiables.Nous ne pouvons toutefois en garantir ni la précision ni l'exhaustivité. Conformément aux "conditions de vente" de Crouse-Hinds et étant donné que les conditions d'utilisation échappent à notre contrôle, l'acheteur doit décider lui-même si le produit est approprié à l'usage qu'il entend en faire et assumer tous les risques et toutes les responsabilités connexes.

COOPER Crouse-Hinds

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Crouse-Hinds Division
PO Box 4999, Syracuse, New York 13221 • U.S.A.

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Révision 2
Révise 04/02

TMCX TERMINATOR™

COOPER Crouse-Hinds

Información de Instalación y Mantenimiento

IF1184

CONSERVE ESTAS INSTRUCCIONES PARA FUTURAS CONSULTAS

APLICACIÓN

Los accesorios TMCX "Terminators" están diseñados para utilizarse con cables con cubierta metálica con cubierta exterior Tipo MC, armadura engargolada y armadura corrugada continua y cable Tipo TC en charola en lugares peligrosos (clasificados) cuando se instalan, de acuerdo con las secciones 501-4(a) y (b), 501-5(c)(d) y (e), 502-4(a) y (b), 502-5 y 503-3 del NEC.

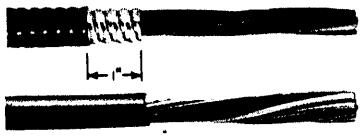
Los accesorios TMCX "Terminators" se instalan para proporcionar un medio para pasar el cable Tipo MC (cables con cubierta metálica con cubierta exterior) y cable Tipo TC† (cables para charola) en una envolvente, panel de alumbrado y control u otro equipo para proporcionar una terminación hermética al agua. Los accesorios Los TMCX son reusables. La cámara de retención / sellado de la armadura sirve como una unión integral que permite desensamblar y reusar sin comprometer la integridad del cable o del sello. Una vez que se ha sellado el cable, el TMCX puede desensamblarse para quitar el cable y la cámara de retención / sellado de la armadura del cuerpo.

La continuidad de la tierra entre la armadura del cable y las envolventes de metal se mantiene inherentemente con el cable tipo MC. El cable tipo TC es puesto a tierra por un conductor de tierra separado.

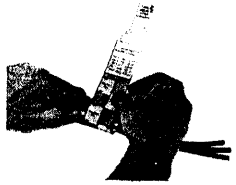
Los accesorios TMCX "Terminators" están listados por UL para lugares peligrosos (únicamente con el Compuesto Sellador Epóxico TSC) de acuerdo con las Normas UL 514B y 886 *. Son adecuados para utilizarse en la Clase I, Divisiones 1 y 2, Grupos A, B, C, D; Clase II, Divisiones 1 y 2, Grupos E, F y G; y Clase III, Divisiones 1 y 2 lugares peligrosos (clasificados) del NEC, cuando se instalan de acuerdo con los artículos 501-4(a) y (b), 501-5(c) (d) y (e), 502-4(a) y (b), 502-5 y 503-3 del NEC: (Vea la Tabla 5).

INSTALACIÓN

1. Quite la cubierta (y la armadura si es aplicable) del cable para exponer una longitud suficiente de los conductores requerida para el trabajo. Para el cable Tipo MC deje expuesta la armadura aproximadamente 25,4 mm (1").



2. Usando el medidor-calibrador de cable proporcionado con el "Terminator", mida el diámetro exterior expuesto de la armadura del cable o cable para charola y seleccione el accesorio del cable adecuado. Coloque el fondo del medidor en la armadura o cubierta expuesta del cable y sostenga el medidor con su dedo pulgar. Envuelva el medidor herméticamente. Las flechas en el fondo del medidor indican qué número de catálogo se requiere para el cable en cuestion. En el ejemplo mostrado a continuación, se utilizaría un TMCX3112.



Nota: Si no se tiene disponible un medidor-calibrador de cable, determine el diámetro exterior de la armadura del cable o cubierta del cable y seleccione el accesorio adecuado utilizando la Tabla 1.

* El TMCX10402 está listado por UL únicamente para utilizarse en cables con armadura de acero engargolada.

† 1/2" - 2-1/2"

Rango de tamaños para cables del

Medida NPT	Catalogo	Tipo MC y TC
16 (1/2")	TMCX165	11,17mm - 16,51mm (.440"-.650")
21 (3/4")	TMCX285	15,24mm - 21,59mm (.600"-.850")
27 (1")	TMCX3112	20,32mm - 28,44mm (.800" - 1.120")
35 (1-1/4")	TMCX4140	27,94mm - 35,56mm (1.100" - 1.400")
41 (1-1/2")	TMCX5161	32,51mm - 40,89mm (1.280" - 1.610")
53 (2")	TMCX6206	39,87mm - 52,32mm (1.570" - 2.060")
63 (2-1/2")	TMCX7247	49,02mm - 62,73mm (1.930" - 2.470")
78 (3")	TMCX8302	62,23mm - 76,70mm (2.450" - 3.020")
91 (3-1/2")	TMCX9352	74,93mm - 89,40mm (2.950" - 3.520")
103 (4")	TMCX10402	88,9mm -102,10mm (3.500" - 4.020")

3. Para los cables Tipo MC: Refiérase a la Tabla 2 o siga los pasos con el medidor-calibrador de cable para determinar la cantidad adecuada de armadura que debe exponerse para el ensamble. Quite la cubierta adicional si es necesario. Inspeccione la armadura y use una lima para quitar las rebabas.



Cantidad de cable armado a ser

Medida NPT	expuesto (Dim. A)
16 (1/2")	31,75mm (1-1/4")
21 (3/4")	31,75mm (1-1/4")
27 (1")	34,92mm (1-3/8")
35 (1-1/4")	34,92mm (1-3/8")
41 (1-1/2")	34,92mm (1-3/8")
53 (2")	28,57mm (1-1/8")
63 (2-1/2")	28,57mm (1-1/8")
78 (3")	28,57mm (1-1/8")
91 (3-1/2")	28,57mm (1-1/8")
103 (4")	28,57mm (1-1/8")

Tabla 2

Cantidad de Armado a ser expuesto

Nota: Refiérase al esquema de la página posterior para la identificación de los accesorios componentes para cable TMCX.

4. Preparación del Cable. Para el Tipo MC quite todos los rellenos y pantallas debajo de la armadura. Para el Tipo TC quite los rellenos debajo de la cubierta. Desensamble el cuerpo y la cámara de retención / sellado de la armadura del accesorio. Instale el cuerpo sobre la envolvente y apriétese con una llave de tuercas. Deslice la tuerca collarín y el ensamble del cuerpo intermedio sobre el cable como se muestra a continuación. Separe los conductores de puesta a tierra sin aislar atrás de la armadura o cubierta para permitir sellar los alambres individuales.



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5. Cable Tipo MC: Para acomodar la variación de los procesos de fabricación del cable, y el rango del diámetro exterior de la armadura del cable del accesorio, se instala un reductor no metálico de retención de la armadura en la cámara de retención / sellado de la armadura. Si los conductores no pasan a través del reductor de retención de la armadura, quite el reductor. Asegúrese de que la armadura del cable es detenida por la inserción de la cámara de retención / sellado de la armadura o el reductor de retención de la armadura.



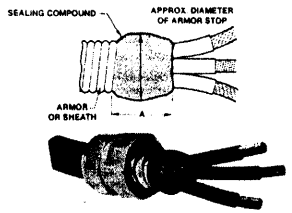
6. Separe los conductores y alambres individuales del conductor de puesta a tierra. Se recomiendan cuñas de madera para sostener a los conductores grandes aparte para el empaque del compuesto. Mezcle 2 partes del compuesto sellador epóxico proporcionado amasando y plegando hasta que se obtenga un color uniforme (aproximadamente 2 a 3 min). Refiérase a la Tabla 3. Se proporciona más compuesto del necesario para la instalación. Use únicamente el necesario.

Nota: No se requieren guantes para la instalación del compuesto sellador. Sin embargo, para aquellos con piel sensible o para la exposición prolongada se recomienda que se utilicen guantes.

Ponga una cantidad suficiente de compuesto entre el diámetro interior de la cubierta de la armadura y manojo de rellenos del conductor. Vea la Tabla 3.

Medida NPT	Catalogo	Cantidad de compuesto requerido	Cantidad de compuesto que se provee	Dim. "A"
16 (1/2")	TMCX165	0.25	0.50	25,4mm (1")
21 (3/4")	TMCX285	0.50	1.00	25,4mm (1")
27 (1")	TMCX3112	0.70	1.00	31,75mm (1-1/4")
35 (1-1/4")	TMCX4140	1.50	2.00	31,75mm (1-1/4")
41 (1-1/2")	TMCX5161	1.85	2.00	38,1mm (1-1/2")
53 (2")	TMCX6206	4.50	5.00	50,8mm (2")
63 (2-1/2")	TMCX7247	8.65	9.00	63,5mm (2-1/2")
78 (3")	TMCX8302	15.75	16.00	76,2mm (3")
91 (3-1/2")	TMCX9352	25.55	28.00	88,9mm (3-1/2")
103 (4")	TMCX10402	38.95	41.00	101,6mm (4")

Tabla 3



Use un palo de madera dura o espiga para poner compuesto en áreas no accesibles fácilmente con los dedos y particularmente en la mayoría de las áreas del centro del cable. Para prevenir dañar a los conductores durante la colocación del compuesto, no utilice herramientas de metal. Selle el extremo de los rellenos, y cualquier hueco resultante con una capa de compuesto con espesor mínimo de 6,4 mm (1/4").

Nota: Al preparar el sello en temperaturas frías, mezcle un tubo de compuesto sellador a la vez.

Nota: La duración del compuesto antes de que endurezca es de aproximadamente 30 min a 20 °C (68 °F). La duración del compuesto disminuye a temperaturas elevadas. En climas fríos - calientes los componentes y el compuesto sellador guardándolos en la cabina de un camión o dentro de una bolsa, pueden usarse cuando se requieran. El accesorio puede ensamblarse a temperaturas tan bajas como 4 °C (40 °F). Permita que el ensamble se fije a 4 °C (40 °F) durante 24 h.

7. Herméticamente envuelva los extremos de los conductores juntos y deslice los conductores a través de la cámara de retención / sellado de la armadura.

Nota: La cinta de aislar o material similar es útil para envolver a los conductores.

Deslice la cámara de retención / sellado de la armadura sobre el compuesto epóxico y regrésela contra la armadura o la cubierta, apretando el compuesto en las guías y regrésela sobre la armadura o cubierta.



8. Quite el exceso de compuesto del extremo mayor de la cámara de retención / sellado de la armadura para exponer el afilamiento de la inserción. Esta superficie debe permanecer limpia para que el resorte asiente adecuadamente y proporcione continuidad de la puesta a tierra y fuerza de jalado. Después de quitar el exceso de compuesto, rellene cualquier hueco con compuesto adicional.



9. Ponga compuesto entre y alrededor de los conductores en el extremo menor de la cámara de retención / sellado de la armadura para llenar cualquier hueco. La cámara debe permanecer nivelada con el extremo de la cámara de retención / sellado de la armadura.

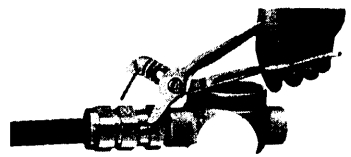
⚠ PRECAUCIÓN

La superficie exterior de la cámara de retención / sellado de la armadura debe permanecer limpia y libre del compuesto y de otra materia extraña. Inmediatamente limpie cualquier exceso de compuesto de la superficie exterior de la cámara de retención / sellado de la armadura. No use herramientas de metal porque pueden dañar la superficie de la cámara de retención / sellado de la armadura.



10. Inserte el cable y el ensamble de la cámara de retención / sellado de la armadura en el cuerpo.

Con la cámara de retención / sellado de la armadura completamente insertada en el cuerpo, deslice el cuerpo intermedio con la tuerca collarín sobre la cámara de retención / sellado de la armadura y enrósquela hacia el cuerpo. Apriete completamente el cuerpo intermedio con una llave de tuercas. Apriete la tuerca collarín en el cuerpo intermedio para comprimir la boquilla para obtener un sello hermético al agua. Refiérase a la Tabla 4 para los requisitos de la fuerza de apriete.



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Size	Cat.No.	Body	Nut
1/2"	TMCX165	300	300
3/4"	TMCX285	500	500
1"	TMCX3112	700	700
1-1/4"	TMCX4140	1000	700
1-1/2"	TMCX5161	1200	700
2"	TMCX6206	1600	700
2-1/2"	TMCX7247	1600	700
3"	TMCX8302	1600	700
3-1/2"	TMCX9352	1600	700
4"	TMCX10402	1600	700

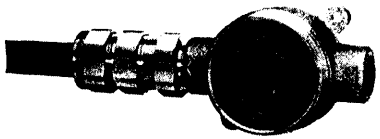
Table 4

11. When using Type MC cable, verify continuity between cable armor and enclosure.
12. Installation is complete. Allow sealing compound to set before moving cables or making cable connections.





Completed Type MC Installation





Completed Type TC Installation

To disassemble a TMCX fitting refer to Figure 1 and the following instructions:

1. Turn off power to the equipment and disconnect all electrical connections.
2. Loosen gland nut (1) without disconnecting it from the intermediate body (2).
3. Disconnect the intermediate body / gland nut assembly (1 & 2) from the body (4).

   Note: If the intermediate body / gland nut assembly does not easily separate from the body, insert a screw driver or similar tool in groove (3) (between armor stop and body) and pry to separate.

   Slide the intermediate body / gland nut assembly back onto cable.
4. Carefully remove the cable and armor stop /sealing chamber assembly from the body by pulling the cable away from the body / enclosure or by moving the body / enclosure away from the cable.
5. The TMCX fitting is ready to be reassembled.

REASSEMBLY

⚠ CAUTION

Before reassembly, examine the tapered joint surfaces of the body and armor stop / sealing chamber. Surfaces must seat fully against each other to provide a proper explosion-proof joint. Remove any dirt or other foreign matter from both surfaces. If either surface is scratched, marred, corroded, or otherwise damaged, do not reassemble. Replace the fitting.

If the surfaces of the armor stop / sealing chamber and body are in good condition, the TMCX may be reassembled. Refer to steps #10 - #12 for proper assembly and torquing requirements.

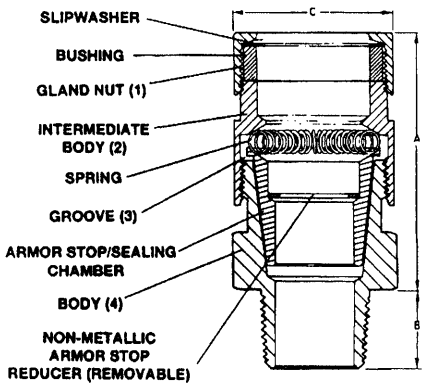


Figure 1

NPT Size	Cat.No.	Cable Range Over Type MC Armor or Type TC Sheath in.	A Inches	B Inches	C Inches
1/2"	TMCX165	.440"-.650"	2-5/8	3/4	1-3/8
3/4"	TMCX285	.600"-.850"	2-7/8	25/32	1-5/8
1"	TMCX3112	.850"-1.120"	3-1/8	15/16	2
1-1/4"	TMCX4140	1.100"-1.400"	3-1/8	31/32	2-7/16
1-1/2"	TMCX5161	1.280"-1.610"	3-3/8	31/32	2-3/4
2"	TMCX6206	1.570"-2.060"	4-1/2	1	3-1/2
2-1/2"	TMCX7247	1.930"-2.470"	4-3/4	1-7/16	4
3"	TMCX8302	2.450"-3.020"	4-7/8	1-7/16	4-7/8
3-1/2"	TMCX9352	2.950"-3.520"	5-3/8	1-5/8	5-3/8
4"	TMCX10402	3.500"-4.020"	5-1/2	1-5/8	5-7/8

TABLE 5 - COMPLIANCES

TMCX Series Terminator cable fittings are UL Listed for hazardous locations (with TSC Epoxy Sealing Compound only) according to UL sstandards 514B and 886**. They are suitable for use in NEC hazardous (classified) locations when installed in accordance with NEC articles 501-4(a) and (b), 501-5(c)(d) and (e), 502-4(a) and (b), 502-5 and 503-3. Tray cable is not suitable for use in Class III hazardous (classified) locations.

Catalog Number	Compliances	Catalog Number	Compliances
TMCX165	Class I←, Division 1&2, Groups A,B,C,D	TMCX6206	Class I←, Division 1&2, Groups A,B,C,D
TMCX285	Class II, Division 1&2, Groups E,F,& G	TMCX7247	Class II, Division 1&2, Groups E,F,& G
TMCX3112	Class III	TMCX8302†	Class III
TMCX4140		TMCX9352†	
TMCX5161		TMCX10402†	

** TMCX10402 is UL Listed only for use with steel interlocked armor cable.
† TMCX8302, -9352 and -10402 are not UL Listed for use with Type TC cable.
← The TMCX Series is approved for use in Division 1 hazardous locations when used with MC cable approved for Division 1 hazardous locations.

All statements, technical information and recommendations contained herein are based on information and tests we believe to be reliable. The accuracy or completeness thereof are not guaranteed. In accordance with Crouse-Hinds "Terms and Conditions of Sale", and since conditions of use are outside our control, the purchaser should determine the suitability of the product for the intended use and assumes all risk and liability whatsoever in connection therewith.

COOPER Crouse-Hinds

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Revised 04/02
Supercedes 02/02

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Raccord d[e] câble TMCX TERMINATORMD

COOPER Crouse-Hinds

Renseigneme[nts] sur l'installation et l'entretien

IF1184

CONSERVEZ CES INSTRUCTIONS POUR VOUS Y RÉFÉRER ULTÉRIEUREMENT.

APPLICATION

Les raccords de câbles Terminator de la série TMCX sont conçus pour être utilisés avec des câbles gainés à armure métallique MC, des câbles à armure articulée, à armure gaufrée continue et des câbles pour chemin de câbles de type TC dans des emplacements dangereux (classifiés) lorsqu'ils sont installés selon les sections 501-4(a) et (b), 501-5(c)(d) et (e), 502-4(a) et (b), 502-5 et 503-3 du NEC.

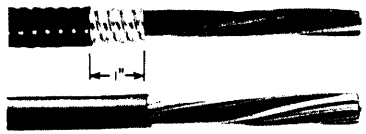
Les raccords de câbles Terminator de la série TMCX permettent l'introduction de câbles de types MC (gainés à armure métallique) et TC (pour chemins de câbles) dans un boîtier, un tableau ou autre équipement de manière à assurer une terminaison étanche à l'eau. Ils sont réutilisables. La chambre d'étanchéité / la butée d'armure sert de raccord union intégral permettant le démontage et la réutilisation sans mettre en danger l'intégrité du câble ou du joint. Une fois le câble étanchéisé, il est possible de démonter le TMCX pour retirer le câble et la chambre d'étanchéité / la butée d'armure du corps.

Avec les câbles de type MC, la continuité à la terre entre l'armure du câble et les boîtiers métalliques est maintenue. Le câble de type TC est mis à la terre à l'aide d'un conducteur de terre distinct.

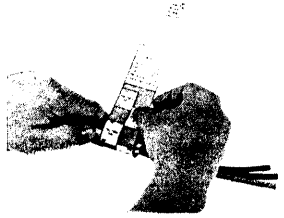
Les raccords de câbles Terminator de la série TMCX sont répertoriés UL pour les emplacements dangereux (avec le ciment d'étanchéité à l'époxy TSC seulement) selon les normes 514B et 886 des UL. Ils conviennent à l'utilisation dans les emplacements dangereux (classifiés) de classe I, divisions 1 et 2, groupes A, B, C, D; de classe II, divisions 1 et 2, groupes E, F et G; et de classe III, divisions 1 et 2 du NEC conformément aux sections 501-4(a) et (b), 501-5(c)(d) et (e), 502-4(a) et (b), 502-5 et 503-3 du NEC (voir le tableau 5).

INSTALLATION

1. Retirer la gaine (et, au besoin, l'armure) du câble de manière à exposer une longueur suffisante de conducteurs. Dans le cas de câbles de type MC, laisser environ 1 po d'armure exposée.



2. En se servant de la jauge et du calibre de câble fournis avec le Terminator, mesurer la longueur de l'armure de câble exposée ou le diamètre extérieur du câble pour chemin de câbles et choisir le raccord approprié. Placer le bas du calibre sur l'armure du câble ou la gaine exposée et maintenir le calibre à l'aide du pouce. Enrouler fermement le calibre. La flèche au bas du calibre indique le numéro de catalogue du raccord nécessaire pour terminer le câble. Dans l'exemple ci-dessous, il faudrait utiliser un raccord TMCX3112.



N.B. : Se reporter au dessin au trait de la dernière page pour identifier les composants du raccord de câble TMCX.

* TMCX 10402 is UL Listed for use with steel interlock armor cable only
† 1/2" - 2-1/2" sizes

Dim. NPT	N°cat.	Dim. d'armure de câble (type MC) ou de gaine (type TC) correspondantes	
1/2 po	TMCX165	0,440 po	0,650 po
3/4 po	TMCX285	0,600 po	0,850 po
1 po	TMCX3112	0,800 po	1,120 po
1 1/4 po	TMCX4140	1,100 po	1,400 po
1 1/2 po	TMCX5161	1,280 po	1,610 po
2 po	TMCX6206	1,570 po	2,060 po
2 1/2 po	TMCX7247	1,930 po	2,470 po
3 po	TMCX8302	2,450 po	3,020 po
3 1/2 po	TMCX9352	2,950 po	3,520 po
4 po	TMCX10402	3,500 po	4,020 po

Tableau 1

3. Dans le cas des câbles de type MC, se reporter au tableau 2 ou aux étapes relatives au calibre et à la jauge de câble pour calculer la longueur d'armure à dénuder en vue de l'assemblage. Au besoin, enlever davantage de gaine. Inspecter l'armure et se servir d'une lime pour éliminer les ébarbures éventuelles.



Dim. NPT	Long. d'armure à dénuder (dim. A)
1/2 po	1 1/4 po
3/4 po	1 1/4 po
1 po	1 3/8 po
1 1/4 po	1 3/8 po
1 1/2 po	1 3/8 po
2 po	1 1/8 po
2 1/2 po	1 1/8 po
3 po	1 1/8 po
3 1/2 po	1 1/8 po
4 po	1 1/8 po

Tableau 2
Long. d'armure à dénuder

N.B. : Se reporter au dessin au trait de la dernière page pour identifier les composants du raccord de câble TMCX.

4. Préparer le câble. Dans le cas du type MC, retirer le bourrage et le blindage jusqu'à l'armure. Dans celui des câbles de type TC, retirer le bourrage jusqu'à la gaine. Retirer le corps et la butée d'armure / la chambre d'étanchéité du raccord. Installer le corps dans le boîtier et serrer à l'aide d'une clé. Glisser l'écrou d'étanchéité et le corps intermédiaire sur le câble de la manière illustrée ci-dessous. Ramener individuellement les conducteurs de terre non isolés vers l'arrière jusqu'à l'armure ou la gaine pour pouvoir cimenter chaque brin.



5. Dans le cas des câbles MC, pour tenir compte des écarts dans les procédés de fabrication des câbles et de la gamme de diam. ext. d'armure de câble du raccord, on installe un réducteur de butée d'armure dans la butée d'armure / la chambre d'étanchéité. Il faut le retirer si les conducteurs ne passent pas dans le réducteur. S'assurer que le câble n'est pas bloqué par la butée d'armure / la chambre d'étanchéité ou le réducteur.

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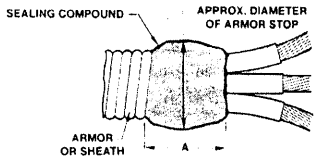
6. Séparer les conducteurs et les brins du conducteur de terre. On recommande de placer des cales en bois pour maintenir les gros conducteurs à distance et poser le ciment. Mélanger le ciment d'étanchéité époxydique à deux éléments fourni en le pétrissant et en le pliant jusqu'à ce qu'on obtienne une couleur uniforme (environ 2 à 3 minutes). Se reporter au tableau 3. L'emballage contient plus de ciment que nécessaire pour l'installation. Ne pas en utiliser plus que nécessaire.

N.B. : Il n'est pas nécessaire de porter des gants pour appliquer le ciment. Toutefois, le port de gants est recommandé aux personnes à la peau sensible ou qui sont exposées au ciment pendant une longue période.

Mettre une quantité suffisante de ciment entre le diamètre intérieur de l'armure ou de la gaine et le faisceau de conducteurs. Se reporter au tableau 3.

Dim. NPT	N°cat.	Quantité de composé nécessaire(oz)	Quantité de composé fournie(oz)	Dim. «A»
1/2 po	TMCX165	0.25	0.50	1 po
3/4 po	TMCX285	0.50	1.00	1 po
1 po	TMCX3112	0.70	1.00	1 1/4 po
1 1/4 po	TMCX4140	1.50	2.00	1 1/4 po
1 1/2 po	TMCX5161	1.85	2.00	1 1/2 po
2 po	TMCX6206	4.50	5.00	2 po
2 1/2 po	TMCX7247	8.65	9.00	2 1/2 po
3 po	TMCX8302	15.75	16.00	3 po
3 1/2 po	TMCX9352	25.55	28.00	3 1/2 po
4 po	TMCX10402	38.95	41.00	4 po

Tableau 3





Se servir d'une cheville ou d'un bâton en bois dur pour pousser le ciment dans les endroits qu'on ne peut atteindre avec les doigts, particulièrement au centre du câble. Éviter d'utiliser des outils en métal, qui risqueraient d'abîmer les conducteurs. Cimenter l'extrémité du bourrage, ainsi que les vides qui subsistent en posant une couche d'une épaisseur minimale de ⁄ po.

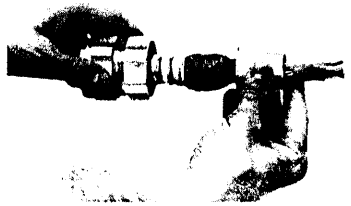
N.B. : Si l'on prépare le ciment par temps froid, mélanger un tube à la fois.

N.B. : Le ciment reste malléable pendant environ 30 minutes à 68 °F (20 °C). Cette durée diminue à mesure que la température augmente. Par temps froid, réchauffer les composants et le ciment d'étanchéité dans la cabine d'un camion ou dans sa poche jusqu'au moment de les utiliser. On peut assembler le raccord jusqu'à des températures aussi basses que 40 °F (4 °C). Laisser sécher le tout à 40 °F (4 °C) pendant 24 heures.

7. Enrouler fermement les extrém[ités] s conducteurs ensemble et les insérer dans ' d'armure / la chambre d'étanchéité.

N.B. : Pour enrouler les con[ducteu]rs, on peut se servir de ruban pour canalisations ou d'un matériau semblable.

Faire glisser la butée d'armure / la chambre d'étanchéité sur le ciment à l'époxy et la ramener contre l'armure ou la gaine, en repoussant le ciment sur les conducteurs puis sur l'armure ou la gaine.



8. Éliminer l'excédent de ciment de l'extrémité la plus grosse de la butée d'armure / la chambre d'étanchéité de manière à exposer le cône. Cette surface doit demeurer propre pour permettre au ressort de bien se positionner pour assurer un bon contact et offrir une bonne prise pour le retrait. Après avoir éliminé l'excédent de ciment, remplir les vides à l'aide de ciment supplémentaire.



9. Pack compound between and around conductors at the small end of the armor stop / sealing chamber to fill any voids. Chamber should remain flush with the end of the armor stop / sealing chamber.

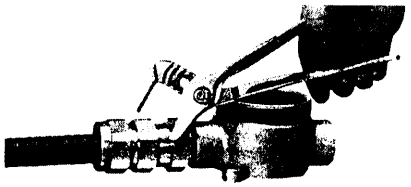
⚠ ATTENTION

La surface extérieure de la butée d'armure / la chambre d'étanchéité doit demeurer propre et exempte de ciment ou d'autres matières étrangères. Essuyer sans tarder l'excédent de ciment de la surface extérieure de la butée d'armure / la chambre d'étanchéité. Éviter d'utiliser des outils en métal qui risqueraient d'abîmer la surface de la butée d'armure / la chambre d'étanchéité.



10. IInsérer la butée d'armure / la chambre d'étanchéité dans le corps.

Une fois la butée d'armure / la chambre d'étanchéité insérée à fond dans le corps, faire glisser le corps intermédiaire et l'écrou d'étanchéité sur la butée d'armure / la chambre d'étanchéité puis visser dans le corps en serrant à fond à l'aide d'une clé. Serrer l'écrou d'étanchéité sur le corps intermédiaire de manière à comprimer la bague et ainsi obtenir un joint étanche à l'eau. Voir les exigences de serrage au tableau 4.



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Medida NPT	Catalogo	Torque de Apriete Cuerpo	Tuerca
16 (1/2")	TMCX165	-cm(300 lb-plg)	345,6 kg-cm(300 lb-plg)
21 (3/4")	TMCX285	cm (500 lb-plg)	576 kg-cm (500 lb-plg)
27 (1")	TMCX3112	kg-cm (700 lb-plg)	806 kg-cm (700 lb-plg)
35 (1-1/4")	TMCX4140	1152 kg-cm (1000 lb-plg)	806 kg-cm (700 lb-plg)
41 (1-1/2")	TMCX5161	1382,4 kg-cm (1200 lb-plg)	806 kg-cm (700 lb-plg)
53 (2")	TMCX6206	1843,2 kg-cm (1600 lb-plg)	806 kg-cm (700 lb-plg)
63 (2-1/2")	TMCX7247	1843,2 kg-cm (1600 lb-plg)	806 kg-cm (700 lb-plg)
78 (3")	TMCX8302	1843,2 kg-cm (1600 lb-plg)	806 kg-cm (700 lb-plg)
91 (3-1/2")	TMCX9352	1843,2 kg-cm (1600 lb-plg)	806 kg-cm (700 lb-plg)
103 (4")	TMCX10402	1843,2 kg-cm (1600 lb-plg)	806 kg-cm (700 lb-plg)

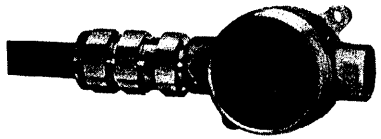
Tabla 4

11. Al usar el cable Tipo MC, verifique la continuidad entre la armadura del cable y la envolvente.
12. La instalación está completa. Permita que se endurezca el compuesto sellador antes de mover los cables o hacer las conexiones del cable.





Completada la Instalación del Tipo MC





Completada la Instalación del Tipo TC

DESMONTAJE

Para desmontar un accesorio TMCX, referirse a la Figura 1 y las instrucciones siguientes:

1. Apague la energía del equipo y desconecte todas las conexiones eléctricas.
2. Afloje la tuerca collarín (1) sin desconectarla del cuerpo intermedio (2).
3. Desconecte el ensamble cuerpo intermedio / tuerca collarín (1 y 2) del cuerpo (4).

   Nota: Si el ensamble cuerpo intermedio / tuerca collarín no se separa fácilmente del cuerpo, inserte un destornillador o herramienta similar en la ranura (3) (entre la retención de la armadura y el cuerpo) y haga palanca para separar.

   Deslice el ensamble cuerpo intermedio / tuerca collarín de regreso hacia el cable.
4. Cuidadosamente quite el cable y el ensamble de la cámara de retención / sellado de la armadura del cuerpo sacando el cable del cuerpo / envolvente o retirando el cuerpo / envolvente del cable.
5. El accesorio TMCX está listo para montarse de nuevo.

⚠ PRECAUCIÓN

Antes del volver a montar, examine las superficies adelgazadas de la unión del cuerpo y de la cámara de retención / sellado de la armadura. Las superficies deben asentarse completamente una contra otra para proporcionar una unión a prueba de explosión adecuada. Quite cualquier suciedad u otra materia extraña de ambas superficies. Si cualquier superficie se rasga, estropea, corroe, o se daña de otra forma, no se vuelve a montar. Reemplace el accesorio.

VOLVER A MONTAR

Si las superficies de la cámara de retención / sellado de la armadura y el cuerpo están en buenas condiciones, el TMCX puede volverse a montar. Refiérase a los pasos #10 - #12 para el ensamble adecuado y los requisitos de la fuerza de apriete.

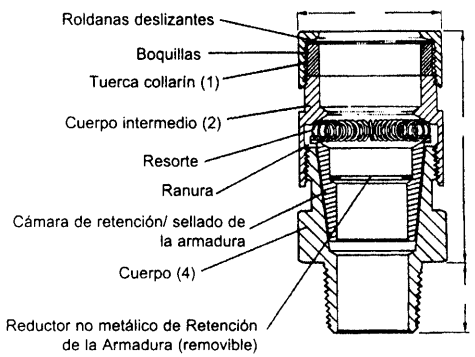


Figura 1

DIMENSIONES

Medida NPT	Catalogo	Rango de Cable Tipo MC o TC	A	B	C
16 (1/2")	TMCX165	11,17mm - 16,51mm (.440"-.650")	66,675mm (2-5/8")	19,5mm (3/4")	79,37 mm (3-1/8")
21 (3/4")	TMCX285	15,24mm - 21,59mm (.600"-.850")	73,02 mm (2-7/8")	19,84 mm (25/32")	41,27 mm (1-5/8")
27 (1")	TMCX3112	20,32mm - 28,44mm (.800" - 1.120")	79,37 mm (3-1/8")	23,81 mm (15/16")	50,8mm (2")
35 (1-1/4")	TMCX4140	27,94mm - 35,56mm (1.100" - 1.400")	79,37 mm (3-1/8")	24,60 mm (31/32")	11,11 mm (2-7/16")
41 (1-1/2")	TMCX5161	32,51mm - 40,89mm (1.280" - 1.610")	85,72 mm (3-3/8")	24,60 mm (31/32")	69,85 mm (2-3/4")
53 (2")	TMCX6206	39,87mm - 52,32mm (1.570" - 2.060")	134,94 mm (5-5/16")	25,4mm (1")	88,9mm (3-1/2")
63 (2-1/2")	TMCX7247	49,02mm - 62,73mm (1.930" - 2.470")	153,99 mm (6-1/16")	36,51 mm (1-7/16")	101,6mm (4")
78 (3")	TMCX8302	62,23mm - 76,70mm (2.450" - 3.020")	169,86mm (6-11/16")	36,51 mm (1-7/16")	123,82mm (4-7/8")
91 (3-1/2")	TMCX9352	74,93mm - 89,40mm (2.950" - 3.520")	196,85 mm (7-3/4")	41,27 mm (1-5/8")	136,52 mm (5-3/8")
103 (4")	TMCX10402	88,9mm -102,10mm (3.500" - 4.020")	211,14 mm (8-5/16")	41,27 mm (1-5/8")	149,22 mm (5-7/8")

TABLA 5 - EQUIVALENCIAS

Los accesorios Terminadores del cable Serie TMCX están listados por UL para lugares peligrosos (únicamente con el Compuesto Sellador Epóxico TSC) de acuerdo con las Normas UL 514B y 886 **. Son adecuados para utilizarse lugares peligrosos (clasificados) del NEC, cuando se instalan de acuerdo con los artículos 501-4(a) y (b), 501-5(c) (d) y (e), 502-4(a) y (b), 502-5 y 503-3 del NEC. El cable para charolas no es adecuado para utilizarse en lugares peligrosos (clasificados) Clase III.

Número de catálogo	Cumple con	Número de catálogo	Cumple con
TMCX165	Clase I, Divisiones 1 y 2, Grupos A,B,C,D	TMCX6206	Clase I, Divisiones 1 y 2, Grupos A,B,C,D
TMCX285	Clase II, Divisiones 1 y 2, Grupos E,FyG	TMCX7247	Clase II, Divisiones 1 y 2, Grupos E,FyG
TMCX3112	Clase III	TMCX8302†	Clase III
TMCX4140		TMCX9352†	
TMCX5161		TMCX10402†	

** El TMCX10402 está listado por UL únicamente para utilizarse en cables con armadura de acero engargolada.

† El TMCX8302, -9352 y -10402 no están listados por UL para utilizarse con cables Tipo TC.

← La Serie de TMCX esta aprobada para utilizarse en lugares peligrosos División 1 cuando se utiliza con cables MC aprobados para lugares peligrosos División 1.

Todas las declaraciones, información técnica y recomendaciones contenidas aquí se basan en la información y pruebas que creemos que son confiables. No se garantizan la exactitud o integridad de esto. De acuerdo con "los Términos y Condiciones de Venta" de Crouse-Hinds, y dado que las condiciones de uso están fuera de nuestro control, el comprador debe determinar la conveniencia del producto por su uso intencional y debe asumir todo el riesgo y obligación en absoluto en relación con esto.

COOPER Crouse-Hinds

Cooper Industries Inc.
Crouse-Hinds Division
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IF1184
Revisión 2
Revised 04/02
Supercedes 02/02

Chapter 17 PLANT EMERGENCY EQUIPMENT

MANUFACTURER/DISTRIBUTOR:

ANIXTER
3000,LOUIS AMOS
LACHINE,QUE
PH:514-636-3636 fax:1286

17.1 UPS MODEL SUA750 XL.

MANUFACTURER/DISTRIBUTOR:

BARNETT ENGINEERING LTD.
215,7710 5th .SE
T2H-2L9
PH. 403-255-9544.
FAX: 403-259-2343

17.2 PROTALK PLUS ALARM REPORTING UNIT.

END OF CHAPTER 17

APC Smart-UPS XL 750VA USB & Serial 120V

REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT. ANY ACTION TAKEN MAY BE SUBJECT TO THE REQUIREMENTS OF THE CONTRACT.
☑ [illegible]
☐ MAKE NOTED CORRECTIONS
☐ REVISE & RESUBMIT
☐ REJECTED
DATE Nov 7/05 BY DC
EARTH TECH (CANADA) INC.

APC
Legendary Reliability™

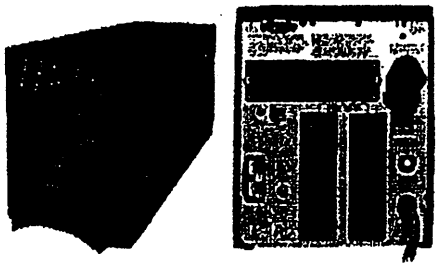
Canada

APC Smart-UPS XL 750VA USB & Serial 120V

APC Smart-UPS XL, 750VA/600W, Input 120V/Output 120V, Interface Port DB-9 RS-232, SmartSlot, USB, Extended runtime model

Includes: CD with software, Smart UPS signalling RS-232 cable, USB cable, User Manual

Part Number : SUA750XL



Compare Models
Runtime Chart
Email Technical Specifications
Printer Friendly

Additional Information
Product Overview
User Manual & Installation Guides
Product Distribution

[+] More Images

Technical Specifications

Output

Output Power Capacity	600 Watts / 750 VA
Max Configurable Power	600 Watts / 750 VA
Nominal Output Voltage	120V
Output Voltage Distortion	Less than 5% at full load
Output Frequency (sync to mains)	47 - 53 Hz for 50 Hz nominal,57 - 63 Hz for 60 Hz nominal
Crest Factor	up to 5 : 1
Waveform Type	Sine wave
Output Connections	(8) NEMA 5-15R

Input

Nominal Input Voltage	120V
Input Frequency	50/60 Hz +/- 3 Hz (auto sensing)
Input Connections	NEMA 5-15P
Cord Length	6 feet (1.83 meters)
Input voltage range for main operations	82 - 144V
Input voltage adjustable range for mains operation	75 - 154V

Options:
- Automatic Transfer Switches
- Batteries
- Interface Connections
- Management Devices
- Rack Power Distribution
- Replacement Battery Cartridges
- Services
- Software

Features:
- USB connectivity

General Features:
- Adjustable voltage sensitivity
- Adjustable voltage-transfer points
- Audible alarms
- Automatic restart of loads after UPS shutdown
- Automatic self-test
- Boost and Trim Automatic Voltage Regulation (AVR)
- Cold-start capable
- Disconnected battery notification
- Generator compatible
- Hot-swappable batteries
- Intelligent battery management
- LED status indicators
- Network manageable
- Plug-and-Play external batteries
- Power conditioning
- Predictive failure notification
- Resettable circuit breakers
- Safety-agency approved
- Scalable runtime
- Serial Connectivity
- SmartSlot
- Temperature-compensated battery charging

APC Smart-UPS XL 750VA USB & Serial 120V

more details...

Topology: Line Interactive

Batteries & Runtime

Battery Type	Maintenance-free sealed Lead-Acid battery with suspended electrolyte : leakproof
Replacement battery cartridge	RBC7
RBC™ Quantity	1
Typical Backup Time at Half Load	50.6 minutes (300 Watts)
Typical Backup Time at Full Load	16.6 minutes (600 Watts)
Runtime Chart	Smart-UPS XL
Extended Run Options	APC Smart-UPS XL 750VA USB & Serial 120V

Communications & Management

Interface Port(s)	DB-9 RS-232,SmartSlot,USB
Available SmartSlot™ Interface Quantity	1
Control panel	LED status display with load and battery bar-graphs and On Line : On Battery : Replace Battery : and Overload Indicators
Audible Alarm	Alarm when on battery : distinctive low battery alarm : configurable delays
Emergency Power Off (EPO)	Optional

Surge Protection and Filtering

Surge energy rating	459 Joules
Filtering	Full time multi-pole noise filtering : 0.3% IEEE surge let-through : zero clamping response time : meets UL 1449

Physical

Maximum Height	8.50 inches (216 mm)
Maximum Width	6.70 inches (170 mm)
Maximum depth	17.30 inches (439 mm)
Net Weight	53.00 lbs. (24.09 kg)
Shipping Weight	58.00 lbs. (26.36 kg)
Shipping Height	15.25 inches (387 mm)
Shipping Width	12.60 inches (320 mm)
Shipping Depth	23.25 inches (591 mm)
Color	Black
Units per Pallet	24.00

Environmental

Operating Environment	0 - 40 °C (32 - 104 °F)
Operating Relative Humidity	0 - 95%
Operating Elevation	0-10000 feet (0-3000 meters)
Storage Temperature	-15 - 45 °C (5 - 113 °F)

Storage Relative Humidity	0 - 95%
Storage Elevation	0-50000 feet (0-15000 meters)
Online Thermal Dissipation	100 BTU/hr

Conformance

Regulatory Approvals	BSMI,CSA,FCC Part 15 Class A,UL 1778
Standard Warranty	2 years repair or replace
Equipment protection policy	Lifetime : $150000

*Estimated Resale Price - Without Tax/VAT

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APC
Legendary Reliability™

Runtime by load for: Smart-UPS XL

Filter by input voltage [All Voltages] [Refresh]

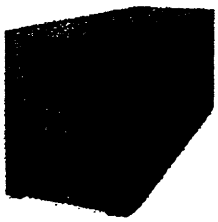
120V

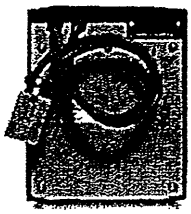
Watts	50	100	200	300	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2500	3000	3500	Full	Half
VA~	70	140	280	420	560	700	840	980	1120	1260	1400	1680	1960	2240	2520	2800	3500	4200	4900	Load	Load
SUA750XL	5 hrs 1 mins	2 hrs 52 mins	1 hrs 24 mins	51 min	33 min	23 min	17 min	–	–	–	–	–	–	–	–	–	–	–	–	17 min (600 Watts)	51 min (300 Watts)
SUA750XL + (1)SUA24XLBP	16 hrs 13 mins	9 hrs 45 mins	5 hrs 16 mins	3 hrs 30 mins	2 hrs 33 mins	1 hrs 58 mins	1 hrs 35 mins	–	–	–	–	–	–	–	–	–	–	–	–	1 hrs 35 mins (600 Watts)	3 hrs 30 mins (300 Watts)
SUA750XL + (1)UXBP24	51 hrs 12 mins	31 hrs 16 mins	17 hrs 25 mins	11 hrs 57 mins	9 hrs 2 mins	7 hrs 13 mins	5 hrs 59 mins	–	–	–	–	–	–	–	–	–	–	–	–	5 hrs 59 mins (600 Watts)	11 hrs 57 mins (300 Watts)
SUA750XL + (2)SUA24XLBP	27 hrs 26 mins	16 hrs 39 mins	9 hrs 9 mins	6 hrs 12 mins	4 hrs 38 mins	3 hrs 39 mins	2 hrs 59 mins	–	–	–	–	–	–	–	–	–	–	–	–	2 hrs 59 mins (600 Watts)	6 hrs 12 mins (300 Watts)
SUA750XL + (2)UXBP24	103 hrs 0 mins	63 hrs 9 mins	35 hrs 26 mins	24 hrs 31 mins	18 hrs 40 mins	15 hrs 2 mins	12 hrs 33 mins	–	–	–	–	–	–	–	–	–	–	–	–	12 hrs 33 mins (600 Watts)	24 hrs 31 mins (300 Watts)
SUA750XL + (3)SUA24XLBP	38 hrs 40 mins	23 hrs 33 mins	13 hrs 3 mins	8 hrs 55 mins	6 hrs 43 mins	5 hrs 20 mins	4 hrs 24 mins	–	–	–	–	–	–	–	–	–	–	–	–	4 hrs 24 mins (600 Watts)	8 hrs 55 mins (300 Watts)
SUA750XL + (3)UXBP24	149 hrs 12 mins	91 hrs 35 mins	51 hrs 30 mins	35 hrs 43 mins	27 hrs 16 mins	22 hrs 0 mins	18 hrs 25 mins	–	–	–	–	–	–	–	–	–	–	–	–	18 hrs 25 mins (600 Watts)	35 hrs 43 mins (300 Watts)
SUA750XL + (4)SUA24XLBP	49 hrs 53 mins	30 hrs 28 mins	16 hrs 57 mins	11 hrs 38 mins	8 hrs 48 mins	7 hrs 1 mins	5 hrs 49 mins	–	–	–	–	–	–	–	–	–	–	–	–	5 hrs 49 mins (600 Watts)	11 hrs 38 mins (300 Watts)
SUA750XL + (4)UXBP24	195 hrs 24 mins	120 hrs 1 mins	67 hrs 34 mins	46 hrs 55 mins	35 hrs 52 mins	28 hrs 59 mins	24 hrs 17 mins	–	–	–	–	–	–	–	–	–	–	–	–	24 hrs 17 mins (600 Watts)	46 hrs 55 mins (300 Watts)
SUA1000XL	5 hrs 1 mins	2 hrs 52 mins	1 hrs 24 mins	51 min	33 min	23 min	17 min	12 min	10 min	–	–	–	–	–	–	–	–	–	–	10 min (800 Watts)	33 min (400 Watts)
Watts	50	100	200	300	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2500	3000	3500	Full	Half
VA~	70	140	280	420	560	700	840	980	1120	1260	1400	1680	1960	2240	2520	2800	3500	4200	4900	Load	Load
SUA1000XL + (1)SUA24XLBP	16 hrs 13 mins	9 hrs 45 mins	5 hrs 16 mins	3 hrs 30 mins	2 hrs 33 mins	1 hrs 58 mins	1 hrs 35 mins	1 hrs 18 mins	1 hrs 5 mins	–	–	–	–	–	–	–	–	–	–	1 hrs 5 mins (800 Watts)	2 hrs 33 mins (400 Watts)
SUA1000XL + (1)UXBP24	51 hrs 12 mins	31 hrs 16 mins	17 hrs 25 mins	11 hrs 57 mins	9 hrs 2 mins	7 hrs 13 mins	5 hrs 59 mins	5 hrs 5 mins	4 hrs 24 mins	–	–	–	–	–	–	–	–	–	–	4 hrs 24 mins (800 Watts)	9 hrs 2 mins (400 Watts)

APC Smart-UPS XL 24V Battery Pack

Includes: User Manual

Part Number : **SUA24XLBP**





[+] More Images

Email Technical Specifications
Printer Friendly

Additional Information
Product Distribution

Technical Specifications

Batteries & Runtime

Battery Volt-Amp-Hour Capacity	816
Battery Type	Maintenance-free sealed Lead-Acid battery with suspended electrolyte : leakproof
Expected Battery Life (years)	3 - 5
RBC™ Quantity	1

Options:
- Replacement Battery Cartridges
- Services

Features:
- Cascading Capabilities
- Hot Pluggable Operation
- Intelligent Battery Management

Physical

Net Weight	69.00 lbs. (31.36 kg)
Maximum Height	8.50 inches (216 mm)
Maximum Width	6.70 inches (170 mm)
Maximum depth	17.30 inches (439 mm)
Shipping Weight	73.00 lbs. (33.18 kg)
Shipping Width	12.60 inches (320 mm)
Shipping Height	15.25 inches (387 mm)
Shipping Depth	23.25 inches (591 mm)
Color	Black
Units per Pallet	24.00

Environmental

APC Smart-UPS XL 24V Battery Pack

Operating Environment	0 - 40 °C (32 - 104 °F)
Operating Relative Humidity	0 - 95%
Operating Elevation	0-10000 feet (0-3000 meters)
Storage Temperature	-15 - 45 °C (5 - 113 °F)
Storage Relative Humidity	0 - 95%
Storage Elevation	0-50000 feet (0-15000 meters)

⊟ **Conformance**

Standard Warranty	2 years repair or replace

*Estimated Resale Price - Without Tax/VAT

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www.apc.com

User Manual

English

APC Smart-UPS®

500 VA
100 VAC

750 VA
100/120/230 VAC

Tower

Uninterruptible Power Supply

990-1587A 12/2005

17.1

Introduction

The APC Uninterruptible Power Supply (UPS) is designed to prevent blackouts, brownouts, sags, and surges from reaching your equipment. The uninterruptible power supply (UPS) filters small utility line fluctuations and isolates your equipment from large disturbances by internally disconnecting from the utility line. The UPS provides continuous power from its internal battery until the utility line returns to safe levels or the battery is fully discharged.

1: INSTALLATION

The User Manual and Safety Guide are accessible on the supplied User Manuals CD and on the APC web site, www.apc.com.

Unpack

Attention: Read the safety instruction sheet before installation.

Inspect the UPS upon receipt. Notify the carrier and dealer if there is damage.

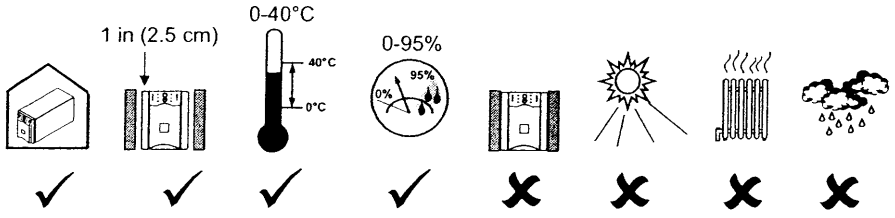
The packaging is recyclable; save it for reuse or dispose of it properly.

Check the package contents:

Attention: The UPS comes with battery disconnected.

- ❑ UPS
- ❑ UPS literature kit containing:
  - ❑ Product documentation, safety and warranty information
  - ❑ Smart-UPS™ User Manuals CD
  - ❑ *120V and 230V models:* PowerChute® CD
  - ❑ *120V and 230V models:* Serial and USB communication cables
  - ❑ *230V model*: Two jumper cables

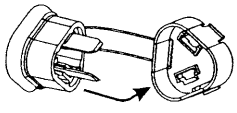
Position the UPS



Connect the Battery

The battery connector is located on the rear panel.

For battery connection, push the tethered jumper plug into the corresponding port.



Connect Equipment and Power to the UPS

1. Connect equipment to the UPS.

   Note: A laser printer draws significantly more power than other types of equipment and may overload the UPS.

2. Add accessories to the Smart-Slot (optional).
3. Connect ground leads to the TVSS screw (optional). To make the connection, loosen the screw and connect the surge suppression device ground lead. Tighten the screw to secure the lead.
4. Plug the UPS into a two-pole, three-wire, grounded receptacle only. Avoid using extension cords.

   100V/120V models: The power cord is attached to the UPS. The input plug is a NEMA 5-15P.

   230V model: The power cord is supplied in the UPS literature kit.

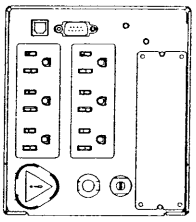
5. *120V model*: Check the *site wiring fault* LED ◎ located on the rear panel. It will be illuminated if the UPS is plugged into an improperly wired utility power outlet (see *Troubleshooting*).
6. Turn on all connected equipment. To use the UPS as a master *on/off* switch, be sure all connected equipment is on.
7. Press the (Test) button on the front panel to power the UPS.

   Note: The battery charges to 90% capacity during the first four hours of normal operation. Do not expect full battery run capability during this initial charge period.

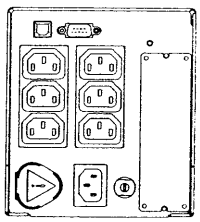
8. For optimal computer system security, install PowerChute Smart-UPS monitoring software.

Rear Panels

100V/120V



230V



Basic Connectors

Serial Port ***USB Port*** ***TVSS Screw***





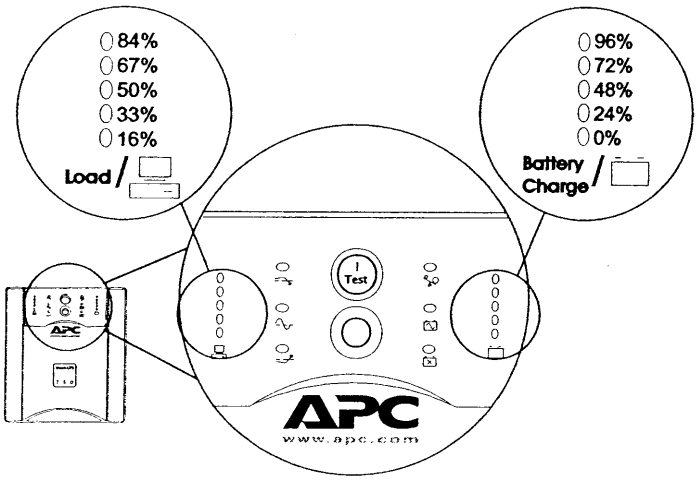
Use only interface kits approved by APC.

Use only the supplied cable to connect to the Serial Port. A standard serial interface cable is incompatible with the UPS. **Serial and USB Ports cannot be used simultaneously.**

The UPS features a transient voltage surge-suppression (TVSS) screw for connecting the ground lead on surge suppression devices such as telephone and network line protectors.
When connecting grounding cable, disconnect the UPS from utility power.

2: OPERATION

Front Display Panel



INDICATOR	DESCRIPTION
Online	The UPS is supplying utility power to the connected equipment.
AVR Trim	The UPS is compensating for a high utility voltage.
AVR Boost	The UPS is compensating for a low utility voltage.
On Battery	The UPS is supplying battery power to the connected equipment.
Overload	The connected loads are drawing more than the UPS power rating.
Replace Battery/ Battery Disconnected	The battery is disconnected or must be replaced.
FEATURE	**FUNCTION**
Power On	Press this button to turn on the UPS. (Read on for additional capabilities.)
Power Off	Press this button to turn off the UPS.

FEATURE	FUNCTION
Self-Test	**Automatic:** The UPS performs a self-test automatically when turned on, and every two weeks thereafter (by default). During the self-test, the UPS briefly operates the connected equipment on battery. **Manual:** Press and hold the (Test) button for a few seconds to initiate the self-test.
Cold Start	*120V and 230V models only*: Supply battery power to the UPS and connected equipment in the absence of utility voltage (see *Troubleshooting*). Press the (Test) button for one second and release. The UPS will beep briefly and go quiet. Press and hold the button again, but for approximately three seconds. The unit will emit a sustained beep. Release the button during this beep.
Diagnostic Utility Voltage 100V 120V 230V 119 133 266 109 124 248 100 114 229 91 105 210 81 96 191 Battery Charge	The UPS has a diagnostic feature that displays the utility voltage. **The UPS starts a self-test as part of this procedure. The self-test does not affect the voltage display.** Press and hold the (Test) button to view the utility voltage bar graph display. After a few seconds, this five-LED *battery charge* display on the right of the front panel will show the utility input voltage. Refer to the figure at left for the voltage reading (values are not listed on the UPS). The display indicates the voltage is between the displayed value on the list and the next higher value (see *Troubleshooting*).

Battery Operation

The UPS switches to battery operation automatically if the utility power fails. While running on battery, an alarm beeps four times every 30 seconds.

Press the (Test) button to silence this alarm. If the utility power does not return, the UPS continues to supply power to the connected equipment until the battery is fully discharged.

If PowerChute is not being used, files must be manually saved and the computer must be turned off before the UPS fully discharges the battery.

Refer to www.apc.com for on battery runtimes.

17.1

3: User Configurable Items

Note: Settings are adjusted through PowerChute software or optional Smart Slot accessory cards.			
Function	**Factory Default**	**User Selectable Choices**	**Description**
Automatic Self-Test	Every 14 days (336 hours)	Every 7 days (168 hours), On Startup Only, No Self-Test	Set the interval at which the UPS will execute a self-test.
UPS ID	UPS_IDEN	Up to eight characters (alphanumeric)	Uniquely identify the UPS, (i.e. server name or location) for network management purposes.
Date of Last Battery Replacement	Manufacture Date	mm/dd/yy	Reset this date when you replace the battery module.
Minimum Capacity Before Return from Shutdown	0 percent	0, 15, 30, 45, 50, 60, 75, 90 percent	Specify the percentage to which batteries will be charged following a low-battery shutdown before powering connected equipment.
Voltage Sensitivity The UPS detects and reacts to line voltage distortions by transferring to battery operation to protect connected equipment.	High	High sensitivity, Medium sensitivity, Low sensitivity	Note: In situations of poor power quality, the UPS may frequently transfer to battery operation. If the connected equipment can operate normally under such conditions, reduce the sensitivity setting to conserve battery capacity and service life.
Alarm Delay Control	Enable	Enable, Mute, Disable	Mute ongoing alarms or disable all alarms permanently.
Shutdown Delay	90 seconds	0, 90, 180, 270, 360, 450, 540, 630 seconds	Set the interval between the time when the UPS receives a shutdown command and the actual shutdown.
Low Battery Warning	2 minutes PowerChute software provides automatic, unattended shutdown when approximately 2 minutes of battery operated runtime remains.	2, 5, 8, 11, 14, 17, 20, 23 minutes (Times are approximate.)	The UPS will beep when 2 minutes of battery runtime remains. Change the low battery warning interval setting to the time that the operating system or system software requires to safely shut down.
Synchronized Turn-on Delay	0 seconds	0, 60, 120, 180, 240, 300, 360, 420 seconds	Specify the time the UPS will wait after the return of utility power before turn-on (to avoid branch circuit overload).

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NOTE: SETTINGS ARE ADJUSTED THROUGH POWERCHUTE SOFTWARE OR OPTIONAL SMART SLOT ACCESSORY CARDS.			
FUNCTION	**FACTORY DEFAULT**	**USER SELECTABLE CHOICES**	**DESCRIPTION**
High Transfer Point	*100V model:* 108 Vac *120V model:* 127 Vac *230V model:* 253 Vac	*100V model:* 108, 110, 112, 114 Vac *120V model:* 127, 130, 133, 136 Vac *230V model:* 253, 257, 261, 265 Vac	Set the high transfer point higher to avoid unnecessary battery usage when the utility voltage is usually high and the connected equipment is specified to operate with input voltages this high.
Low Transfer Point	*100V model:* 92 Vac *120V model:* 106 Vac *230V model:* 208 Vac	*100V model:* 86, 88, 90, 92 Vac *120V model:* 97, 100, 103, 106 Vac *230V model:* 196, 200, 204, 208 Vac	Set the low transfer point lower when the utility voltage is usually low and the connected equipment is specified to operate with input voltages this low.
Output Voltage (*230V model only*)	230 Vac	220, 230, 240 Vac	Select the output voltage.

4: Storage, Maintenance, and Shipping

Storage

Store the UPS covered in a cool, dry location, with the battery fully charged.

At -15 to +30 °C (+5 to +86 °F), charge the UPS battery every six months.
At +30 to +45 °C (+86 to +113 °F), charge the UPS battery every three months.

Battery Module Maintenance

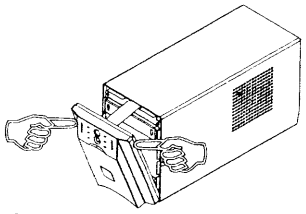
The UPS battery life differs based on usage and environment. Consider replacing the battery every three years.

This UPS has an easy to replace, hot-swappable battery. Replacement is a safe procedure, isolated from electrical hazards. You may leave the UPS and connected equipment on during the replacement procedure. See your dealer or contact APC (see *Contact Information*) for information on replacement batteries.

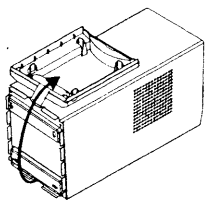
Note: Upon battery disconnection, equipment is not protected from power outages.

Removing the Front Bezel and Battery Module

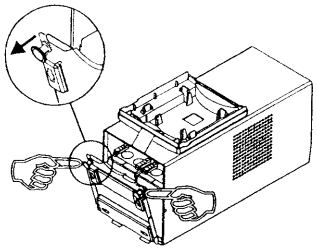
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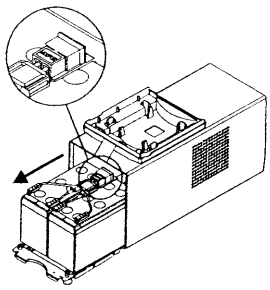
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Replacing the Battery Module

Reverse the instructions for *Removing the Front Bezel and Battery Module*. Note: To close the battery door, ensure the plungers are in the extended position, push the door shut, and push the plungers into the locked position.

Be sure to deliver the spent battery to a recycling facility or ship it to APC in the replacement battery packing material.

Shipping

1. Shut down and disconnect any equipment attached to the UPS.
2. Shut down the UPS, and disconnect the UPS from the utility power outlet.
3. Unplug the battery connector, located on the rear panel.

For further shipping instructions and to obtain appropriate packing materials, contact APC (see *Contact Information*).

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5: TROUBLESHOOTING

Use the chart below to solve minor UPS installation and operation problems. Refer to www.apc.com with complex UPS problems.

PROBLEM AND/OR POSSIBLE CAUSE	SOLUTION
UPS WILL NOT TURN ON	
UPS not connected to utility power supply.	Check that the power cord from the UPS to the utility power supply is securely connected at both ends.
Battery not connected properly.	Check that battery connector on the rear panel is fully snapped into position.
Very low or no utility voltage.	Check the utility power supply to the UPS by plugging in a table lamp. If the light is very dim, have the utility voltage checked.
UPS WILL NOT TURN OFF	
Internal UPS fault.	Do not attempt to use the UPS. Unplug the UPS, unplug the battery connector on the rear panel, and have it serviced immediately.
UPS BEEPS OCCASIONALLY	
Normal operating UPS beeps when running on battery.	None. The UPS is protecting the connected equipment from occasional utility power irregularities.
UPS IS NOT PROVIDING EXPECTED BACKUP TIME	
The UPS battery is weak due to a recent outage or is near the end of the service life.	Charge the battery. Batteries require recharging after extended outages, and wear faster when frequently put into service or when operated at elevated temperatures. If the battery is near the end of the service life, consider replacing even if the *replace battery* LED is not yet illuminated.
LEFT HALF, RIGHT HALF, OR CENTER SECTION OF FRONT PANEL LEDS ARE FLASHING	
Internal UPS fault. The UPS has shut down.	Do not attempt to use the UPS. Turn off the UPS, unplug the battery connector on the rear panel, and have it serviced immediately.
FRONT PANEL LEDS FLASH SEQUENTIALLY	
The UPS has been shut down remotely through software or an optional accessory card.	None. The UPS will restart automatically when utility power returns.
ALL LEDS ARE OFF AND THE UPS IS PLUGGED INTO A WALL OUTLET	
The UPS is shut down or the battery is discharged from an extended outage.	None. The UPS will return to normal operation when the power is restored and the battery has a sufficient charge.

PROBLEM AND/OR POSSIBLE CAUSE	SOLUTION
THE OVERLOAD LED IS ILLUMINATED AND THE UPS EMITS A SUSTAINED ALARM TONE	
The UPS is overloaded. The connected equipment is drawing more VA than the UPS can sustain.	The connected equipment exceeds the specified "maximum load." The alarm remains on until the overload is removed. Disconnect nonessential equipment from the UPS to eliminate the overload. The UPS continues to supply power as long as it is online and the circuit breaker does not trip; the UPS will not provide power from batteries in the event of a utility voltage interruption. If a continuous overload occurs while the UPS is on battery, the unit turns off output in order to protect the UPS from possible damage.
THE REPLACE BATTERY/BATTERY DISCONNECTED LED IS ILLUMINATED	
This LED flashes and a short beep is emitted every two seconds to indicate the battery is disconnected.	Check that the battery connector on the rear panel is fully engaged.
Weak battery.	Allow the battery to recharge for 24 hours. Then, perform a self-test. If the problem persists after recharging, replace the battery.
Failure of a battery self-test.	The UPS emits short beeps for one minute and the *replace battery* LED illuminates. The UPS repeats the alarm every five hours. Perform the self-test procedure after the battery has charged for 24 hours to confirm the *replace battery* condition. The alarm stops and the LED clears if the battery passes the self-test.
THE SITE WIRING FAULT LED ON THE REAR PANEL IS ILLUMINATED (120V MODEL ONLY)	
The UPS is plugged into an improperly wired utility power outlet.	Wiring faults detected include missing ground, hot-neutral polarity reversal, and overloaded neutral circuit. Contact a qualified electrician to correct the building wiring.
THE INPUT CIRCUIT BREAKER HAS TRIPPED	
The UPS is overloaded. The plunger on the circuit breaker has popped out.	Reduce the load on the UPS by unplugging equipment. Press in the plunger on the circuit breaker.
THE AVR BOOST OR AVR TRIM LEDS ARE ILLUMINATED	
The system is experiencing excessive periods of low or high voltage.	Seek qualified service personnel to check your facility for electrical problems. If the problem continues, contact the utility company for further assistance.
UPS OPERATES ON BATTERY ALTHOUGH UTILITY VOLTAGE EXISTS	
The UPS input circuit breaker has tripped.	To reduce the load on the UPS, unplug equipment and press in the plunger on the circuit breaker.
The line voltage is very high, low or distorted.	Move the UPS to a different outlet on a different circuit, as inexpensive fuel powered generators may distort the voltage. Test the input voltage with the utility voltage display (see *Operation*). If acceptable to the connected equipment, reduce the UPS sensitivity (see *User Configurable Items*).

PROBLEM AND/OR POSSIBLE CAUSE	SOLUTION
BATTERY CHARGE AND LOAD LED BARGRAPHS FLASH SIMULTANEOUSLY	
The UPS has shutdown. The internal temperature of the UPS has exceeded the allowable threshold for safe operation.	Check that the room temperature is within the specified limits for operation. Check that the UPS is properly installed, allowing for adequate ventilation (see *Position the UPS*). Allow the UPS to cool down. Restart the UPS. If the problem continues, contact APC (see *Contact Information*).
DIAGNOSTIC UTILITY VOLTAGE	
All five LEDs are illuminated.	The line voltage is extremely high and should be checked by an electrician.
There is no LED illumination.	If the UPS is plugged into a properly functioning utility power outlet, the line voltage is extremely low.
ONLINE LED	
There is no illumination.	The UPS is running on battery, or it must be turned on.
The LED is blinking.	The UPS is running an internal self-test.

Service

If the UPS requires service do not return it to the dealer. Follow these steps:

1. Review the problems discussed in *Troubleshooting* to eliminate common problems.
2. If the problem persists, contact APC Customer Service through the APC web site, www.apc.com/support.
   - Note the model number of the UPS, the serial number, and the date purchased. If you call APC Customer Service, a technician will ask you to describe the problem and attempt to solve it over the phone. If this is not possible, the technician will issue a Returned Material Authorization Number (RMA#).
   - If the UPS is under warranty, repairs are free.
3. Pack the UPS in its original packaging. If this is not available, refer to www.apc.com/support for information about obtaining a new set.
   - Pack the UPS properly to avoid damage in transit. Never use Styrofoam beads for packaging. Damage sustained in transit is not covered under warranty.
   - **Always DISCONNECT THE BATTERY before shipping in compliance with U.S. Department of Transportation (DOT) regulations.** The battery module(s) may remain in the UPS; it does not have to be removed.
4. Mark the RMA# on the outside of the package.
5. Return the UPS by insured, prepaid carrier to the address given to you by Customer Service.

Contact Information

U.S. Customers - Refer to www.apc.com/support.

International Customers - Refer to www.apc.com, select the appropriate country from the country selection field, and select the *Support* tab at the top of the web page.

17.1

6: REGULATORY AND WARRANTY INFORMATION

100V/120V models

LISTED 42C2
E95463

LR 63938

警告使用者:
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

Shielded signal cables must be used with this product to ensure compliance with the Class A FCC limits.

230V models

N394

ME 61

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take corrective actions.

2003

EC Declaration of Conformity

We, the undersigned, declare under our sole responsibility that the equipment specified below conforms to the following standards and directives:

Standards to Which Conformity Declared: IEC/EN 62040-1-1, -2, IEC 60950-1, and EN 60950-1

Application of Council Directives: 73/23/EEC, 89/336/EEC, 91/157/EEC, 92/31/EEC

Type of Equipment: Uninterruptible Power Supply

Model Numbers: SUA750I

Manufacturer's Name and Address:

American Power Conversion
132 Fairgrounds Road
West Kingston, Rhode Island, 02892, USA
-or-
American Power Conversion (A. P. C.) b. v.
Ballybritt Business Park
Galway, Ireland
-or-
American Power Conversion
2nd Street
PEZA Cavite Economic Zone
Rosario, Cavite
Philippines
-or-

American Power Conversion
Lot 10, Block 16, Phase 4
PEZA, Rosario, Cavite
Philippines
-or-
American Power Conversion
Lot 3, Block 14, Phase 3
PEZA, Rosario, Cavite
Philippines
-or-
APC (Suzhou) UPS Co., Ltd
339 Suhong Zhong Lu
Suzhou Industrial Park
Suzhou Jiangsu 215021
P R China

Importer's Name and Address: American Power Conversion (A. P. C.) b. v.
Ballybritt Business Park
Galway, Ireland

Place: N. Billerica, MA U.S.A. Richard J. Everett, Sr. Regulatory Compliance Engineer — 5 Jan 03

Place: Galway, Ireland Ray S. Ballard, Managing Director, Europe — 5 Jan 03

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Limited Warranty

American Power Conversion (APC) warrants its products to be free from defects in materials and workmanship for a period of two years from the date of purchase. Its obligation under this warranty is limited to repairing or replacing, at its own sole option, any such defective products. To obtain service under warranty you must obtain a Returned Material Authorization (RMA) number from customer support. Products must be returned with transportation charges prepaid and must be accompanied by a brief description of the problem encountered and proof of date and place of purchase. This warranty does not apply to equipment that has been damaged by accident, negligence, or misapplication or has been altered or modified in any way. This warranty applies only to the original purchaser who must have properly registered the product within 10 days of purchase.

EXCEPT AS PROVIDED HEREIN, AMERICAN POWER CONVERSION MAKES NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Some states do not permit limitation or exclusion of implied warranties; therefore, the aforesaid limitation(s) or exclusion(s) may not apply to the purchaser.

EXCEPT AS PROVIDED ABOVE, IN NO EVENT WILL APC BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF THIS PRODUCT, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. Specifically, APC is not liable for any costs, such as lost profits or revenue, loss of equipment, loss of use of equipment, loss of software, loss of data, costs of substitutes, claims by third parties, or otherwise.

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17.1

APC Smart-UPS
Uninterruptible Power Supply
120 VAC User's Manual

www.apcc.com

990-7016B, Revision 3

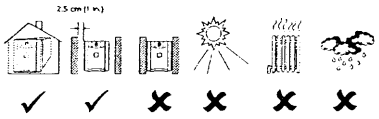
Initial Start-Up

To obtain warranty coverage, please fill out and return the warranty registration card now.

Inspection

Inspect the UPS upon receipt. Notify the carrier and dealer if there is damage. The packaging is recyclable; save it for reuse or dispose of it properly.

Placement



✓ ✓ ✗ ✗ ✗ ✗

Install the UPS in a protected area that is free of excessive dust and has adequate air flow. Do not operate the UPS where the temperature and humidity is outside the specified limits.

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the warranty.

Installation

To install this UPS, please follow the installation instructions in the *Smart-UPS Quick Reference Guide*.
This UPS is equipped with a SmartSlot for accessories. See the APC Website (www.apcc.com) for available accessories.

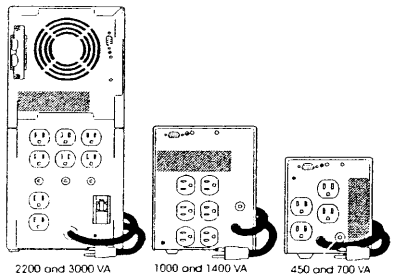
Check the Site Wiring Fault Indicator

Caution: If the site wiring fault indicator lights, get a qualified electrician to correct the building wiring.

Charge the battery

The UPS charges its battery whenever it is connected to utility power. The battery will charge fully during the first 4 hours of normal operation. Do not expect full runtime during this initial charge period.

Rear Views



Connect Computer Interface Port (Optional)

Power management software and interface kits can be used with this UPS. Use only kits supplied or approved by the manufacturer. If used, connect the interface cable to the 9-pin computer interface port on the back panel of the UPS. Secure the connector's screws to complete the connection.

Connect Ground Leads to TVSS Connector (Optional)

The UPS features a TVSS connector for connecting the ground lead on transient voltage surge-suppression (TVSS) devices such as telephone and network line protectors. The TVSS connector provides grounding through the UPS's power cord ground conductor. To make a connection to the TVSS connector, loosen the screw and connect the surge suppression device's ground lead. Tighten the screw to secure the lead.

Battery Pack Connector (3000 VA only)

Use the battery pack connector to connect the optional external battery pack.

Voltage Sensitivity

The UPS detects line voltage distortions such as spikes, notches, dips, and swells, as well as distortions caused by operation with inexpensive fuel-powered generators. By default, the UPS reacts to distortions by transferring to on-battery operation to protect the loads. Where power quality is poor, the UPS may frequently transfer to on-battery operation. If the loads can operate normally under such conditions, battery capacity and service life may be conserved by reducing the sensitivity of the UPS.

To reduce UPS sensitivity, press the configuration button on the rear panel. Use a pointed object such as a pen to press the button. Press it once to set the UPS's sensitivity to **reduced**. Press it again to set the sensitivity to **low**. Press the button a third time to reset **normal** sensitivity.

- normal — When the UPS is set to normal sensitivity, the configuration LED is brightly lit. When it is set to reduced sensitivity, the LED is dimly lit. When it is set to low sensitivity, the LED is off.
- reduced
- low

Low Battery Warning Interval

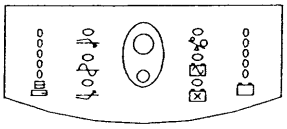
By default, the low battery warning occurs when there are approximately two minutes of on-battery run time remaining. This may not be enough time to gracefully shut down some protected computer systems.

To change the warning interval, press the rear panel configuration button while pressing and holding the front-panel on/test button.

- 2 min. — Press the configuration button once to set the low battery warning interval to approximately five minutes. Press it again to set the interval to approximately seven minutes. Press the button a third time to reset the interval to two minutes.
- 5 min.
- 7 min

Operating Instructions

Switch On — Switch Off



With the UPS plugged in, press and release the large upper on/test button to supply power to the loads. The loads are immediately powered while the UPS performs a self-test.

Press and release the small, lower off button to turn off power to the loads. It may be convenient to use the UPS as a master on/off switch for the protected equipment.

Note: Whenever the UPS is plugged in and utility voltage is present, the charger maintains battery charge.

The on-line LED illuminates when the UPS is supplying utility power to the loads.

Self-test

The UPS performs a self-test automatically when turned on, and every two weeks thereafter (by default). Automatic self-test eases maintenance requirements by eliminating the need for periodic manual self-tests.

During the self-test, the UPS briefly operates the loads on-battery. If the UPS passes the self-test, it returns to on-line operation.

If the UPS fails the self-test it immediately returns to on-line operation and lights the replace battery LED.

The loads are not affected by a failed test. Recharge the battery overnight and perform the self-test again. If the replace battery LED is still on, replace the battery using the ***Replacing the Battery*** procedure.

SmartTrim

The SmartTrim LED comes on to indicate that the UPS is compensating for a high voltage.

SmartBoost

The SmartBoost LED comes on to indicate that the UPS is compensating for a low voltage.

On Battery

During on-battery operation, the on-battery LED illuminates and the UPS sounds an audible alarm consisting of four beeps every 30 seconds. The alarm stops when the UPS returns to on-line operation.

Low Battery

When the UPS is operating on-battery and the energy reserve of the battery runs low, the UPS beeps continuously until the UPS shuts down from battery exhaustion or returns to on-line operation.

Battery Charge Bar Graph

- 100%
- 80%
- 60%
- 40%
- 20%

The 5-LED display on the right of the front panel shows the present charge of the UPS's battery as a percentage of the battery's capacity. When all five LEDs light, the battery is fully charged. The top LED goes out whenever the battery is not 100% charged. When the LEDs are flashing, the battery can supply less than the "low battery warning interval" time for the load.

Shutdown Mode

If there is no utility power present, a host system connected to the computer interface port can command the UPS to shut down. This is normally done to preserve battery capacity after a controlled shutdown of the protected system. In shutdown mode the UPS stops supplying power to the load, waiting for the return of utility power.

The UPS scrolls the front panel indicators sequentially in shutdown mode. If the UPS has shutdown due to a low battery, the UPS lights the Battery Charge Bar Graph only. When line power is restored, the UPS returns to on-line operation.

Replace Battery

If the battery fails a self-test, the UPS emits short beeps for one minute and the replace battery LED illuminates. The UPS repeats the alarm every five hours. Perform the self-test procedure to confirm replace battery conditions. The alarm stops when the battery passes the self-test.

Load Bar Graph

- 85%
- 67%
- 50%
- 33%
- 17%

The 5-LED display on the left of the front panel shows the power drawn from the UPS by the load. The display indicates the percentage of the UPS's rated capacity. For example, if three LEDs are lit, the load is drawing between 50% and 67% of the UPS's capacity. If all five LEDs light, thoroughly test your complete system to make sure that the UPS will not become overloaded.

Overload

When loads exceed the UPS's capacity, the overload LED illuminates, the UPS emits a sustained tone, and the input circuit breaker may trip (the resettable center plunger of the circuit breaker pops out). The alarm remains on until the overload is removed. Disconnect nonessential load equipment from the UPS to eliminate the overload. If there is AC power and the circuit breaker does not trip during overload, the loads are still powered. If the circuit breaker trips and the UPS attempts to go on-battery, the output AC will shut down.

Cold Start

When the UPS is off and there is no utility power, it is possible to cold start the UPS to power the loads from the UPS's battery.

Note: Cold start is not a normal condition.

- Press and hold the on/test button until the UPS begins beeping.
- Release the on/test button during the beeping to start the UPS.

Utility Voltage Bar Graph

This UPS has a diagnostic feature that displays the utility voltage. With the UPS plugged into the normal utility power, press and hold the on/test button to see the utility voltage bar graph display. After approximately four seconds the 5-LED display on the right of the front panel shows the utility input voltage. Refer to the figure below for the voltage reading.

- 132
- 123
- 115
- 107
- 98

The display indicates that the voltage is between the displayed value from the list and the next higher value. For example, with three LEDs lit, the input voltage is between 115 and 123 VAC.

If no LEDs come on and the UPS is plugged into a working AC power outlet, the line voltage is extremely low.

If all five LEDs come on, the line voltage is extremely high and should be checked by an electrician.

Note: The UPS starts a self-test as part of this procedure. The self-test does not affect the voltage display.

Storage

Storage Conditions

Store the UPS covered and upright in a cool, dry location, with its battery fully charged. Before storing, charge the UPS for at least 4 hours. Disconnect any cables connected to the computer interface port to avoid unnecessarily draining the battery.

Extended storage

- At -15 to +30 °C (+5 to +86 °F), charge the UPS's battery every 6 months.
- At +30 to +45 °C (+86 to +113 °F), charge the UPS's battery every 3 months.

Replacing the Battery

This UPS has an easy to replace hot-swappable battery. Battery replacement is a safe procedure, isolated from electrical hazards. You may leave the UPS and loads on for the following procedure. See your dealer or call the number in this manual for information on replacement battery kits.

Note: Please read the cautions in the *APC Safety Guide*.
Once the battery is disconnected, the loads are not protected from power outages.

Battery Replacement Procedure - 2200 - 3000 VA Models



1. Grasp the top edge of the bottom front cover and **tilt** it out.



2. **Unhook** the bottom section of the front cover from the chassis and set it aside.
3. Use a flat-blade screwdriver or a coin to **remove** the two battery door screws and open the door.
4. Grip the wires for the front set of batteries and **pull** firmly to disconnect the connector from the battery compartment.
5. Pull the white cord on the front battery connector to remove the batteries.
6. Set aside the foam spacer located between the batteries.
7. Reach into the battery compartment and grasp the white cord on the other battery connector. **Pull** firmly to disconnect the connector and remove the second set of batteries.



Note: Be careful removing the batteries - they are heavy.

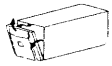
8. Slide the first set of new batteries into the unit. Hold the connector down below the top of the batteries and toward the door, otherwise the assembly will not fit. Guide the connector over the top of the batteries and **press firmly** to connect it to the rear connector of the battery compartment.

Note: Small sparks at the battery connectors are normal during connection.

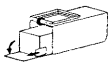
9. Set the foam spacer against the rear batteries to prevent the wires from being pinched.
10. **Slide** the second set of batteries in, then guide the connector over the batteries and **press firmly** to connect it to the front connector of the battery compartment.
11. **Close** the battery door, **replace** the screws, and replace the lower front cover.
12. Dispose of the old battery properly at an appropriate recycling facility or return it to the supplier in the packing material for the new battery. See the new battery instructions for more information.



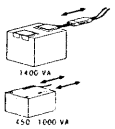
Battery Replacement Procedure - 450 - 1400 VA Models



1. Grasp the top of the front cover and **tilt** it out and down.



2. **Unhook** the bottom of the cover from the chassis and lift it upward to expose the battery door. Be careful not to strain the ribbon cable. Do not touch the exposed printed circuit board.
3. **Fold** the front cover on top of the UPS as shown.
4. Use a flat-blade screwdriver or a coin to **remove** the two battery door screws and open the door.
   Grasp the tab and gently **pull** the battery out of the UPS.
5. Disconnect the battery leads.
   - For the 450 through 1000 VA models, loosen the connectors by gently wiggling them while pulling straight back from the battery connector.
   - For the 1400 VA model, pull the two gray couplers apart to disconnect the battery.



6. **Connect** the battery leads to the new battery.

Note: Small sparks at the battery connectors are normal during connection.

   - For the 450 through 1000 VA models, connect the red wire to the positive (+) terminal and the black wire to the negative (–) terminal.
   - For the 1400 VA model, connect the gray battery coupler to the UPS's coupler.
7. **Slide** the battery into the UPS.
8. **Close** the battery door, **replace** the battery compartment screws, and replace the front cover.
9. Dispose of the old battery properly at an appropriate recycling facility or return it to the supplier in the packing material for the new battery. See the new battery instructions for more information.



User Configuration Items

Note: Setting these items requires optional software or hardware.

Function	Factory Default	User Selectable Choices	Description
Automatic Self-Test	Every 14 days (336 hours)	Every 7 days (168 hours), On Startup Only, No Self-Test	Sets the interval at which the UPS will execute a self-test.
UPS ID	UPS_IDEN	Up to eight characters to define the UPS.	Use this field to uniquely identify the UPS for network management purposes.
Date of Last Battery Replacement	Manufacture Date	Date of Battery Replacement	Reset this date on battery replacement.
Minimum Capacity Before Return from Shutdown	0 percent	15, 50, 90 percent	The UPS will charge its batteries to the specified percentage before return from a shutdown.
Sensitivity	Normal	Reduced, Low	Set lower than normal sensitivity to avoid lowered battery capacity and service life in situations where the load can tolerate minor power disturbances.
Duration of Low Battery Warning	2 minutes	5, 7, 10 minutes	Sets the time before shutdown at which the UPS issues a low battery warning. Set higher than the default only if the OS needs the time for graceful shutdown.
Alarm Delay After Line Fail	5 second delay	30 second delay, At Low Battery Condition, No Alarm	To avoid alarms for minor power glitches, set the alarm delay.
Shutdown Delay	20 seconds	180, 300, 600 seconds	Sets the interval between when the UPS receives a shutdown command and when shutdown occurs.
Synchronized Turn-on Delay	0 seconds	60, 180, 300 seconds	To avoid branch circuit overload, the UPS will wait the specified time after the return of utility power before turn-on.
High Transfer Point	132 VAC	135, 138, 129 VAC	To avoid unnecessary battery usage, set the High Transfer Point higher if the utility voltage is chronically high and the load is known to work well under this condition.
Low Transfer Point	103 VAC	100, 97, 106 VAC	Set the Low Transfer Point lower if the utility voltage is chronically low and the load can tolerate this condition.

For Computer Interface Port Specifications, see the APC Website (www.apcc.com).

Service

If the UPS requires service do not return it to the dealer!

Follow these steps:

1. Use the ***Troubleshooting*** section of the ***Quick Reference Guide*** to eliminate common problems.
2. Verify that no circuit breakers are tripped. A tripped circuit breaker is the most common UPS problem!
3. If the problem persists, call customer service or visit the APC Internet Website (www.apcc.com).
   - Note the model number of the UPS, the serial number, and the date purchased. A technician will ask you to describe the problem and try to solve it over the phone, if possible. If this is not possible the technician will issue a Return Merchandise Authorization Number (RMA#).
   - If the UPS is under warranty, repairs are free. If not, there is a repair charge
4. Pack the UPS in its original packaging. If the original packing is not available, ask customer service about obtaining a new set.
   - Pack the UPS properly to avoid damage in transit. Never use Styrofoam beads for packaging. Damage sustained in transit is not covered under warranty.
   - Include a letter with your name, RMA#, address, copy of the sales receipt, description of the trouble, your daytime phone number, and a check (if necessary).
5. Mark the RMA# on the outside of the package.
6. Return the UPS by insured, prepaid carrier to the address given to you by Customer Service.

North & Latin America	Europe
APC 132 Fairgrounds Road West Kingston, Rhode Island 02892 USA 1-800-800-4APC/1-401-789-5735	APC Ballybritt Business Park Galway, Ireland 10800-702000 353-91-702020
Internet http://www.apcc.com	**E-Mail** apctech@apcc.com

Specifications

	450 VA	700 VA	1000 VA	1400 VA	2200 VA	3000 VA
Acceptable input voltage	0 - 160 VAC					
Output voltage	103-132 VAC (by default)					
Input Protection	Resettable circuit breaker					
Frequency limits (on-line operation)	50 or 60 Hz, ±5%					
Transfer time	2 ms typical, 4 ms maximum					
Maximum load	450 VA 280 W	700 VA 450 W	1000 VA 670 W	1400 VA 950 W	2200 VA 1600 W	3000 VA 2250 W
On-battery output voltage	115 VAC					
On-battery frequency	50 or 60 Hz, ±0.1 Hz; unless synchronized to utility during brownout.					
On-battery waveshape	Low-distortion sine wave					
Protection	Overcurrent and short-circuit protected, latching shutdown on overload.					
Noise Filter	Normal and common mode EMI/RFI suppression, 100 kHz to 10 MHz					
Battery type	Spill proof, maintenance free, sealed lead-acid					
Typical battery life	3 to 6 years, depending on number of discharge cycles and ambient temperature					
Typical recharge time	2 to 5 hours from total discharge					
Operating temperature	0 to +40 °C (+32 to +104 °F)					
Storage temperature	-15 to +45 °C (+5 to +113 °F)					
Operatng and storage relative humidity	0 to 95%, non-condensing					
Operating elevation	0 to +3,000 m (0 to +10,000 ft)					
Storage elevation	0 to +15,000 m (0 to +50,000 ft)					
Electromagnetic immunity	IEC 801-2, 801-3, 801-4					
Audible noise in dBA at 1 m (3 ft)	<41	<42	<45		<53	
Size (H x W x D)	15.8 x 13.7 x 35.8 cm (6.2 x 5.4 x 14.1 in.)		21.6 x 17 x 43.9 cm (8.5 x 6.7 x 17.3 in.)		43.2 x 19.6 x 54.6 cm (17.0 x 7.7 x 21.5 in.)	
Weight - net (shipping)	10.5 (11.8) kg 23.2 (26) lb.	13.1 (14.5) kg 29 (32) lb.	18.8 (20.8) kg 41.5 (46) lb.	24.1 (26.1) kg 53 (58) lb.	51 (60.8) kg 112 (134) lb.	55.8 (64.4) kg 123 (142) lb.
Safety approvals	Listed to UL 1778, certified to CSA 107.1					
EMC verification	FCC/DOC Class B certified				FCC/DOC Class A verified	

ProTalk® Plus

Alarm Reporting Unit
Operating Manual

BARNETT ENGINEERING LTD.
www.barnett-engg.com

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Operating Manual

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ProTalk® Plus

Alarm Reporting Unit

Operating Manual

Model B1290

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October, 2004
Rev. 1.07

BARNETT ENGINEERING LTD.

ACTA/IC Customer Instructions

The ProTalk Model B1290 ARU meets and exceeds the necessary requirements for operation and connection to a PSTN telephone line in Canada and the United States. It currently holds the following approvals:

1. FCC part 15, subsection J/A
2. Industry Canada CS-03 Part I Issue 8
3. TIA/EIA-968
4. CSA C22.2 No 60950-00 / UL 60950, 3rd Edition

FCC Regulations

1. This equipment complies with Part 68 of the FCC rules and the requirements adopted by ACTA. On the side of this equipment is a label that contains, among other information, a product identifier in the format US:AAAEQ##TXXXX. If requested, this information must be provided to the telephone company.

2. A plug and jack used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by ACTA. A compliant telephone cord and modular plug is provided with this product. It is designed to be connected to a compatible modular jack that is also compliant.

3. The ringer equivalence number (REN) is used to determine the number of devices that may be connected to a telephone line. The total number of all RENs on any one line should not exceed 5.0 in most cases. Excessive RENs on the telephone line may result in the devices not ringing in response to an incoming call. To be certain of the number of devices that may be connected to a line, as determined by the total RENs, contact the telephone company to determine the maximum REN for the calling area. The REN for this product is shown separately on the label and is also part of the product identifier that has the format US:AAAEQ##TXXXX. The digits represented by ## are the REN without a decimal point (e.g. 00 is a REN of 0.0).

4. If the ProTalk Plus model B1290 causes harm to the telephone network, the telephone company will notify you in advance that a temporary discontinuance of service may be required. But if advance notice is not practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

5. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make the necessary modifications in order to maintain uninterrupted service.

6. If trouble is experienced with the B1290, please contact Barnett Engineering Ltd., 215 7710 5th Street SE, Calgary, Alberta, Canada T2H 2L9 for repair and/or warranty information. If the trouble is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.

7. Repair work must be performed by Barnett Engineering Ltd.

8. This device must not be installed on coin-operated or multi-party telephone lines.

Class B Computing Device

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/ TV technician for help.

FCC Part 68 Continuing Compliance

The testing which will be performed on this equipment as part of the Part 68 compliance program will essentially follow the same format as the contained in the test data portion of this application. Testing and evaluation will be performed at least annually on a minimum of one production unit. Testing will be performed in-house or by a laboratory that has the proper facilities for verifying compliance to the requirements of Part 68. Should

such testing indicate the need for changes to the equipment under test, said changes will be demonstrated to comply with Part 68 by testing and evaluation and proper notification will be given to the FCC in the form of a modification filing.

Upon request from the FCC, copies of the reports showing Part 68 compliance for a recent production lot, or one or more units for Part 68 compliance verification inspection, will be supplied.

Industry Canada Regulations

NOTICE: This equipment meets the applicable Industry Canada Terminal Equipment Technical Specifications. This is confirmed by the registration number. The abbreviation, IC, before the registration number signifies that registration was performed based on a Declaration of Conformity indicating that Industry Canada technical specifications were met. It does not imply that Industry Canada approved the equipment.

NOTICE: The Ringer Equivalence Number (REN) for this terminal equipment is 0. The REN assigned to each terminal equipment provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed five.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas. *Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.*

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Introduction

Description

Basic Operation

The ProTalk Plus model B1290 is a device used to monitor alarms at an unattended site. If an alarm occurs, such as building intrusion, power failure, high or low temperature or equipment failure, the B1290 automatically dials out on the telephone line. When the telephone is answered, the B1290 announces in a clear voice the name of the site and the alarm condition that has occurred. If there is no answer, the B1290 will continue to dial through a list of telephone numbers until it reaches someone and is able to report its alarm.

This manual describes the basic operation of the ProTalk Plus model B1290, and its most common applications. The B1290 can, however, be programmed to perform many more functions at the discretion of the user. It can announce alarms over radio, telephone, a public address system or a combination of these. It can also be programmed to send coded tones along with the voice messages to activate such devices as radio pagers, relays or annunciator panels. It can be used as a master station to concentrate alarms from a number of remote sites. It can be commanded to perform remote control functions by receiving codes from a tone telephone. Expanders can be added to increase the capacity of the unit from the basic eight alarm inputs and four relay outputs up to 64 inputs and 32 outputs.

The B1290 can be completely customized for your application because all of the operating parameters are programmed by the user, including the voice messages. Like its predecessor, the ProTalk B1270, the B1290 can also be programmed using a standard tone telephone. A stored voice in the B1290 prompts you step-by-step when you are entering new voice messages or codes, and speaks back all the values that you have saved.

With the added feature of PC software, it is also possible to program the B1290 from a computer. Using the PC software all of the information in the B1290 can be read, written and stored to disk.

The programming sections of this manual describe how the B1290 is configured with a phone set. Instructions for programming with the software application are found in the Help section of the program.

How to Use this Manual

This manual is organized in such a way that if you want the B1290 to function with its default settings as a simple telephone dialer, you need only read the first two chapters of the manual covering the physical installation, basic programming and operation. If you wish to change some of the default settings or have the B1290 perform more advanced functions, continue on to the next chapter where the Program Codes are described in detail. Several step-by-step examples of programming the B1290 into different configurations are given. The final chapter describes some of the problems most commonly experienced when the B1290 is first installed, and gives advice on troubleshooting.

Getting Started

Description

The B1290 is housed in metal case with plug-in terminal blocks and jacks for field wiring. Table 1 and Figure 1 show the connection points to the B1290. Figure 3 shows how wiring connections are made to the unit.

Table 1: ProTalk Wiring Connections

RADIO

1	Radio TX
2	Radio RX
3	PTT Output.
4	COS Input
5	Ground
6	ACK Input
7	Ground
8	+11.5 to +28 power

RELAYS

1	Relay 1 NC
2	Relay 1 Common
3	Relay 1 NO
4	Relay 2 NC
5	Relay 2 Common
6	Relay 2 NO
7	Relay 3 NC
8	Relay 3 Common
9	Relay 3 NO
10	Relay 4 NC
11	Relay 4 Common
12	Relay 4 NO

SERIAL

2	RXD
3	TXD
4	DTR
5	GND
6	DSR

ALARMS

1	Alarm 1 Input
2	Alarm 2 Input
3	Alarm 3 Input
4	Alarm 4 Input
5	Alarm 5 Input
6	Alarm 6 Input
7	Alarm 7 Input
8	Alarm 8 Input
9	Ground
10	Ground

POWER
2.5mm power, center ground

PHONE
RJ11 Line 1

PGM
RJ11 Line 1

EXP
2.5mm mono, center data

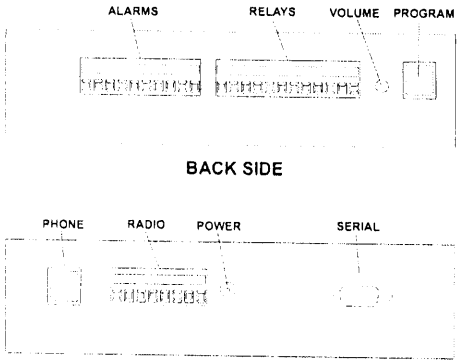


Figure 1 Connector Locations

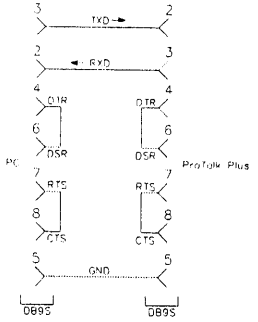


Figure 2 Programming Cable Wiring

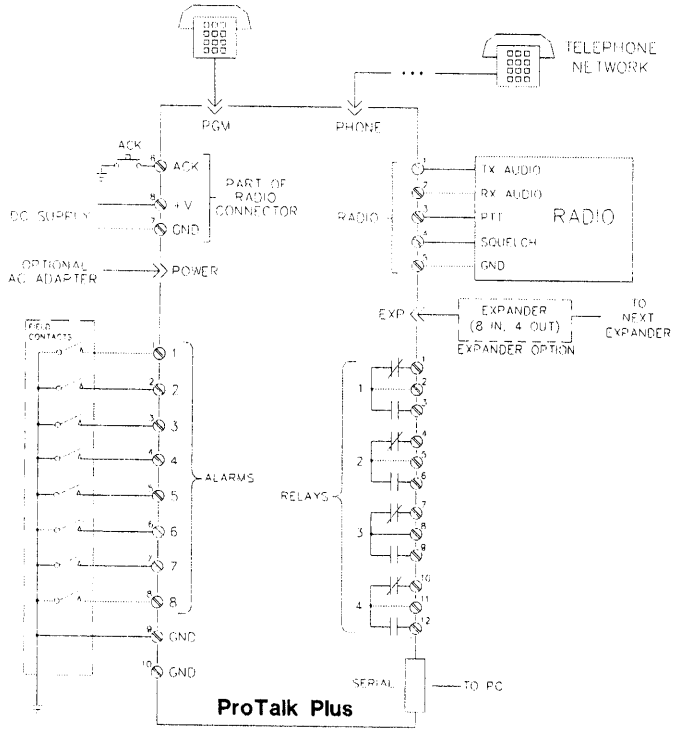


Figure 3 ProTalk Plus Wiring Diagram

Power Requirements

The B1290 will operate from a supply of +11.5 VDC to +28 VDC. The typical current requirement is 100 mA plus 10 mA per relay. Each expander uses an additional 60 mA plus 25 mA per relay.

Connect power only to one of the two available inputs: the DC inputs on the Radio terminal block or the plug used with an AC adapter.

Installation

The B1290 should be installed in a clean, dry place suitable for electronic equipment. The unit will operate from -40°C to +60°C.

Caution: Power and the telephone line should not be connected until the rest of the installation is complete.

Use a flat blade screwdriver to make connections to the screw terminals on the sides of the enclosure.

Alarms

In its default condition, the B1290 looks for a normally open (NO) contact which closes to ground to indicate an alarm. The B1290 may also be programmed to accept inputs normally closed (NC) to ground which open on an alarm condition. To change this parameter, refer to the alarm format in I/O Configuration - Program Code 5. When using NC contacts, ensure that all unused alarm points are either disabled or connected to ground. Refer to Figure 4 for details on how to connect an alarm signal line.

All of the alarm inputs are optically isolated and are operated from the B1290's internal 12 volt supply.

Connect the alarm inputs to the positions labeled 1 through 8 on the ALARM terminal block.

Caution: DO NOT connect a voltage source to the alarm inputs.

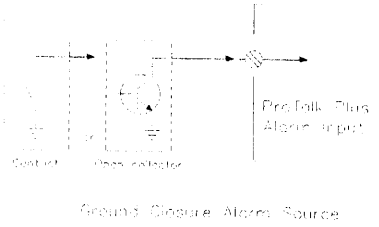


Figure 4 Alarm Input Connection

Relays

Four form C relay outputs are available, rated for 1.0 A at 30 VDC, or 0.3 A at 120 VAC. Connect external devices to the contacts on the RELAY connector. When connecting to larger loads, connect an interposing relay between the B1290 and the load.

Radio

If the alarms are to be announced over radio, connect TX to the transmit audio of the radio, and RX to the receive audio. *RX should always be connected to squelched audio.* Independent transmit level adjustments are available for voice, DTMF and tone signals. Adjust the levels of the transmit audio signals using the programming phone or the software setup. For the receive level adjustment, set the programmed level to match the level of the incoming signal: for a -10 dBm received signal from the radio the programmed value would be -10 dBm. The range of adjustment for both receive and transmit signals is -20 dBm to 0 dBm.

The PTT output provides a ground closure through an open collector to signal the radio to transmit. Connect this point to the radio's push-to-talk circuit. The maximum rating is 150 mA, 25V.

The COS input is used to indicate to the B1290 whether the radio channel is busy. Connect this point to the output of the radio's carrier-operated switch or relay (COS or COR). In its default condition, the B1290 looks for a high signal to indicate the channel is clear and a low signal when the channel is busy. The B1290 may also be programmed to recognize the reverse polarity. To change this parameter, refer to the squelch polarity in System Settings - Program Code 6. This input is internally pulled up to work with open collector radio outputs. In its default program condition, the input is pulled high when clear and driven low when busy.

Local Acknowledge

This input is used to acknowledge an alarm locally at the B1290 without having to call in over the radio or telephone. Connect the ACK input to a normally open contact which will be grounded to acknowledge the alarm.

Telephone

The telephone line is connected to the RJ11 jack labeled PHONE on the side of the B1290. The line should be using the inner (red/green) pair. Audio levels to the telephone line are fixed internally in conformance with FCC regulations.

The telephone should always be the last item connected.

Caution: DO NOT plug the telephone line into the PGM jack, as damage could result to the B1290.

Expanders

Expanders are used to increase alarm and relay capacity of the B1290. They come in their own metal cases with all connectors clearly labeled. Expanders must be located in close proximity to the master B1290 unit for them to communicate properly. The shielded cables provided to connect between units are cut to accommodate the maximum allowable distance. Substituting cables is not recommended.

Make the alarm and relay connections to the expander in the same way as for the B1290. Use the shielded cable provided to connect between the EXP connector on the B1290 and SERIAL IN on the expander. On subsequent expanders, use the cable supplied with the expander to connect between SERIAL OUT on one board and SERIAL IN on the next.

Next set the DIPswitches on the expander to configure its ID number.

Expander Number	Position 1	Position 2	Position 3
1	OFF	ON	ON
2	ON	OFF	ON
3	OFF	OFF	ON
4	ON	ON	OFF
5	OFF	ON	OFF
6	ON	OFF	OFF
7	OFF	OFF	OFF

DIPswitch positions 4 through 7 must remain on.

Position 8 is used to control the LEDs. It is normally ON, but if you wish to conserve power by disabling the LEDs, set this switch to the OFF position.

If the expander address is changed, the unit must have power removed and then reapplied in order for the master to recognize its new address. All the expander's programmed parameters, aside from the voice messages, are stored in the main ProTalk Plus and are downloaded on power-up.

The expander database will be automatically transferred from the ProTalk Plus if an expander address is changed or an expander is replaced.

The expander requires its own +12 VDC and GND connections. Be sure that all units, master and expander(s), are always powered up and down together. Do not connect or disconnect expander cables when the system is powered up.

The POWER LED lights when the power is on. The expander also has an RX LED which lights when it is being polled by the master B1290, and a RESPONSE LED which indicates when it is responding.

Power-up Sequence

Once the installation is complete, DC power can be connected to the B1290. On start-up, the B1290 will go through the following self-test sequence:

1. LED Test
   - VOICE, TONE and, HOOK LEDs On.
   - PTT LED Off
   - RUN LED Flashing
2. Hardware Test
   - ALARM LEDs 1-8 On
   - Memory test
   - One second dwell time for this test
3. Vocabulary Voice Test
   - ALARM LEDs 1-7 On
4. User Voice Message Test
   - ALARM LEDs 1-6 On
5. Database Setup
   - ALARM LEDs 1-5 On
6. End of Test
   - ALARM LEDs 1-8 Off
   - One second dwell time
   - Software version spoken over the speaker
7. Normal Operation
   - RUN LED Steady

The telephone line may then be plugged in as the last connection. *Ensure that the telephone is connected into the PHONE port on the B1290.*

Start-up Programming

Introduction

Now you are ready to begin programming. When the B1290 is initially powered up, it will prompt you to input three parameters which must be entered before it can operate — the voice messages, a list of telephone numbers and the Acknowledge Code. Once these values have been entered, with its default settings, the unit will function as a straight telephone dialer when an alarm is present. If you require the B1290 to perform more advanced functions, continue on to the chapter where the Program Codes are explained in detail.

Before you start programming, there are a few points with which you must be familiar. First, although it is possible to program the B1290 remotely by calling it up over the telephone line, it is assumed that when you initially install the unit you will be using a local programming phone. The B1290 must be programmed with a phone which sends DTMF tones (Touch Tone); it will not recognize the signals from a phone which sends dial pulses.

The B1290 is designed to be user friendly. When you listen in the earpiece of the programming phone, you will hear spoken messages. These are called voice "prompts", and they tell you what information the B1290 is expecting you to enter. Whenever you program a new value, the B1290 will immediately speak that parameter back to you, so you will know right away whether the code was entered correctly. You can change a parameter as many times as you like before going on to the next one. If you make a mistake, such as entering a value outside the range for that parameter, the B1290 will immediately let you know by announcing *Error*. And if you get confused, just hang up the phone and start again. The B1290 will start again at the beginning when you pick up the handset.

The other feature you need to know is how to enter data. If you were entering information from a keyboard or other terminal, you would use the "Enter" key or a "Carriage Return". A telephone does not have this key, so we substitute the code ✱✱ for "Enter". The two "stars" (asterisks) must be entered one after the other, with no more than one second between the beginning of the first digit and the beginning of the second. This is a much longer time than most people think, and there is no need to rush when entering the code. If you enter the digits too fast, the telephone will only recognize one ✱. You may get an *Error* message if this happens or else the B1290 will ignore the entry and wait for another ✱✱. The ✱✱ code is used throughout the programming sequence to enter information or proceed to the next step. With practice you will soon determine the correct speed.

Where the # digit is used in a DTMF code or a telephone number it must be entered as two # digits. For example, the DTMF code #2# would be entered as ##2##.

The B1290 will not work the way you want it to until all three of the required parameters have been entered correctly, so if you hang up in the middle of this procedure, the B1290 will take you back to the beginning of the sequence the next time you come off hook.

Throughout the programming sequence, the unit will speak stored parameters using a prompt, followed by the word "is", then the stored data. For example, to tell you the Acknowledge Code is set to 1234, the B1290 says *Acknowledge Code is 1234.* Input from the telephone's keypad is expected following this message. Whenever voice messages are required, the unit will beep twice, prompting the user to speak into the telephone handset.

Site ID and Voice Alarm Messages

Plug any standard tone telephone into the jack labeled "PGM".

Lift the handset to your ear. You will hear the B1290 speak the words *Program voice; site is* followed by silence since there is no voice message programmed.

B1290: Program voice.

Site is...

The B1290 is prompting you to enter the name of the site. The name you program will be announced at the start of every message along with the list of alarms.

To record the voice message, enter the record code (2).

YOU: 2✱✱

After you hit the second star, the B1290 will prompt you with a beep-beep tone.

B1290: beep-beep

As soon as you hear the tone, you can begin to record your message. The VOICE LED on the front panel will light while the B1290 is recording. Speak the name of the site, e.g. Ajax Compressor Station. The B1290 detects when you stop speaking and automatically plays back the message. Pauses between words may cause the recording to terminate. The VOICE LED will light while it is playing back.

YOU: Ajax Compressor Station

B1290: Site is Ajax Compressor Station.

Did the message played back sound acceptable? If you think it could be improved, enter the record code (2) followed by ✱✱ again and repeat the message as many times as you like. Once you are satisfied with the way the message sounds, hit the enter code (✱✱).

YOU: ✱✱

The B1290 will prompt you for the next entry.

B1290: Alarm One is...

Repeat the above steps to record the alarm message, e.g. power failure.

YOU: 2 * *

B1290: beep-beep

YOU: *Power Failure*

B1290: Alarm One is Power Failure.

Repeat the above steps until you are satisfied with the way the message sounds. Then continue.

YOU: * *

B1290: Alarm Two is...

Enter the voice message associated with the second alarm point, e.g. intrusion alarm.

YOU: 2 * *

B1290: beep-beep

YOU: *Intrusion Alarm*

B1290: Alarm Two is Intrusion Alarm.

YOU: * * *Next*

B1290: Alarm Three is...

Repeat the above steps until all the alarm points have been programmed. When you have entered all the voices, enter Quit (# ✱✱) at the announcement of the next empty alarm. If you use all eight alarms, the B1290 will automatically advance after you enter the last voice message. The next step in the startup process is to program the telephone numbers.

YOU: # * *

Telephone Numbers

B1290: Program Directory

B1290: Directory A, Line One is Radio Alert Voice. (default)

The B1290 has just spoken the actions that will occur from the commands on the first line in Directory A. The default radio announcement will now be replaced with a phone call-out command. Enter 2 to indicate you want to program the line with new commands.

YOU: 2 * * *Change line*

B1290: beep

Details on how directory commands are entered are shown in Program Code 2 Directories. The startup process described here provides only the basic auto-dialer configuration.

Enter the phone number using the pushbuttons on your telephone. The entry shown below will result in the B1290 dialing the selected number and then speaking the alarm messages. The #0 at the beginning is the DIAL command, followed by a #8 command for VOICE.

YOU: # 0 2 5 5 9 5 4 4 # 8 * *

B1290: Directory A, Line One is DIAL 2559544 VOICE.

If there is an error in the entry, hit the program code 2 followed by ✱✱ and try again. If the sequence is played back correctly, hit the enter code.

YOU: * * *Next*

B1290: Directory A, Line Two is empty

The B1290 is prompting you for the second directory line. The commands entered for line 2 are what will occur if there is no acknowledgement after the first line commands are completed during operation.

YOU: 2 * * *Change line*

B1290: beep

YOU: # 0 2 5 5 2 3 4 3 # 8 * *

B1290: Directory A, Line Two is DIAL 2552343 VOICE.

YOU: * *

B1290: Directory A, Line Three is empty.

The B1290 is prompting you for a third telephone number to dial if it cannot get an answer at the first two. Continue entering telephone numbers up to a maximum of twenty. If you are not using twenty numbers, enter the Quit code (#) at the prompt. If you hit the Enter code (✱✱) for an empty telephone number, the B1290 assumes that you have no more telephone numbers to enter and will jump to the next function.

YOU: * *

or

YOU: # * *

Acknowledge Code

B1290: Program Acknowledge Code.

B1290: Acknowledge Code is 1234.

The B1290 is prompting you to enter an acknowledge code. This is the code you send to the B1290 when it calls you up to announce an alarm, to acknowledge that you have received the message. Otherwise the unit will keep on dialing. 1234 is the default code. You may use this code or enter a different one from 1 to 8 digits in length. It should be something easy to remember.

YOU: 2 4 6 8 * #

B1290: Acknowledge Code is 2468.

YOU: * #

B1290: Enter Program Code.

The B1290 is prompting you to enter a Program Code if you need to program more advanced functions into the unit. If you require them, proceed to the chapter where Program Codes are explained in detail. Otherwise, hang up the programming phone.

At this point the B1290 will function as an alarm reporting unit over the telephone, dialing through the numbers you have programmed into Directory A until it is answered, then announcing the voice messages you have recorded to report an alarm.

Unless something happens to corrupt the memory of the B1290, these parameters will be stored indefinitely and you will not be prompted to enter them again.

The next time you lift the programming phone off hook, the B1290 will announce its status and prompt you to *Enter Control Code.* DO NOT enter any codes from the telephone. WAIT five seconds; the B1290 will time out and automatically enter the programming mode. When you hear the prompt *Program Access; Enter Program Code,* you may begin programming.

Do not remove power from the B1290 while you are programming. Always put the telephone handset back on-hook before removing power.

Front Panel

The front panel of the B1290 is shown in Figure 5. The description of the front panel indicators will assist you in verifying the correct operation of the unit.

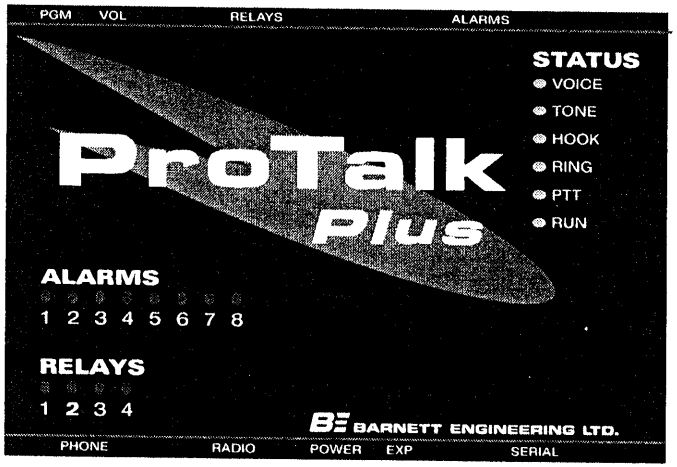


Figure 5 ProTalk Plus Front Panel

Alarm LEDs

The Alarm LEDs light when the associated alarm input is in the alarm state. Unacknowledged alarms will be flashing and any that have been acknowledged will be on solid.

Relay LEDs

The Relay LEDs light whenever the associated relay is on.

Voice

The Voice LED is on whenever the B1290 is recording or playing user messages. It flashes when vocabulary messages are being played or when there is an error in the user voices.

Tone

The Tone LED is on for the duration of a transmitted DTMF digit or other generated tone. It will also be on when call progress tones are detected on the phone line. It will flash once for each received DTMF digit.

Hook

The Hook LED comes on whenever the B1290 goes off hook, to dial or answer the telephone. It will flash if a phone port error is detected (no dial tone or other expected call progress signal). The hook LED will also flash during pulse dialing.

Run

The Run LED will be on steady when the B1290 is operating correctly. This LED will flash if an error condition is present.

Ring

When ringing is detected on the telephone line, the Ring LED illuminates. Since answering the telephone is a low priority task to the B1290, it may ignore the ringing if it is processing other tasks (e.g. speaking on the radio).

PTT

The PTT LED will light when the B1290 generates a push-to-talk signal to the radio.

Operation

This chapter gives a detailed description of exactly how the B1290 will operate after the start-up programming has been completed. Parameters which may be altered are pointed out, with reference to the appropriate Program Code section.

Alarm Sequence

When the B1290 receives an alarm on one of its inputs, it goes off hook and listens for dial tone. If dial tone is not present, the B1290 will hang up and try again. After three unsuccessful attempts to detect dial tone, the B1290 will conclude there is a problem with the line and stop dialing. When this occurs the unit will report *Telephone Access Error* over the radio, set the error relay and flash the RUN and HOOK LEDs.

If dial tone is detected, the B1290 dials the first telephone number stored in Directory A using tone dialing. When the telephone line is answered, the B1290 will announce its Site ID, the list of any alarms present, and prompt the user to *Enter Acknowledge Code.* It will repeat this message a minimum of three times, pausing five seconds after each announcement to wait for an acknowledgment. When the Acknowledge Code is detected, the B1290 will announce *Alarms Acknowledged* and then prompt "Enter Control Code".

If the line is busy, if there is no answer, or if the B1290 does not receive the Acknowledge Code after announcing the alarm, it will hang up the telephone line, then go off hook again and dial the next number in the directory. If the B1290 dials all the way through the directory without being acknowledged, it will wait two minutes (Interval Timer A), then start dialing again from the top of the directory. After three tries (Times A) at two minute intervals, the B1290 will retry the list every ten minutes (Interval Timer B) thereafter, not stopping until it is acknowledged.

All of the timers and intervals mentioned above are adjustable. In addition, the B1290 may be programmed to announce the alarm a number of times over radio, or a public address system, as well as dialing on the telephone.

Acknowledging an Alarm

When the B1290 calls you on the telephone, it may take up to five seconds before it starts speaking. After it announces the alarms, it prompts you to *Enter Acknowledge Code.* You have five seconds to begin entering the digits.

If the B1290 has been programmed to operate its relays (Program Code 3, DTMF Codes), you may send a relay code over the telephone before acknowledging the alarms. The B1290 will actuate the relay, speak the associated voice message, then prompt you again to *Enter Acknowledge Code.* After the B1290 has detected the Acknowledge Code, it will speak the

phrase *Alarms Acknowledged* and return to the "Enter Program Code" level. If no activity occurs for 5 seconds it will hang up.

Appending the # digit at the end of the Acknowledge code allows you to acknowledge the alarm for sixty minutes only. After one hour, the B1290 will check the alarm inputs again, and if the same alarm is still present, it will begin the reporting cycle just as if it was a new alarm.

Any series of digits entered immediately after the acknowledge code will be echoed back to the user. This feature is sometimes used in systems applications.

To acknowledge the B1290 locally, activate the local acknowledge switch connected to the unit (see the section on "Installation - Local Acknowledge"). The alarms may be acknowledged at any time. The *Alarms Acknowledged* announcement will occur whenever the B1290 is available to speak.

Telephoning the B1290

When you call the B1290 on the telephone, it will answer after four rings (Rings before Answer) and announce its site ID, any alarms which are present, and the status of any relays which have been assigned codes. After this announcement, the B1290 will prompt you to *Enter Control Code.* The B1290 then waits ten seconds for you to enter a code. This could be a code to operate one of the relays, an Acknowledge Code, an Interrogate Code, or an Access Code which would allow you to go into the programming mode. If an Access Code (password) has not been programmed, the B1290 will automatically go into the programming mode after five seconds, prompting you to *Enter Program Code.* You may then program the B1290 from your telephone, the same as you would from a local programming phone.

The B1290 will hang up whenever it has waited for more than ten seconds without receiving a DTMF code.

Changing Telephone Directories

Telephone directories can be changed remotely without entering the programming mode. The directory can be changed by entering the Directory Control Code over the telephone system, local programming telephone, or two-way radio.

Refer to the Directory section, Program Code 2, for a description of the directory format and its uses.

This example uses the local programming phone to change the telephone format from DIRECTORY A to DIRECTORY B and then to DIRECTORY C. A typical installation may use a programming telephone mounted permanently at the site to make this procedure as simple as possible.

B1290: Enter Control Code

YOU: 0 0 0

B1290: Telephone Format is Directory B

YOU: 0 0 0

B1290: Telephone Format is Directory C

It is also common to enter this code using a DTMF keypad over the radio system when the operators at the site change shift.

The B1290 will not allow an empty directory to be selected.

Error Messages

The B1290 will speak error messages when it is called on the phone line, interrogated over the radio port or when the local program phone is used.

Hardware Error

The B1290 speaks *Alert - Site Error* when either the user voices or the vocabulary memory space is corrupt.

Database Error

The B1290 speaks *Alert - Program Error* when either the configuration database is corrupt.

Phone Error

The B1290 speaks *Alert - Telephone Access Error* when there has been a call progress error such as no dial tone during a phone call.

Expander Error

The B1290 speaks *Alert - Expander Error* when a communication error is experienced with an expander.

Program Codes

How to Enter the Programming Mode

To begin programming, you must hear the prompt *Enter Program Code* from the B1290. One way to get to this prompt was discussed in the chapter on **Getting Started**. After you have entered the initial voice messages, telephone numbers and an Acknowledge Code, the B1290 will prompt you to begin programming. A local programming phone may be used at any time to alter parameters. It is also possible to program the B1290 remotely by dialing it up over the telephone line.

If you call up a B1290 over the phone once it has been programmed, it will answer after four rings (default) and announce its site ID, any alarms present, the status of the relays (if they have been programmed) and any error status messages. Then it will prompt you to *Enter Control Code.* If the unit has been programmed to operate with a password, you must enter the Access Code at this time. The B1290 will reply with *Program Access* and prompt you to *Enter Program Code.* If an Access Code has not been programmed, the B1290 will time out after five seconds and automatically enter the programming mode. You will hear the prompt *Program Access; Enter Program Code.*

When you connect a local programming phone, the B1290 goes through a similar sequence. It will announce its site ID, any alarms present, the status of any programmed relays and any error status messages. Then it will prompt you to *Enter Control Code.* It is not necessary to know the Access Code to program from the local phone. Wait five seconds, and the B1290 will automatically prompt you with *Program Access; Enter Program Code.*

IMPORTANT: Remember that all programming codes must be followed by the "**" code to enter them.

The following chapter, **Programming Reference**, divides the programming parameters into functional blocks. Refer to that chapter to determine the parameter changes required for a specific function.

Appendix C is a **Programming Tree** for the B1290. It gives an overview of the parameters which may be programmed and how they are organized. The Program Codes are explained in detail in the next section.

Program Code 1 **: Voices

When you enter Program Code 1, you will hear the following prompt:

B1290: Enter Voice Code

YOU: [1][*][*] *Record Site ID and alarm messages*

[2][*][*] *Record relay messages*

[3][*][*] *Erase all messages*

[*][*] *Exit to Enter Program Code prompt*

1**: Record Alarm Voices (includes Site ID)

Record the voice messages associated with the unit (site ID) and each individual alarm point. These are the messages which will be announced over the radio or telephone whenever the alarm is present.

B1290: Site is Ajax Compressor Station

YOU: [2][*][*] *Record*

[#][*][*] *Quit*

[*][*] *Enter/Next*

Default: empty

If the message is OK, continue by hitting Enter. If you would like to record a new message, enter 2** to record. As soon as you hit the second asterisk of the Enter code, the B1290 will prompt you to record a voice message. When you stop speaking, the B1290 will immediately play back the message that you recorded. Pauses between words may cause the recording to terminate. Repeat as many times as you need until the voice message sounds acceptable. Then hit Enter (**) to proceed, or # ** to exit back to the Enter Voice Code prompt.

Entering Next advances to the alarm message section and the first alarm message will be spoken

B1290: Alarm One is ...

YOU: [2][*][*] *Record*

[#][*][*] *Quit*

[*][*] *Enter/Next*

If you enter messages for all eight alarms, the B1290 will automatically exit to the Enter Voice Code prompt.

Default: empty

2**: Record Relay Voices

Record the voice messages associated with each relay. Note that the messages will only be announced if the relays have been programmed to operate from a string (see Program Code 3, Relay On/Off Codes). When a relay is operated, the B1290 will speak the voice message followed by the word "On" or "Off" to verify that the action was taken.

In some applications, it is not necessary to have voice confirmation when a relay is operated. To disable this feature, refer to Program Code 6 - Relay Voices.

The B1290 will always announce the condition of the relays when it is called up or interrogated for status.

B1290: Relay Number One is ...

YOU: [2][*][*] *Record*

YOU: [#][*][*] *Quit*

[*][*] *Enter/Next*

Default: empty

3**: Erase All Voices

B1290: Enter Voice Empty Code

YOU: . [#][3][1][*][*] *Erase (exit with any other entry)*

1290: Voice is Empty

[*][*] *Enter/Next*

Program Code 2 **: Directories

There are four directories in the B1290. To allow different alarms to perform different actions when they are active, each alarm can be selected to use any one of the directories. Each directory defines a unique sequence of actions. There is also a Directory Control Code that modifies the directory selection that the alarms are programmed for. When this code is used there are restrictions placed on how the alarms are assigned to directories. There are three possible ways that the directories can be used.

1. If there is No Directory Control Code:

   Alarms can be assigned to any of the four directories and will always use the one that has been assigned.

2. If there is a Directory Control Code (method 1):

   Alarms can only be assigned Directory A. When the Directory Control Code is received, the directory usage is modified such that the alarms now use the next directory with commands in it. If Directory B has commands then it will be used. When the Directory Control Code is received again, directory usage advances to the next directory with commands in it.

   If all four directories have commands in them, then the Directory Control Code will simply advance to the next directory each time it is received. If the current setting is Directory D when the code is received, then it will return to Directory A.

   If the next directory is unused, it will be skipped.

2. If there is a Directory Control Code (method 2):

   If the alarms are assigned only to Directory A and Directory C, when the Directory Control Code is received, all of the alarms that are assigned to Directory A will switch to use Directory B and all of the Alarms assigned to Directory C will switch to use Directory D. When the Directory Control Code is received again, directories A and C will become the active directories.

   Alarms cannot to assigned to Directory B or Directory D when this mode of operation is selected.

The directory structure is made up of a list of lines with each line containing a sequence of instructions. The B1290 performs the actions defined in each line then waits for a response. If the expected response is not received, the actions in the next line are carried out

Commands are placed into the directory line-by- line with a series of digits representing the required actions.

Commands that can be used in the directory and the digits used to select them are:

[#][0] Dial + digits

[#][1] Radio

[#][2] Wait + 1-3 digits (seconds)

[#][3] Alert

[#][4] Two Tone Paging + (4 or 5 digits) + *+ (4 or 5 digits)
(frequencies in .1 Hz. ie: 12345 would be 1234.5 Hz)

[#][5] Five Tone Paging + 5 digits (5 digit cap code)

or Five Tone Paging + 1digit + * + 5 digits (preamble+ cap code)

[#][6] Single tone + (4 or 5 digits)
(frequency in .1 Hz. ie: 12345 would be 1234.5 Hz)

[#][7] DTMF + 1-16 digits

 Voice

 Answer

When Program Code 2 is selected the B1290 responds with the prompt:

B1290: Enter Directory

YOU:  *Directory A*

 *Directory B*

 *Directory C*

 *Directory D*

 *Help (speaks a summary of commands)*

 *Quit*

If one of the directories is selected a typical response would be:

B1290: Directory A, Line One is DIAL 2559544 WAIT 3 SEC VOICE

This is the command sequence in the first line of the directory and would result in the B1290 dialing the number 2559544, waiting for 3 seconds and then speaking the voice messages. At this time the following options are available:

 Change this line

 Delete this line

 Insert a new line before the current line

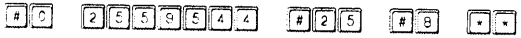
 Quit

 Next

YOU:  *Change this line*

B1290: 'beep'

To change the line, a complete sequence of commands and values must be entered. For example, if the setting was to be changed so that the wait time was 5 seconds instead of 3, the entry would be:

YOU: 

B1290: Directory A, Line One is DIAL 2559544 WAIT 5 SEC VOICE

Which is the same as [DIAL]2559544 [WAIT]5 [VOICE] for this line in the PC programming software.

For an invalid entry, the B1290 will speak the word "Error" at the end.

YOU:  *Delete this line*

B1290: 'beep' if the next line in the directory is empty
or

B1290: Directory A, Line One is DIAL 2559544 DTMF 1234 VOICE

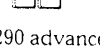
if there is another line in the directory. This was the content of line 2 before the current line was removed. All of the lines move up one line. You can either accept this entry or edit the line.

YOU:  *Insert a new line*

B1290: 'beep'

YOU:  *(new entry)*

B1290: Directory A, Line One is DIAL 2559544 VOICE

YOU:  *Next*

The B1290 advances to the next line in the directory

YOU:  *Quit*

The B1290 returns to the Enter Directory Code prompt.

Limits: Each phone number may contain up to 39 digits.

Default: Directory A has the single command to turn on the radio and speak the voice messages; the other three directories are empty.

If a pause is required when dialing, use the Wait command to insert a delay interval followed by a DTMF command with more digits. This feature is most often used when communicating with devices which require special signaling, such as paging terminals. The #, or pound digit, has no special meaning and is dialed as a pound.

When calling a paging terminal or someone who cannot acknowledge the call from their phone, it may be useful to wait before starting the next telephone call. This allows the called party to get to a phone and call the B1290 to acknowledge it before it calls out again. To do this, put a Wait command with the required delay on the next directory line and then a Dial command on the following line.

To send a group call with 2 Tone Paging, set tone A equal to tone B.

Do not use the Answer command immediately following a Dial command in the directories when Call Progress is enabled. This is the equivalent of two Answer commands and may result in unreliable operation.

Program Code 3 ✱✱: DTMF Codes

The B1290 is capable of decoding, storing, and transmitting all DTMF codes, including codes received from a 4x4 keypad. Enter #✱✱ to clear a DTMF Code.

B1290: Enter DTMF Code

YOU: [*][*][*] *Acknowledge Code*

[2][*][*] *Access Code*

[3][*][*] *Relay On/Off Codes*

[4][*][*] *Alarm On/Off Codes*

[5][*][*] *Remote Alarm Input Codes*

[6][*][*] *Interrogate Code*

[7][*][*] *Directory Control Code*

[*][*] *Exit to Enter Program Code prompt*

1 **: Acknowledge Code

The Acknowledge Code is sent by the called party to indicate that the alarm message has been received. This stops the calling sequence of the B1290.

B1290: Acknowledge Code is ...

YOU: [X][*][*] *(x = 1 to 8 DTMF digits)*

Default: 1234

2 **: Access Code

The Access Code is used as a password to prevent unauthorized callers from altering the programming of the B1290. If an Access Code has been programmed, it must be entered before a telephone caller will receive the *Enter Program Code* prompt. The Access Code is not required for local programming.

B1290: Access Code is ...

YOU: [X][*][*] *(x = 1 to 8 DTMF digits, # = clear)*

Default: empty

3 **: Relay On/Off Input Codes

The relay codes allow users to perform remote control functions at the unattended site. Callers can operate relays on the B1290 by sending DTMF codes from their telephone or radio keypads. Each relay has one code to turn it on and a separate code to turn it off. When a relay is operated, the B1290 speaks a voice message associated with that relay followed by the word "On" or "Off" (see Program Code 1 - Record Relay Voices).

B1290: Relay One On Code is ...

Relay One Off Code is ...

YOU: [X][*][*] *(x = 1 to 8 DTMF digits, # = clear)*

Default: empty

4 **: Alarm On/Off Output Codes

These codes are used to control DTMF-operated devices at the receiving end when an alarm is reported. A typical example would be sending a message to a pager with a digital display. The DTMF On string is sent during the alarm announcement, preceding the voice announcement for that alarm. The DTMF Off string is sent only over the radio port when the alarm returns to normal, and is not accompanied by a voice message. This feature might be used to turn the lamps of an annunciator panel on or off depending on the condition of the alarm. In simple system applications, the alarm On/Off codes of one B1290 might be programmed to be the same as the relay On/Off codes or remote alarm input codes of another B1290.

B1290: Alarm One On code is ...

Alarm One Off code is ...

YOU: [X][*][*] *(x = 1 to 8 DTMF digits, # = clear)*

Default: empty

5 **: Remote Alarm Input Codes

If a remote alarm input code has been programmed, when it is received by the B1290 it will be interpreted exactly the same as an alarm on that input. The most common application is to obtain an alarm report from a remote site via radio. The Alarm LED will show the status for remote alarms.

Do not connect an alarm signal line to an input that has been programmed with a remote alarm input code.

B1290: Alarm One Remote Alarm Code is ...

YOU: [X][*][*] *(x = 1 to 8 DTMF digits, # = clear)*

Default: empty

6 **: Interrogate Code

The Interrogate Code is used to find the current status of the B1290. When it receives the code, the unit reports its site ID, any alarms which are present, the status of any relays which have been programmed to operate and any error status messages. Only the voice messages are repeated; no signaling is sent. As the B1290 always announces its status when it is telephoned, this code is used primarily for querying over radio.

B1290: Interrogate Code is ...

YOU: [X][ ][ ] *(x = 1 to 8 DTMF digits, # = clear)*
Default: 5678

7 **: Directory Control Code

The Directory Control Code is used to call up the B1290 and change the way that the alarms are using the directories. When it receives the code, the directory usage is modified. If the Directory Control Code is used there are restrictions on what directories are available - refer to Program Code 2 Directories for details.

B1290: Directory Control Code is ...

YOU: [X][ ][ ] *(x = 1 to 8 DTMF digits, # = clear)*
Default: 5678

Program Code 4 **: Timer Configuration

When you enter Program Code 4, the B1290 will automatically cycle through the following parameters. After the last one, "Times A", it will go back to the *Enter Program Code* prompt.

Rings Before Answering

When the B1290 is dialed, this parameter sets the number of times it will let the telephone ring before it answers.

B1290: Answer rings is ...

YOU: [0][ ][ ] *no answer*

[X][ ][ ] *number of rings (x = 1 to 8)*

[#][ ][ ] *answer and automatically acknowledge after 8 rings*

Default: 4 (answer after 4 rings)

If the B1290 is on its own telephone line, it will normally be programmed to answer right away, after one or two rings. However, if the line is shared with other users, it should be programmed to answer after 6 to 8 rings, giving people lots of time to pick up the phone before the B1290 automatically answers.

The # is used when the called parties have dial pulse phones. They cannot acknowledge receipt of an alarm using a code. Instead the B1290 recognizes 8 rings on the telephone line as an Acknowledge Code. In the directory, a Wait command with the required delay, is placed on the line following the Dial command. This gives the called party time to hang up the phone, call the B1290 back and let the phone ring 8 times to acknowledge receipt of the alarm (refer to Program Code 2 - Phone Directory).

Interval Timer A

If an alarm is not acknowledged after one pass through the directory, this timer determines how often the B1290 will repeat the reporting sequence.

B1290: Timer A is 2 minutes

YOU: [X][ ][ ] *minutes (x = 1 to 249)*

Default: 2 minutes

Interval Timer B

After the Timer A cycle has completed, this timer determines how often the B1290 goes through its alarm reporting sequence.

B1290: Timer B is 10 minutes

YOU: [0][ ][ ] *automatically acknowledge after Interval A*

[X][ ][ ] *minutes (x = 1 to 249)*

0 would be selected if the alarms were announced over a public address system, for example, where there is no way for the alarms to be acknowledged.

Default: 10 minutes

Cycles Through Timer A (Times A)

This number determines how many times the B1290 will cycle through its alarm reporting sequence at A intervals before switching to B intervals. With its default settings, the B1290 will try 3 times at 2 minute intervals, then switch to reporting at 10 minute intervals. The switch to the B interval is primarily to conserve air time on busy radio systems.

B1290: Times A is ...

YOU [X][ ][ ] *times (x = 0 to 8)*

Default: 3

Program Code 5 **: I/O Configuration

After you enter Program Code 5, the B1290 prompt for the Configuration Code. If you wish to go back to the *Enter Program Code* prompt without going through all of the codes, enter **.

B1290: Enter Configuration Code

YOU: [1][ ][ ] *Alarm Input Setup*

[2][ ][ ] *Using Directory*

[3][ ][ ] *Relay Setup*

[ ][ ] *Exit to Enter Program Code prompt*

1 **: Alarm Input Setup

Alarm Format

This parameter changes the format of the B1290 alarm inputs to match the output of your monitoring devices in the field. Normally open inputs indicate an alarm when the input is grounded, and when the ground signal is removed, the alarm is interpreted as having cleared. Normally closed inputs are grounded in their normal state, and open when an alarm occurs. Latched inputs recognize a pulse as an alarm. After the pulse has disappeared, the input is deemed to be in the alarm condition until it is acknowledged.

Note: A latched alarm should provide a short, predictable pulse to the input of the ProTalk Plus; otherwise, it may have to be acknowledged twice. If the alarm is acknowledged while the input is active, the alarm will not be cleared and new alarms will not activate that input.

B1290: Alarm Format is ...

YOU: [0][ ][ ] *Normally Open*

[1][ ][ ] *Normally Closed*

[2][ ][ ] *Normally Open, Latched*

[3][ ][ ] *Normally Closed, Latched*

[ ][ ] *Next*

Default: 0 (normally open)

Alarm Timer (Debounce) Timescale

The debounce timers on the alarm inputs can operate with a resolution of .1 seconds or .1 minutes. When the B1290 speaks 'seconds' for this value it is indicating that the timer is counting in .1 second steps and when it speaks 'minutes' it is counting in .1 minute steps.

B1290: Alarm Timer is seconds

YOU: [0][ ][ ] *Seconds*

[1][ ][ ] *Minutes*

[ ][ ] *Next*

Default: 0 (seconds)

Alarm Delay (Debounce)

This parameter controls the amount of time an alarm must be present before it actually registers as an alarm. This feature is often used to eliminate fleeting alarms, where the device in the field does not present a clean closure to indicate an alarm, but a series of bounces on the contacts. Another example might be to overcome momentary power fluctuations which cause false alarms to be reported. The debounce on each alarm may be individually set.

B1290: Alarm One Delay is _ _ point _ seconds

YOU: [X][ ][ ] *(x = 0.1 to 19.9)*

The value must be entered in tenths of a second, from 1 to 3 digits. The last digit entered is interpreted as the least significant, i.e. tenths of a second.

Default: 0.5 seconds

2 **: Using Directory

B1290: Alarm One is Directory A

YOU: [0][ ][ ] *Off*

[ ][ ][ ] *Directory A*

[2][ ][ ] *Directory B*

[3][ ][ ] *Directory C*

[4][ ][ ] *Directory D*

[ ][ ] *Next*

Default: 1 (Directory A)

The selected directory will determine which sequences of actions is performed when this alarm is active. Each alarm can use any directory. If the Directory Control Code is used there are restrictions on what directories should be used - refer to Program Code 2 Directories for details.

3 **: Relay Setup

Relay Timer Timescale

The interval timers on the relay outputs can operate with a resolution of 1 second or 1 minute. When the B1290 speaks 'seconds' for this value it is indicating that the timer is counting in 1 second steps and when it speaks 'minutes' it is counting in 1 minute steps.

B1290: Relay Timer is seconds

YOU: [0][ ][ ] *Seconds*

 *Minutes*

 *Next*

Default: 0 (seconds)

Relay On Time

The B1290 has four relays that are turned On with the relay On codes and turned Off with the relay Off codes. The relay timer may be used to turn On a relay for a specified duration and then turn it Off automatically. The timer controls the period of time the relay is On. The interval is programmable from 1 to 199 seconds or from 1 to 199 minutes depending on the setting of the relay timescale. The timers for each relay are programmed separately and operate independently.

Setting the time to zero makes the relay an On/Off type. Setting the timer with the # digit makes the relay operate as a 'special function' output. This function is only available on the main ProTalk Plus unit and not on the expanders. The special functions are:

Relay 1	Unacknowledged Alarm Present
Relay 2	Any Alarm Present
Relay 3	Alarm Acknowledge Received - pulsed when the unit is acknowledged.
Relay 4	Error

B1290: Relay One On Timer is _ _ seconds

YOU:  *Not timed, uses the Relay Off Code*

 *(x = 1 to 199)*

 *(Special function)*

Default: 0 (On until turned Off)

Program Code 6 **: System Settings

When you enter Program Code 6, the B1290 will automatically cycle through the following parameters as you hit Enter (**). When it has completed the whole list, it will return to the *Enter Program Code* prompt.

Dial Format

This parameter determines the method of dialing telephone numbers. Tone format dials using DTMF tones (Touch-Tone). Pulse format dials using pulses as a rotary phone would.

B1290: Dial Format is ...

YOU:  *Tone dialing*

 *Pulse dialing*

 *Next*

Default: 0 (tone dialing)

Squelch Polarity

This setting changes the polarity of the signal used to indicate a busy radio channel.

B1290: Squelch is ...

YOU:  *Busy when the input is low*

 *Busy when the input is high*

 *Next*

Default: 0 (transmit on high)

Relay Voices

This setting enables or disables the B1290's spoken response to a relay operation. If the B1290 is used in a control situation where monitoring the relay operation is not required, the B1290 would be programmed with the relay voices muted. The B1290 relay voices should be enabled where verification of a relay operation is required.

B1290: Relay is ...

YOU:  *Relay voices are not used*

 *Relay voices are used*

 *Next*

Default: 1 (voices on)

Acknowledge Request

This setting enables or disables the B1290's voice prompt *Enter Acknowledge Code.* If the alarm announcement is over a public address system, for example, acknowledgment is not possible. The B1290 would be programmed for automatic acknowledge (see Interval Timer B, Program Code 4) and the request for an Acknowledge Code would be disabled.

The B1290 will continue transmitting its alarms until it receives some form of acknowledgment, automatic or otherwise, even if it does not request one.

B1290: Acknowledge Voice is ...

YOU:  *Acknowledge request is not used*

 *Acknowledge request is used*

 *Next*

Default: 1 (enabled)

Call Progress (Dial Tone Enable)

This setting enables or disables the feature where the B1290 monitors the audio activity on the phone line when it places a call. If enabled, Call Progress will cause the B1290 to look for dial tone before dialing, watch for a busy signal on the called line and then wait until the called party speaks before the alarm announcement begins. Without Call Progress enabled, the B1290 will perform the dial-out operation and speak regardless of the signals encountered on the phone line.

Do not use the Answer command immediately following a Dial command in the directories when Call Progress is enabled. This is the equivalent of two Answer commands and may result in unreliable operation.

B1290: Dial Tone is ...

YOU:  *Call Progress is not used*

 *Call Progress is used*

 *Next*

Default: 1 (enabled)

Program Code 7 **: Expanders

When Program Code 7 is entered, the B1290 gives you the following parameters.

Number of Expanders

Increase the capacity of a basic B1290 by adding up to 7 expanders, each with an additional 8 alarm inputs and 4 relay outputs.

B1290: Expander Number is . . .

YOU:  *Expanders (x = 0 to 7)*

 *Next*

Default: 0

Site Voice Enable

This setting enables or disables the announcement of a site ID from the expander unit. If the expander is being used to increase the number of alarms to be reported from a single site, you probably don't need to announce the site ID again. However, the site ID might be useful to differentiate between alarms from different areas or pieces of equipment.

B1290: Expander Site is . . .

YOU:  *Site voice is not used*

 *Site voice is used*

 *Next*

Default: 0 (expander site ID disabled)

To program the parameters within the expander, the PGM port on the B1290 is used. Programming is done exactly as though the main unit itself was being programmed, except that the expander number precedes the program code. Refer to Example 10 - Adding an Expander for a specific description of this procedure.

Program Code 8 **: Reset Database

This code is used to reset all of the programmed parameters (excluding voices) to their default values.

B1290: Enter Empty Code

YOU:  *Clear Database*

 *Next*

Any other entry will leave the database unchanged.

Program Code 9 **: Audio Levels

This code is used to adjust audio levels for specific signals. For receive levels the setting should correspond to the level of the signal that is coming from the attached equipment. Receive levels can be in the range between -20 dBm and 0 dBm. For transmit levels the setting determines the amplitude of the signal that will be produced at the output of the B1290. Transmit levels can be set in the range between -20 dBm and 0 dBm. The negative sign is automatically applied to any non-zero value.
The settings for the audio levels are presented in the following order for modification

B1290: Radio Code One is . . .(Radio Transmit Tone Level)

YOU: [X][X][-][-] *Level setting (x = 20 to 0)*

[-][-] *Next*

Default: 0

B1290: Radio Code Two is . . .(Radio Transmit DTMF Level)

YOU: [X][X][-][-] *Level setting (x = 20 to 0)*

[-][-] *Next*

Default: 0

B1290: Radio Code Three is . . .(Radio Transmit Voice Level)

YOU: [X][X][-][-] *Level setting (x = 20 to 0)*

[-][-] *Next*

Default: 0

B1290: Radio Code Four is . . .(Radio Receive Level)

YOU: [X][X][-][-] *Level setting (x = 20 to 0)*

[-][-] *Next*

Default: 0

B1290: Telephone Code Five is . . .(Telephone Receive Level)

YOU: [X][X][-][-] *Level setting (x = 20 to 0)*

[-][-] *Next*

Default: 0

Programming Reference

The ProTalk Plus is capable of performing many functions other than those set by its default values. If you require these extended capabilities, they are accessed through the program codes. If the default operation of the unit as described in the **Getting Started** chapter of this manual is sufficient, then you may ignore this section.

This chapter organizes the programming parameters by their functions. See the chapter on **Program Codes** for more detail on the use and meaning of the referenced parameters.

1. Alarm Announcement

This section identifies all of the parameters that determine WHAT is sent when an alarm occurs. By programming these parameters, you may send voice, signaling, and paging tones.

Directory Used (Program Code 5.2)

Directories (Program Code 2)

Record Alarm Voices (Program Code 1.1)

Alarm On/Off Output Codes (Program Code 3.4)

Acknowledge Request (Program Code 6)

Speak Messages (Program Code 2)

2. Alarm Operation

This section identifies all of the parameters that determine WHEN an alarm will be announced. By programming these parameters, you control when an alarm is recognized and announced by the ProTalk Plus.

Alarm Format (Program Code 5.1)

Alarm Delay Timebase (Program Code 5.1)

Alarm Debounce (Program Code 5.1)

Interval Timer A (Program Code 4)

Interval Timer B (Program Code 4)

Cycles Through Timer A (Program Code 4)

3. Operation Codes

These parameters control how the unit operates. When one of these codes is received, the B1290 performs the required function.

Acknowledge Code (Program Code 3.1)

Access Code (Program Code 3.2)

Interrogate Code (Program Code 3.6)

Remote Alarm Input Code (Program Code 3.5)

Directory Control Code (Program Code 3.7)

4. Relay Control

The parameters required to control a relay are listed here. You may use any number of relays, but the ON/OFF input codes, voice message and relay ON time must be programmed for each relay used. The relay voice code enables or disables the voice confirmation for all relays.

Relay ON/OFF Control Codes (Program Code 3.3)

Record Relay Voices (Program Code 1.2)

Relay Timer Timebase (Program Code 5.3)

Relay On Time (Program Code 5.3)

Relay Voice (Program Code 6)

Relay Special Functions (Program Code 5.3)

5. Telephone Specific Parameters

This section describes the parameters used when the unit is required to transmit alarms or signaling over the telephone system.

Using Directory (Program Code 5.2)

Directory Telephone Numbers (Program Code 2)

Access Code (Program Code 3.2)

Rings Before Answering (Program Code 4)

Dial Format (Program Code 6)

6. Radio Specific Parameters

These parameters control the operation of the unit when it is connected to a two-way radio. Refer to the installation section in Getting Started for the required connections to the radio.

Using Directory (Program Code 5.2)

Directory Radio Command (Program Code 2)

Squelch Polarity (Program Code 6)

Radio Warmup (Program Code 2)

7. Expander Attachment

When an expander is added to the system, these parameters must be set. They configure the main B1290 unit to accept the expander. The parameters within the expander must also be programmed. Refer to the Advanced Programming Examples for an example of how this is done.

Number of Expanders (Program Code 7)

Site Voice Enable (Program Code 7)

8. Audio Levels

Audio Levels (Program Code 9)

Programming Examples

Example 1: Reporting Alarms over Radio and Telephone

In this example, assume that your company has a mobile radio system which is monitored by field personnel. Radio operators have DTMF pads on their mics so they can acknowledge an alarm from the B1290. They would like to have the alarm reported over the radio system three times with a 2 minute interval between transmissions, then dialed out over the telephone if it is not acknowledged. If the alarm is not acknowledged, the B1290 should try again in ten minutes. After six tries at ten minute intervals, the B1290 should switch to trying once an hour. The COS on the radio used with the B1290 gives a high signal when the channel is busy.

B1290: Enter Program Code

YOU:  *Directory Code*

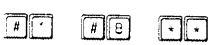
B1290: Enter Directory

YOU:  *Directory A*

B1290: Directory A, Line One is...

YOU:  *Change*

B1290: 'beep'

YOU:  *[RADIO] [VOICE]*

B1290: Directory A, Line One is RADIO VOICE

YOU:  *Next*

B1290: Directory A, Line Two is...

YOU:  *Change*

B1290: 'beep'

YOU:  *[WAIT]120 (seconds)*

B1290: Directory A, Line Two is WAIT 120

YOU:  *Next*

B1290: Directory A, Line Three is...

YOU:  *Change*

B1290: 'beep'

YOU:  *[RADIO] [VOICE]*

B1290: Directory A, Line Three is RADIO VOICE

YOU:  *Next*

B1290: Directory A, Line Four is...

YOU:  *Change*

B1290: 'beep'

YOU:  *[WAIT]120 (seconds)*

B1290: Directory A, Line Four is WAIT 120

YOU:  *Next*

B1290: Directory A, Line Five is...

YOU:  *Change*

B1290: 'beep'

YOU:  *[RADIO] [VOICE]*

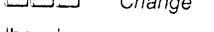
B1290: Directory A, Line Five is RADIO VOICE

YOU:  *Next*

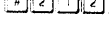
B1290: Directory A, Line Six is...

YOU:  *Change*

B1290: 'beep'

YOU:  *[WAIT]120 (seconds)*

B1290: Directory A, Line Six is WAIT 120

YOU:  *Next*

B1290: Directory A, Line Seven is...

YOU:  *Change*

B1290: 'beep'

YOU: 

[DIAL]2559544 [VOICE]

B1290: Directory A, Line Seven is DIAL 2559544 VOICE

YOU:  *Next*

B1290: Directory A, Line Eight is...

YOU:  *Quit*

B1290: Enter Directory

YOU: [#][*][*] *Quit*

B1290: Enter Program Code

YOU: [4][*][*] *Configuration*

B1290: Answer Rings is 4

YOU: [*][*] *Next*

B1290: Timer A is 2 minutes

YOU: [1][0][*][*] *Enter 10 minutes*

B1290: Timer A is 10 minutes

YOU: [*][*] *Next*

B1290: Timer B is 10 minutes

YOU: [6][0][*][*] *Enter 60 minutes*

B1290: Timer B is 60 minutes

YOU: [*][*] *Next*

B1290: Times A is 3

YOU: [6][*][*] *Enter 6 times*

B1290: Times A is 6

YOU: [*][*] *Next*

B1290: Enter Program Code

YOU: [2][*][*] *Select System Settings*

B1290: Dial Format is 1

YOU: [*][*] *Next*

B1290: Squelch is 0

YOU: [1][*][*] *Enter busy when high*

B1290: Squelch is 1

YOU: [*][*] *Next*

B1290: Relay Voice is On

At this point you are finished programming and may hang up the telephone. The directory is programmed with the voice message repeated three times on the radio and then once on the phone line. Another method of programming the radio announcement would be to have an alert tone

followed by the message repeated twice. In this case the entry for each of the radio related commands would be:

B1290: Directory A, Line One is...

YOU: [#][1] [#][3] [#][8] [#][9] [*][*]

[RADIO][ALERT] [VOICE][VOICE]

B1290: Directory A, Line One is RADIO ALERT VOICE VOICE

Over the telephone, the message will be repeated only once.

If this programming is used, when the B1290 registers an alarm, the reporting cycle will be as follows:

Over radio:
Alert tone
Ajax Compressor Station; Power Failure
Ajax Compressor Station; Power Failure
Enter Acknowledge Code
pause for 2 minutes

Alert tone
Ajax Compressor Station; Power Failure
Ajax Compressor Station; Power Failure
Enter Acknowledge Code
pause for 2 minutes

Alert tone
Ajax Compressor Station; Power Failure
Ajax Compressor Station; Power Failure
Enter Acknowledge Code
pause for 2 minutes

Over telephone: dial 2559544
Ajax Compressor Station; Power Failure
Enter Acknowledge Code
pause for 5 seconds -waiting for acknowledge code
Ajax Compressor Station; Power Failure
Enter Acknowledge Code
pause for 5 seconds -waiting for acknowledge code

This sequence repeats for 60 seconds.

If the Acknowledge Code is not received over the telephone, the B1290 will wait ten minutes and try the complete sequence again, starting with the radio cycle. If no Acknowledge Code is received after six tries at ten minute intervals, the B1290 will switch to reporting every hour until the alarm is acknowledged.

Example 2: Dialing from Two Different Telephone Directories

In this example, the B1290 is programmed to telephone whoever is on call if there is an alarm. The company has two groups of employees which take turns being on call alternate weeks. Instead of reprogramming the B1290 directory every week, two directories are programmed. When the Directory Control Code is received, the B1290 is directed to dial from the other directory. The directory may be switched with the Directory Control Code over the telephone, local programming phone, or two-way radio. There are specific rules governing how the alarms can be assigned to directories if the Directory Change Code is used. Refer to Program Code 2 Directories for more information concerning these rules. This example starts by setting the telephone numbers in the two directories.

B1290: Enter Program Code

YOU: 2 * * *Directory Code*

B1290: Enter Directory

YOU: 1 * * *Directory A*

B1290: Directory A, Line One is...

YOU: 2 * * *Change*

B1290: 'beep'

YOU: # 0 2 5 5 9 5 4 4 # 6 * *

[DIAL]2559544 [VOICE]

B1290: Directory A, Line One is DIAL 2559544 VOICE

YOU: * * *Next*

B1290: Directory A, Line Two is...

YOU: # 0 2 5 5 9 5 9 8 # 6 * *

[DIAL]2559598 [VOICE]

B1290: Directory A, Line Two is DIAL 2559598 VOICE

YOU: * * *Next*

B1290: Directory A, Line Three is...

YOU: # * * *Quit*

B1290: Enter Directory

YOU: 2 * * *Select Directory B*

B1290: Directory B, Line One is...

YOU: 2 * * *Change*

B1290: 'beep'

YOU: # 0 7 6 6 4 4 2 2 # 6 * *

[DIAL]7664422 [VOICE]

B1290: Directory B, Line One is DIAL VOICE

YOU: * * *Next*

B1290: Directory B, Line Two is...

YOU: # 0 7 6 6 8 9 0 1 # 6 * *

[DIAL]7668901 [VOICE]

B1290: Directory B, Line Two is DIAL 7668901 VOICE

YOU: * * *Next*

B1290: Directory B, Line Three is...

YOU: # * * *Quit*

B1290: Enter Directory

YOU: # * * *Quit*

The telephone numbers have now been programmed. Now enter the Directory Control Code

B1290: Enter Program Code

YOU: 3 * * *DTMF Codes*

B1290: Enter DTMF Code

YOU: 7 * * *Directory Control Code*

B1290: Directory Control Code is...

YOU: 7 8 * * *Enter Control Code*

B1290: Directory Control Code is 78

YOU: * * *Next*

B1290: Enter Program Code

Right now the B1290 is programmed with dialing commands in Directory A and Directory B. Any alarms that are to be switched between these two directories should be programmed to use Directory A or the control code will have no effect. Each alarm has its own setting for the directory it is using. Make sure that the alarms you want to have changed are set properly.

YOU: 5 * * *Select Configuration*

B1290: Enter Configuration Code

YOU: 2 * * *Select Using Directory*

B1290: Alarm One is Directory is...

YOU: 1 * * *Select Directory A*

B1290: Alarm One is Directory is A

YOU: * * *Next*

Repeat this for all of the alarms

When you wish to dial from the B directory, call up the B1290 and follow these steps:

B1290: Enter Control Code

YOU: 7 8 *Directory Control Code*

B1290: Telephone Format is Directory B

And to change it back:

B1290: Enter Control Code

YOU: 7 8 *Directory Control Code*

B1290: Telephone Format is Directory A

Example 3: Different Alarms Dialing Different Telephone Numbers

A B1290 is used in an application where there are two different types of related alarms. Some are building alarms, such as intrusion alarms, building temperature, power failure, etc. Others are alarms relating to specific equipment failures, such as compressor failure, high tank level or sump overflow. It is desirable to have the maintenance personnel alerted if there is a building alarm, but if there is a problem with the equipment, it would be preferable to alert the operations technicians.

In this example, alarms 1 and 2 are connected to intrusion alarm and building high temperature respectively. These are building alarms, and are to dial the building maintenance people at 255-9544 and then 255-9598. Compressor failure and high tank level are fed to alarms 3 and 4. Since these are equipment problems, operations technicians at 766-4422 and then 766-8901 are to be alerted. Follow the previous example to enter the telephone numbers in Directory A and Directory B then set the alarms to use these two directories

B1290: Enter Program Code

YOU: 5 * * *Select I/O Configuration*

B1290: Enter Configuration Code

YOU: 2 * * *Select Using Directory*

B1290: Alarm One is Directory...

YOU: 1 * * *Select Directory A*

B1290: Alarm One is Directory A

YOU: * * *Next*

B1290: Alarm Two is Directory...

YOU: 1 * * *Select Directory A*

B1290: Alarm Two is Directory A

YOU: * * *Next*

B1290: Alarm Three is Directory A

YOU: 2 * * *Select Directory B*

B1290: Alarm Three is Directory B

B1290: Alarm Four is Directory A

YOU: 2 * * *Select Directory B*

B1290: Alarm Four is Directory B

YOU: # * * *Quit*

The B1290 is now programmed to dial Directory A when alarms 1 or 2 occur, and Directory B when alarms 3 or 4 occur.

Example 4: Actuating Relays

In this example, when you receive the alarm "High Pressure" from the B1290, you would like to be able to operate a bypass valve for up to ten minutes. The valve can be controlled by one of the relays on the B1290 using Relay On and Relay Off codes.

B1290: Enter Program Code

YOU: 1 * * *Select Voices*

B1290: Enter Voice Code

YOU: 2 * * *Select Relay Voices*

B1290: Relay One is...

YOU: 2 * * *Change*

B1290: beep-beep

YOU: *Bypass Valve*

B1290: Relay One is Bypass Valve

YOU: [ ][ ] *Next*

B1290: Relay Two is...

YOU: [#][ ][ ] *Quit*

B1290: Enter Voice Code

YOU: [#][ ][ ] *Quit*

B1290: Enter Program Code

YOU: [3][ ][ ] *Select DTMF Codes*

B1290: Enter DTMF Code

YOU: [3][ ][ ] *Select Relay On and Off Codes*

B1290: Relay One On Code is empty

YOU: [5][5][5][ ] *(pause)* [ ][ ] *Enter On code*

B1290: Relay One On Code is 555*

YOU: [ ][ ] *Next*

B1290: Relay One Off Code is empty

YOU: [5][5][5][#] [ ][ ] *Enter Off code*

B1290: Relay One Off code is 555#

YOU: [ ][ ] *Next*

B1290: Relay Two On Code is empty

YOU: [ ][ ] *Next*

B1290: Relay Two Off Code is empty

And so on until all of the Relay Codes are done...

B1290: Enter DTMF Code

YOU: [ ][ ] *Next*

B1290: Enter Program Code

YOU: [5][ ][ ] *I/O Configuration*

B1290: Enter Configuration Code

YOU: [3][ ][ ] *Next*

B1290: Relay Timer is seconds

YOU: [ ][ ][ ] *Select minutes for the timebase*

B1290: Relay Timer is minutes

YOU: [ ][ ] *Next*

B1290: Relay One On Timer is 00 minutes

YOU: [ ][0][ ][ ] *Select 10 minutes for the time*

B1290: Relay One On is 10 minutes

YOU: [ ][ ] *Next*

B1290: Relay Two On timer is 00 minutes

At this time you are finished programming and can hang up the phone. When the B1290 calls you with an alarm, the sequence will be as follows:

B1290: Ajax Compressor Station; High Pressure.
Enter Acknowledge Code

YOU: [5][5][5][ ] *Send the Relay On Code*

Ajax Compressor Station;
Bypass Valve On (and Alarm - Enter Acknowledge Code).

YOU: [ ][2][3][4] *Send the Acknowledge Code*

B1290: Ajax Compressor Station;
Alarms Acknowledged

Example 5: Operating a Radio Pager

In this example, when an alarm is received you want to contact the person on call, who is carrying a two-tone radio pager which operates on the company's private radio system. If the person does not call back to acknowledge the alarm, you want the B1290 to start dialing telephone numbers.

B1290: Enter Program Code

YOU: [2][ ][ ] *Directory Code*

B1290: Enter Directory

YOU: [ ][ ][ ] *Directory A*

B1290: Directory A, Line One is...

YOU: [2][ ][ ] *Change*

B1290: 'beep'

YOU: 

[RADIO][2TONE]855.5/1433.4 [VOICE]

B1290: Directory A, Line One is RADIO 2 TONE 855.5 Hz 1433.4 Hz VOICE

YOU:  *Next*

B1290: Directory A, Line Two is...

YOU:  *Change*

B1290: 'beep'

YOU: 

B1290: Directory A, Line Two is DIAL 2559544 VOICE

YOU:  *Next*

B1290: Directory A, Line Three...

You are finished programming and may hang up the phone.

Example 6: Dialing a Paging Terminal

In this example, rather than using a private radio system, the company's employees utilize a city-wide paging service. Normally when you dial the paging terminal, you are prompted to enter your own telephone number. Your number is then displayed on the digital read-out of the pager, so the paged party knows what number to call back. We are going to program the B1290 to call this paging terminal when it reports an alarm.

B1290: Enter Program Code

YOU:  *Directories*

B1290: Enter Directory

YOU:  *Directory A*

B1290: Directory A, Line One is...

YOU: 

[DIAL]2559544 [WAIT]4 [DTMF]734

B1290: Directory A Line One is DIAL 2559544 WAIT 4 seconds DTMF 734

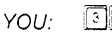
YOU:  *Next*

You are finished programming and may hang up the phone.

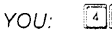
When an alarm occurs, the B1290 will dial the number of the paging terminal, 255-9544; wait for the terminal to answer, wait 4 seconds while the terminal is prompting, then send the DTMF string 734 which represents the calling site. Any alarm will result in the paging message 734.

If you want to distinguish between one alarm and another, use the Alarm On Codes that can be assigned to each input.

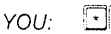
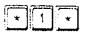
B1290: Enter Program Code

YOU:  *DTMF Codes*

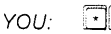
B1290: Enter DTMF Code

YOU:  *Select Alarm On/Off Codes*

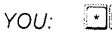
B1290: Alarm One On Code is...

YOU:  *(pause)*  *Code for alarm 1*

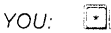
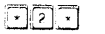
B1290: Alarm One On Code is ✱1✱

YOU:  *Next*

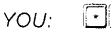
B1290: Alarm One Off Code is...

YOU:  *Next*

B1290: Alarm Two On Code is...

YOU:  *(pause)*  *Code for alarm 2*

B1290: Alarm Two On Code is ✱2✱

YOU:  *Next*

With this Alarm ON code programmed, the DTMF string ✱1✱ will be sent immediately preceding the alarm one message when alarm one is active. The message displayed on the pager will be: 734✱1✱

The string ✱2✱ will be sent with alarm two.

In this example, the same result could have been achieved by sending 734 as part of the alarm ON DTMF code. The 734 is included as part of the telephone number and is sent with every alarm. It appears much like a site identifier.

This example also assumes that the pager could be dialed directly. Sometimes a separate number for the pager must be dialed after the number for the paging terminal. In that case, you might need to insert another delay, and there might not be room to include the site identifier as part of the telephone number.

Another way the B1290 could be programmed to dial a paging terminal would be to make the alarm On DTMF code the same as the telephone num-

ber of the B1290. The telephone number would then be displayed on the pager, and the called party would receive the alarm message when he called the B1290 back. The B1290 would have to be programmed to wait some time for an acknowledgment before it continued dialing.

Example 7: Announcing Alarms over a Public Address System

In this example, the B1290 is used to announce alarms from an unattended location over a building's public address system. You want the alarms to be announced twice, repeated again one minute later then repeated for the last time one minute after this. To make the process stop after the third repetition, program Timer B to zero. A zero value in Timer B means that the alarm is automatically acknowledged after A Times.

Connect the radio port, TX Audio and PTT, from the B1290 to the PA inputs.

Starting with the timer setup.

B1290: Enter Program Code

YOU: [4][*][*]

B1290: Answer Rings is 4 (No effect on operation)

YOU: [*][*] *Next*

B1290: Timer A is 2 minutes

YOU: [1][*][*] *Change the timer to 1 minute*

B1290: Timer A is 1 minutes

YOU: [*][*] *Next*

B1290: Timer B is 10 minutes

YOU: [0][*][*] *Change the timer to zero*

B1290: Timer B is 0 minutes

YOU: [*][*] *Next*

B1290: Times A is 3

YOU: [2][*][*] *Change the times A to 2*

B1290: Times A is 2

YOU: [*][*] *Next*

The timers are now set, now put the commands into the directory.

B1290: Enter Program Code

YOU: [2][*][*] *Directory Code*

B1290: Enter Directory

YOU: [*][*][*] *Directory A*

B1290: Directory A, Line One is...

YOU: [2][*][*] *Change*

B1290: 'beep'

YOU: [#][1] [#][3] [#][8] [#][6]

[RADIO][ALERT][VOICE][VOICE]

B1290: Directory A, Line One is RADIO ALERT VOICE VOICE

YOU: [*][*] *Next*

B1290: Directory A, Line Two is..

YOU: [#][*][*] *Quit*

B1290: Enter Directory

YOU: [#][*][*] *Quit*

Now remove the acknowledge request prompt.

B1290: Enter Program Code

YOU: [6][*][*]

B1290: Dial Format is Zero

YOU: [*][*] *Next*

B1290: Squelch is 0

YOU: [*][*] *Next*

B1290: Relay voice is On

YOU: [*][*] *Next*

B1290: Acknowledge Voice is On

YOU: [0][*][*]

B1290: Acknowledge Voice is Off

YOU: [*][*] *Next*

B1290: Dial Tone is on

At this point you are finished programming and may hang up.

YOU: [*][*] *Next*

Example 8: Activating an Annunciator Panel

In this system application, a B1290 is used to report alarms from a number of remote locations by turning the lamps of an annunciator panel on and off.

Figure 6 shows a system where two remote sites are transmitting DTMF codes to a central site. The Alarm On code associated with the remote alarms is the same as the Relay On code at the central site. Similarly, the Alarm Off codes at the remote locations are the same as the Relay Off codes at the central site.

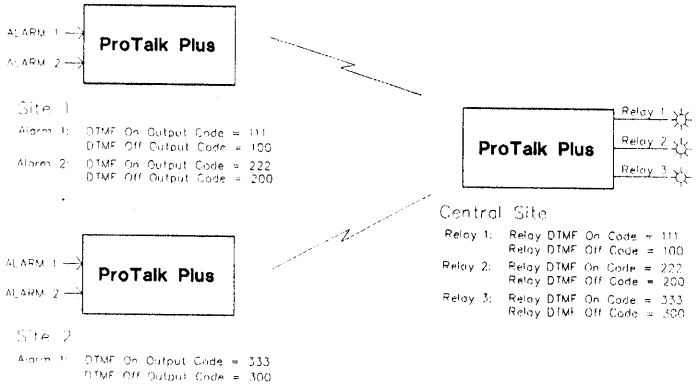


Figure 6 Activating an Annunciator Panel

When a remote alarm occurs, the DTMF code for that alarm is transmitted to the central site. On receiving this code, the central site activates the relay associated with that alarm. When the alarm clears, the Off code is transmitted from the remote, and the cental site's associated relay is released.

Example 9: Concentrating Alarms from Remote Sites

In the following example, a number of remote sites report their alarms over radio to a B1290, which concentrates the alarms and reports them over the telephone.

Figure 7 is an example of two remote sites communicating with a central site to have their alarms announced over the telephone. At the remote site, the B1290s are programmed to operate over radio. They are programmed

with an alarm On output code and an Acknowledge Code. At the central site, the B1290 is programmed to accept remote alarm inputs on alarms 1, 2, and 3, and is connected to a telephone.

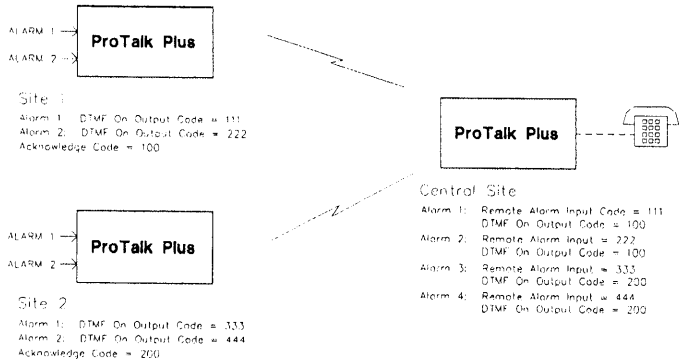


Figure 7 Concentrating Remote Alarms

When one of the remote units is alarmed, it will send its alarm ON output code over the radio. This code will be interpreted as a remote alarm input code at the central unit. This will initiate the B1290 to send its alarm report over radio and telephone. As part of its alarm sequence over radio, the B1290 will send its alarm On output code. This code will be interpreted as an acknowledgment by the remote, and it will stop sending the alarm. The central unit will continue to report over radio and telephone until it is acknowledged.

Example 10: Adding an Expander

In this example, you are adding an expander to a B1290 to increase the number of alarm inputs and relay outputs.

Install and program the main B1290 unit as per the instructions in this manual. Install the expander in a location very close to the B1290. Complete the wiring to all the alarms and relays, then apply power to the expander. Connect the cable supplied with the expander from the auxiliary connector on the B1290 to the SERIAL IN connector on the expander.

The expander is programmed from the B1290. Note that when the Program Code is entered, it is preceded by the number of the expander.

B1290: Enter Program Code

YOU: 7 * * *Expanders*

B1290: Expander Number is 0

YOU: 1 * * *Enter 1 for the number of expanders*

B1290: Expander Number is One

YOU: * * *Next*

B1290: Expander Site Voice is 0 (default is not to announce the expander ID)

YOU: * * *Next*

B1290: Enter Program Code

YOU: 1 * * * *Expander 1, Voices*

B1290: Enter Voice Code

YOU: 1 * * *Record Alarm Voices*

B1290: Expander One Site is...

YOU: * * *Next (Site ID is disabled - don't need a voice message)*

B1290: Expander One, Alarm One is...

YOU: 2 * * *Change this voice*

B1290: beep-beep

YOU: *Intrusion*

B1290: Expander One, Alarm One is Intrusion

YOU: * * *Next*

B1290: Expander One Alarm Two is...

YOU: 2 * * *Change this voice*

B1290: beep-beep

YOU: *High Temperature*

B1290: Expander One, Alarm Two is High Temperature

YOU: * * *Next*

B1290: Expander One, Alarm Three is...

Continue programming in the normal fashion, remembering to enter the number of the expander before the Program Code. Only the voices MUST be programmed; the other parameters have their standard defaults. Not all parameters are accessible in the expander. The following is a list of those which may be programmed:

Voices
Relay On/Off codes
Alarm On/Off codes
Remote alarm input codes
Alarm format
Relay On time
Alarm delay (debounce)
Expander Site ID enable

If you try to change any other parameters, the B1290 will announce *Error*. To solve this problem, define all of the expanders in the system in the B1290 using program code 7 (number of expanders).

To change the Alarm On code for the first alarm on the second expander, you would program the following (the example assumes that the number of expanders has already been set to 2 as shown above):

B1290: Enter Program Code

YOU: 2 3 * * *Expander 2, DTMF Codes*

B1290: Enter DTMF Code

YOU: 4 * * *Alarm On/Off Output codes*

B1290: Expander Two Alarm One On Code is Empty

YOU: 3 6 7 8 * * Enter code 9678

B1290: Expander Two Alarm One On Code is 9678

YOU: * * *Next*

etc.

Troubleshooting

Problem: I've hooked up the B1290 as per the installation instructions but nothing happens.

- Use a voltmeter to check that the power supply is properly connected. If an AC adapter is being used, it should have an output of at least 12 volts DC with a center-negative power connector. If the DC power source is connected to the RADIO terminal block, it should have the positive lead connected to terminal 8 and the negative lead to terminal 7 .

- Do not attach power to both inputs at the same time.

Problem: The B1290 will not program from a local programming phone.

- If you do not hear the voice prompt to begin programming, check that the programming phone is plugged into the PGM jack and not the PHONE jack.

- If you hear the voice prompt to begin programming, but the B1290 does not register your entries, check that you are using a tone phone. Sometimes a pushbutton phone actually sends dial pulses rather than DTMF. You can tell the difference by listening in the earpiece; pulse dialing sounds like clicking, DTMF like tones.

- Check for the TONE LED on the front panel when a digit is being received. Some phones send short bursts of tone rather than continuous tone while the key is depressed. If the B1290 is not detecting DTMF, try another phone.

- Check the setting of the receive level for the phone port. Since it is not possible to do this using the programming phone, it will have to done with the programming software.

- Disconnect the RX input from the radio. Audio received from this input is summed with the audio from the programming phone. If noise is being received, it will affect the decoding of tones and the programming of the voices. The RX input should always be connected to squelched audio.

Problem: The B1290 does not dial out over the telephone line when an alarm occurs.

- Check that the phone line is plugged into the correct jack. The jack labeled PGM is for a local programming phone; the telephone line should be plugged into the PHONE jack.

- Check that the telephone is dialing from the correct directory (Program Code 2). The B1290 has four separate directories: A, B, C and D. Check that the telephone numbers are entered correctly in the selected directory, and that the directory is not empty.

- Check that an alarm is actually present, as indicated by the LEDs on the front panel. In its default condition, the B1290 expects to see a closure to ground at the alarm input. If your alarm inputs are normally closed contacts which open on an alarm condition, this parameter may be adjusted using Program Code 5. The debounce can also be set in this section. This parameter may be set to delay reporting an alarm until it has been present for a certain number of seconds, in which case it will not recognize a momentary closure.

Problem: The B1290 waits a long time before announcing the alarm over the radio.

- The B1290 will wait for one minute when the COS input is busy and then transmit anyway. This is done to ensure that an open squelch on the radio does not disable the reporting operation. Check the Squelch Polarity setting to make sure that it matches the operation of the radio's COS output. If the COS input to the B1290 is left open the Squelch Polarity should be set to 0 using Program Code 6.

- Check the alarm delay (debounce) parameter using Program Code 5. If a delay has been programmed, the B1290 will wait until the alarm has been present for that interval before reporting it.

- Check the directory programming to make sure that there is not an unwanted Wait command present.

Problem: The B1290 continues dialing even after the alarms have been acknowledged.

- The most common cause of this problem is fleeting alarms. They occur when the device reporting an alarm to the B1290 gives a series of pulses on the contacts instead of a clean closure. If the problem cannot be corrected in the field wiring, one option is to "debounce" the alarms using the B1290 alarm delay parameter using Program Code 5. When this value is set, contacts must be closed for a specific period of time before they are recognized as alarms.

- Check if any new alarms are announced when the B1290 continues to dial after it has been acknowledged. Sometimes alarms at a remote site are related, occurring in a chain reaction from a single cause. The B1290 will start dialing when it receives the first alarm, but if another alarm occurs in the meantime, it will keep dialing until all the alarms are acknowledged.

Problem: The B1290 won't answer the phone.

- Check that the phone line is plugged into the PHONE jack and not the PGM jack.

- Check that the phone line is using the inner red/green pair, and not the outer black/yellow pair (normally reserved for line 2).

- Check that the B1290 is configured to answer the phone, using Program Code 4. If the number of rings before answering is set to 0, the B1290 will never answer the phone.

- Answering the telephone will not occur if the B1290 is engaged in any of these activities: speaking on the radio, in local programming mode and when it is using the phone line to call out. Counting of rings only begins once the unit is in its idle state.

- Check that the ringing voltage on the telephone line exceeds 40 VAC at 20 Hz. The RING LED located on the front panel will indicate if proper ringing voltage is being received.

- Check that the telephone line has a standard ringing cadence of two seconds on, four seconds off. If the ringing cadence is greatly different, it may not be detected.

Problem: The B1290 will not acknowledge.

- Check that you are sending the correct digits. The acknowledge code can be changed using Program Code 3.

- If the B1290 is not acknowledging over radio, it may be necessary to adjust the receive level setting for the radio port.

- If the B1290 is not acknowledging over the telephone line, it may be necessary to adjust the receive level setting for the phone port.

- Check that the TONE LED on the front panel of the B1290 lights when a DTMF digit is received.

Problem: The B1290 does not activate its relay when I send the DTMF On code.

- Check that you are sending the right digits. The relay On/Off codes can be changed by using Program Code 3.

- Check the relay On time using Program Code 5. If the setting is 0, the relay will stay On until it is commanded Off. For any other setting, the relay will only operate for the programmed number of seconds.

- If the relays do not operate from codes sent over the radio, it may be necessary to adjust the receive level setting for the radio port.

- If the relays do not operate from codes sent over the telephone, it may be necessary to adjust the receive level setting for the phone port.

- Check that the TONE LED on the front panel of the B1290 lights when a digit is received.

Problem: Our operators live in an area which has a dial pulse exchange. How can they acknowledge the B1290 when it calls?

- Even though the operators have rotary phones, they can still send tone codes if they have a DTMF pad, purchased separately, which sits by the phone.

- The B1290 may be programmed to automatically acknowledge after eight rings. Thus if the B1290 calls an operator with a dial pulse phone, the operator can hang up after he hears the message, call the B1290 right back, let the phone ring eight times, and the B1290 will recognize that as an acknowledgment. Set the number of rings before answering to # in the Configuration section (Program Code 4), and put a Wait command in the next directory line to allow time for them to call the B1290 back.

Problem: How can I prevent unauthorized personnel from calling up the B1290 and altering its programming?

- In its default condition, the B1290 does not require any type of password. If you wish to enter one, refer to the Access Code in the DTMF Codes section (Program Code 3). If an Access Code is programmed, anyone calling the B1290 will receive a report of its status, but it will prompt the caller to enter the Access Code before allowing them into the programming mode.

Problem: Can I use the * character as part of my DTMF strings? Won't this be confused with the "Enter" code?

- The # and* characters may be used as a part of any programmable DTMF string. The only time you must be careful is when entering an asterisk (*) as the last digit in a string. Be sure to wait more than one second after entering the last digit before hitting Enter (**); otherwise the last * will be interpreted as part of the Enter code.

Problem: The B1290 has lost its programming.

- As it runs, the B1290 is constantly performing internal self-checks, and on rare occasions it may find that a memory location has been corrupted. If that happens, the B1290 resets all programmed parameters (except the voice messages) to the default values. At the same time, it will announce *Program Code Error* over the radio. As the telephone directories have been lost, the B1290 cannot dial out to report the failure over the phone. The only way you will be able to tell that something has gone wrong is by phoning the B1290; it will announce a *Program Code Error* as soon as it answers the phone. In order to have some local indication that an error has occurred, hook a local speaker into the radio connections.

The most common causes of a memory loss are power spikes which enter the board through the power, ground, telephone line, or radio connections.

Problem: I tried to change the telephone numbers and now the B1290 will not dial out at all.

- Check the programming for Directory A to be sure that the correct command sequence is entered. If a Directory Control Code is being used, make sure that the B1290 has not been changed to a directory that disables the alarm reporting. This would be the case where a directory contains the single Wait command or possibly commands for only the radio port.

Warranty Statement

Barnett Engineering Ltd. warrants that all equipment supplied shall be free from defects in material or workmanship at the time of delivery. Such warranty shall extend from the time of delivery for a period of one year. Buyer must provide written notice to Barnett Engineering Ltd. within this prescribed warranty period of any defect. If the defect is not the result of improper usage, service, maintenance, or installation and equipment has not been otherwise damaged or modified after delivery, Barnett Engineering Ltd. shall either replace or repair the defective part or parts of equipment or replace the equipment or refund the purchase price at Barnett Engineering Ltd.'s option after return of such equipment by buyer to Barnett Engineering Ltd. Shipment to Barnett Engineering Ltd.'s facility shall be borne on account of buyer.

(1)Consequential Damages: Barnett Engineering Ltd. shall not be liable for any incidental or consequential damages incurred as a result of any defect in any equipment sold hereunder and Barnett Engineering Ltd.'s liability is specifically limited to its obligation described herein to repair or replace a defective part or parts covered by this warranty.

(2)Exclusive Warranty: The warranty set forth herein is the only warranty, oral or written, made by Barnett Engineering Ltd. and is in lieu of and replaces all other warranties, expressed or implied, including the warranty of merchantability and the warranty of fitness for particular purpose.

Specifications

Alarm Inputs	8, optically isolated, 2mA to operate, ground closure required.
Control Outputs	4 independent form C outputs controlled by programmable codes or used as special function outputs. Rated: 1 Amp at 30 Volts
Telephone Connection	RJ11; tone or pulse line.
Programming Connection	RJ11; accepts a standard telephone.
Receive Audio	-20 dBm to 0 dBm, 10 k ohm impedance; unbalanced, AC coupled.
Transmit Audio	-20 dBm to 0 dBm, 600 ohm impedance, unbalanced, AC coupled.
Channel Busy (COS)	Ground closure.
PTT	Open collector, 25 V max, 150 mA max.
Acknowledge Input	Ground closure.
Voice Quality	Digitized, toll quality, 32 kbps.
Power	+11.5 VDC to +28 VDC, 100 mA standby current, 10 mA per active relay.
Environment	-40°C to + 60°C, 95% relative humidity, non-condensing.
Physical	6.5" x 8.5" x 2" Plug-in terminals
Approvals	FCC Part 68, FCC Part 15 - Class A, Industry Canada CS-03 Part I Issue 7, CSA C22.2 No 60950-00 / UL 60950, 3rd Edition

Appendix A - Programmable Features

Alarm Messages	Unique Site ID plus individual messages for each input. Message length is variable
Alarm Polarity	Selects NO or NC input format
Alarm Latch	Latches fleeting alarm inputs
Alarm Debounce	Selects the delay time before a change of state on the input is valid. Range is 0.1 to 19.9 in either seconds or minutes
Alarm Directory	Selects one of four directories that contain command actions to be taken when the alarm is active.
Interval Timer	Two stage timer that uses 'A' interval 'A' times before switching to 'B' interval. Both 'A' and 'B' interval are adjustable up to 249 minutes.
Acknowledge Code	Stops the reporting sequence: 1 to 8 digits
Interrogate Code	Speaks alarms and relay state: 1 to 8 digits
Alarm On/Off Output Codes	Sent when an alarm becomes active (on) or when it returns to normal (off). Different codes for each alarm. 1 to 8 digits
Remote Alarm Input Codes	Simulate an alarm condition when received. Different codes for each alarm. 1 to 8 digits
Directory Control Code	Changes the alarms to use different directories; also referred to as shift change. Two modes are available: one where all alarms are assigned to Directory A and can be controlled to alternately use the other three directories and another where Directory A alternates with Directory B and Directory C alternates with Directory D.
Directory Commands	Each directory can have up to 20 lines of command sequences. The commands are executed when an alarm using the directory is active. The commands are: ‣ Dial - phone the programmed number. ‣ Voice - Speak the alarm messages ‣ Radio - turn on the radio transmitter ‣ Wait - Insert a pause: 1 to 249 seconds. ‣ 2 Tone - send a two tone page ‣ 5 Tone - send a five tone page

	▸ 1 Tone - send a single tone ▸ Alert - send a beeping tone ▸ DTMF - send a string of digits ▸ Answer - monitor the call progress signals and wait for the called party to speak before announcing the alarm message.
Access Code	Password for dial-up access to programming:1 to 8 digits
Acknowledge Request	The acknowledge request at the end of the alarm annunciation can be disabled for use with public address systems.
Number of Rings	Sets the number of rings before the B1290 will answer the line: 1 to 8 rings or never.
Squelch Polarity	Sets the radio busy monitor to either high or low when busy.
Relay Voices	Voice messages that are returned when a relay is operated.
Disable Relay Voices	Relay voices are not spoken.
Relay On/Off Codes	DTMF codes that turn the relay on and off. Independent for each relay: 1 to 8 digits
Relay Timer	Makes the relay a timed type where it will remain on for the specified time after the On code is received. Range is 1 to 199 in either seconds or minutes
Relay Special Function	These automatic functions can be assigned to the relays: ▸ Relay 1: New (unacked) alarm on ▸ Relay 2: Any alarm on ▸ Relay 3: Alarm acknowledged (timed) ▸ Relay 4: Error
Pulse Dial	Forces dialing to be pulse instead of tone.
Number of Expanders	Sets the number of connected expanders.
Disable Expander ID	Stops the site ID in the expander from being spoken.
Audio Levels	Sets the gain for audio signals in the B1290

Appendix B - Options

B1256	AC Adapter
B1290E	Expander module. Adds 8 inputs and 4 relays. Maximum of 7 expanders
Option 004	External power pack with 120 VAC power supply, sealed battery and charger. 12 hour capacity in standby. Connection of the Option 004 power supply is shown in Figure 8.

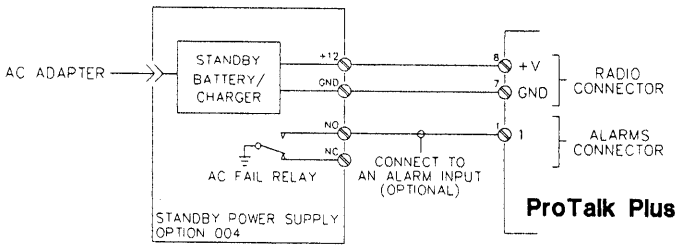
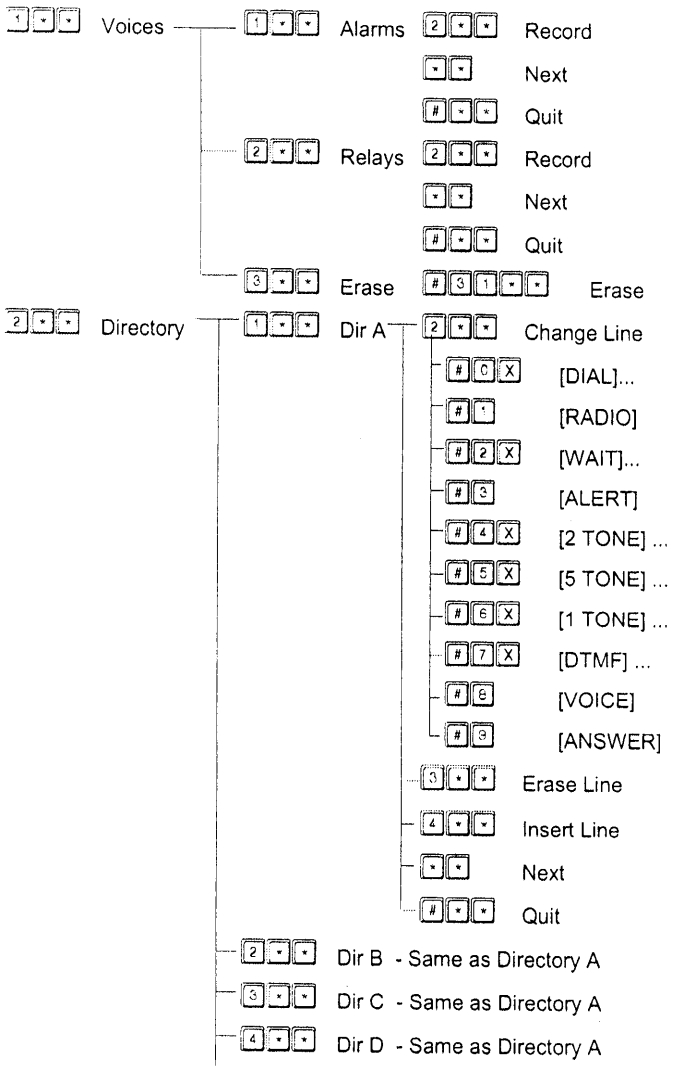
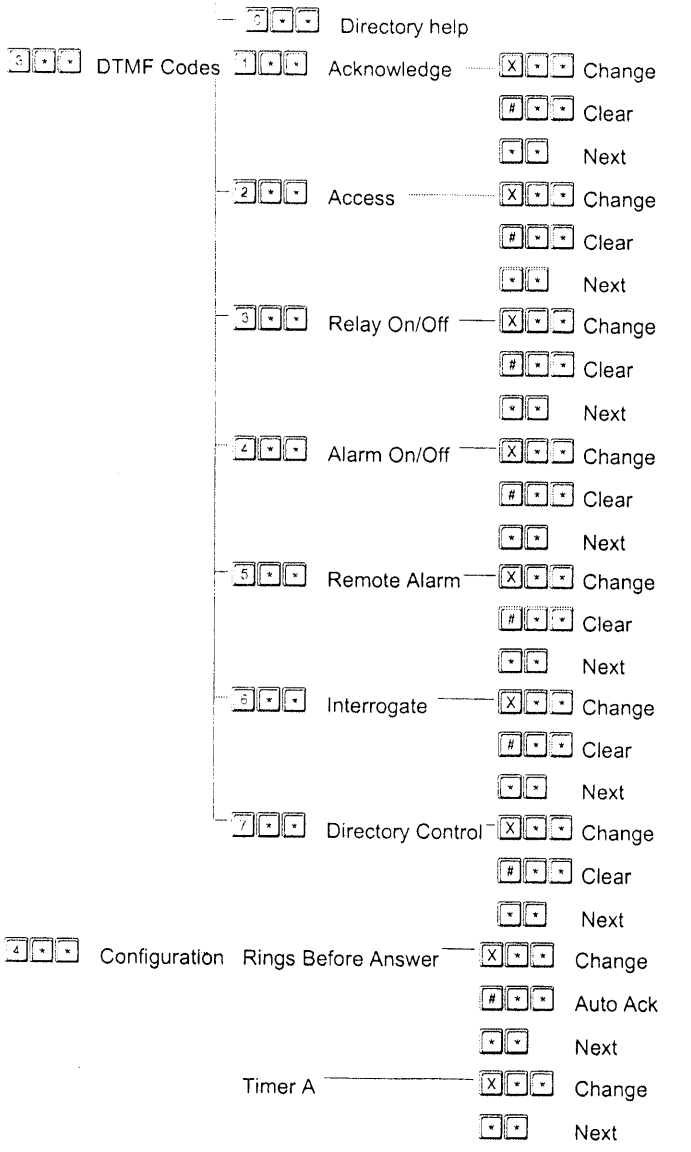


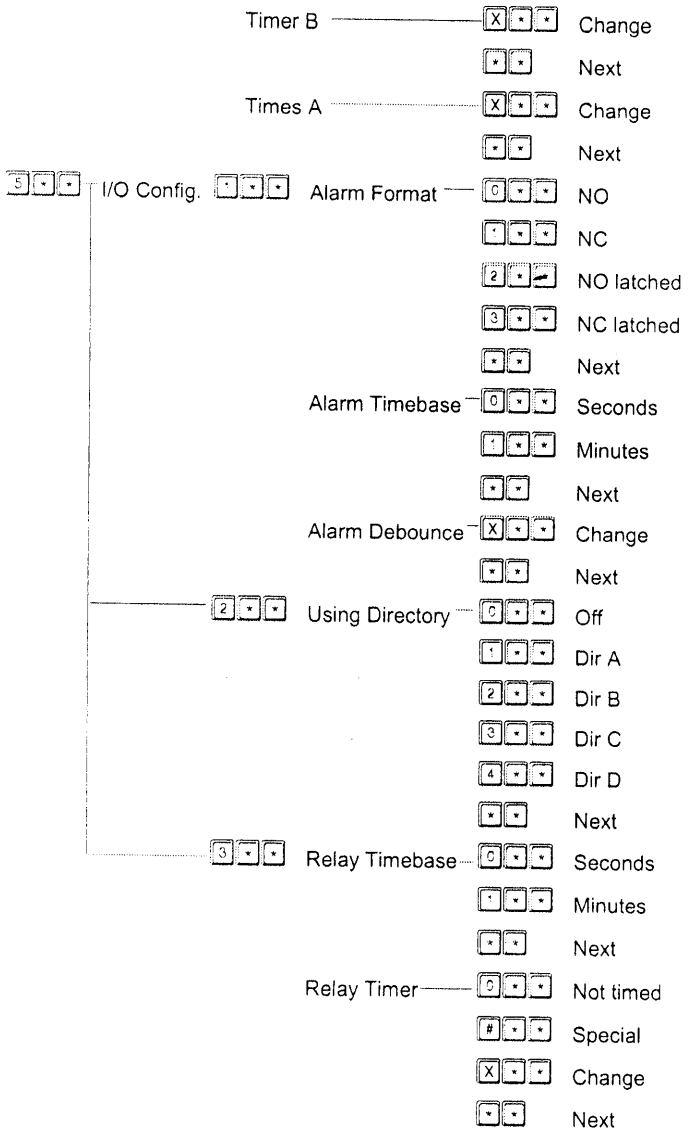
Figure 8 Option 004 Connections

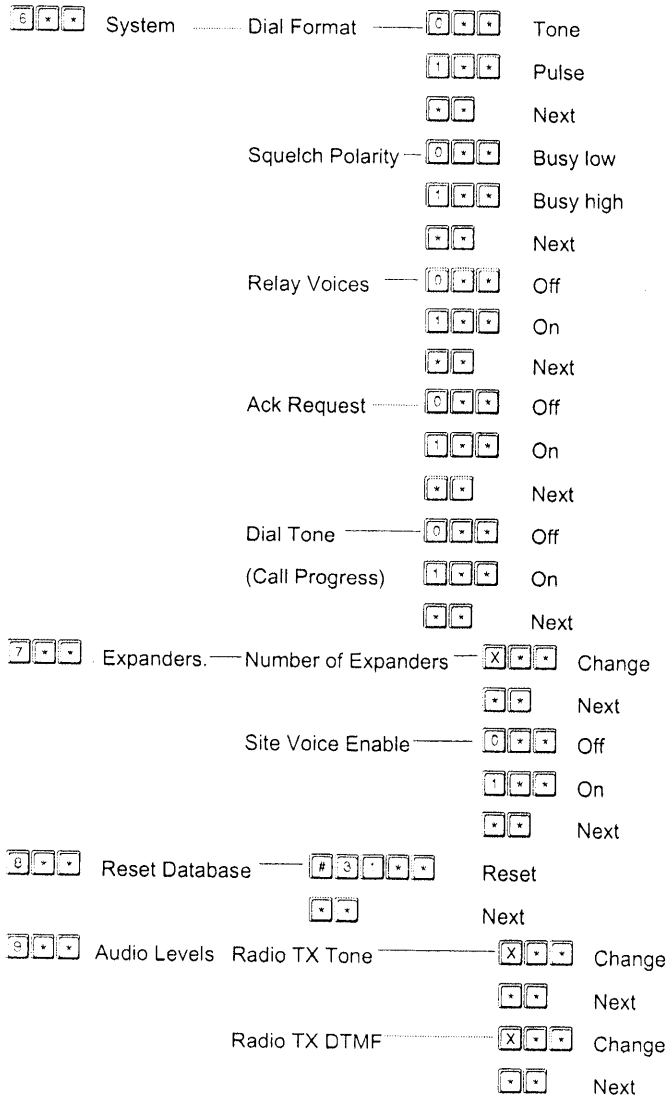
Appendix C - Programming Tree

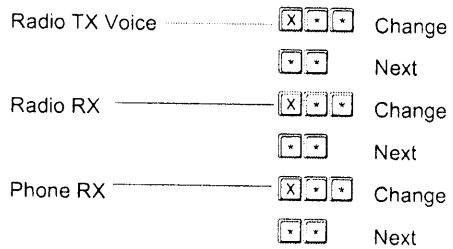
The parameters used to program the ProTalk Plus are given as a summary below. Where X appears, user data is entered






Timer B
Change
Next
Times A
Change
Next
5 I/O Config. 1
Alarm Format
NO
NC
NO latched
NC latched
Next
Alarm Timebase
Seconds
Minutes
Next
Alarm Debounce
Change
Next
2 Using Directory
Off
Dir A
Dir B
Dir C
Dir D
Next
3 Relay Timebase
Seconds
Minutes
Next
Relay Timer
Not timed
Special
Change
Next


6 System
Dial Format
Tone
Pulse
Next
Squelch Polarity
Busy low
Busy high
Next
Relay Voices
Off
On
Next
Ack Request
Off
On
Next
Dial Tone
(Call Progress)
Off
On
Next
7 Expanders.
Number of Expanders
Change
Next
Site Voice Enable
Off
On
Next
8 Reset Database
3 1
Reset
Next
9 Audio Levels
Radio TX Tone
Change
Next
Radio TX DTMF
Change
Next



Appendix D - Mounting

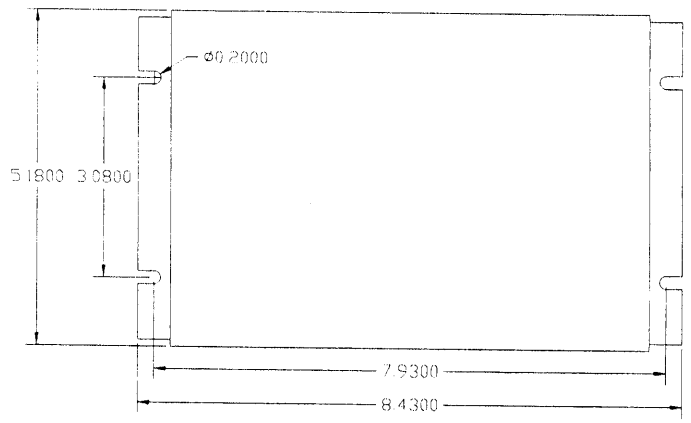


Figure 9 Mounting Detail

Chapter 18 PLANT LEVEL TRANSMITTERS

MANUFACTURER/DISTRIBUTOR:
EVEREST AUTOMATION
277,BRUNWICK BLV.
POINTE-CLAIRE,QUE. H9R 4X5
PH:514-630-9290 FAX:6535

18.1 TIP SENSITIVE ULTRASONIC LEVEL CONTROL

Ultrasonic Tip Sensitive Magnetrol 910-A1A2-016 --- LSHH-103 (explosion proof type)

Ultrasonic Tip Sensitive Magnetrol 910-A1A2-010 --- LSHH-104 (explosion proof type)

MANUFACTURER/DISTRIBUTOR:
VISION-MILLTRONICS
358,RUE MCARTHUR
VILLE ST-LAURENT,QUE H4T 1X8
PH:514-733-1800 FAX:3830

18.2 MULTIRANGER "EJA530A-eas4n-02EE/CF1/D4/MV25VIS-4M"

18.3 XPS-10/15 F SERIES TRANSDUCER

MANUFACTURER/DISTRIBUTOR:
PROVAN
2315, HALPERN
ST-LAURENT,QUE. H4S 1S3
PH:514-332-3230 FAX:3552

18.4 ABSOLUTE PRESSURE TRANSMITTER EJA530A. "FEW TANK"

18.5 BLOCK AND BLEED MULTI PORT VALVE.

END OF CHAPTER 18

LSHH 103 → 10" Lonb
LSHH 104 → 16" Lonb

Magnetrol®

EVEREST

ECHOTEL® 910

Tip sensitive ultrasonic level control

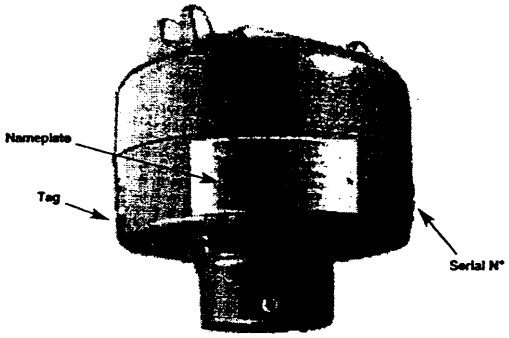
INSTRUCTION MANUAL AND REPLACEMENT PARTS

WARNING: NOT SUITABLE FOR USE IN AERATED/ADHESIVE PROCESSES

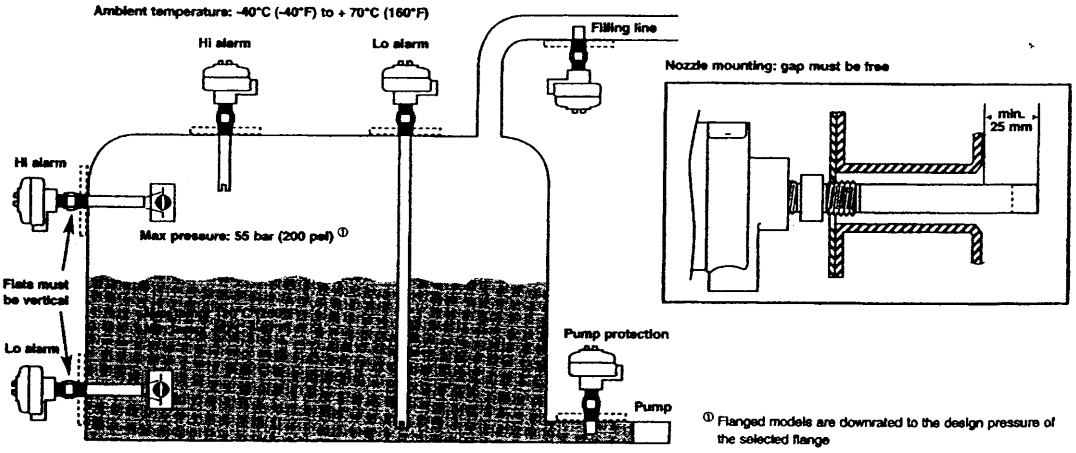
Serial n°: _____ **Tag n°:** _____

UNPACKING

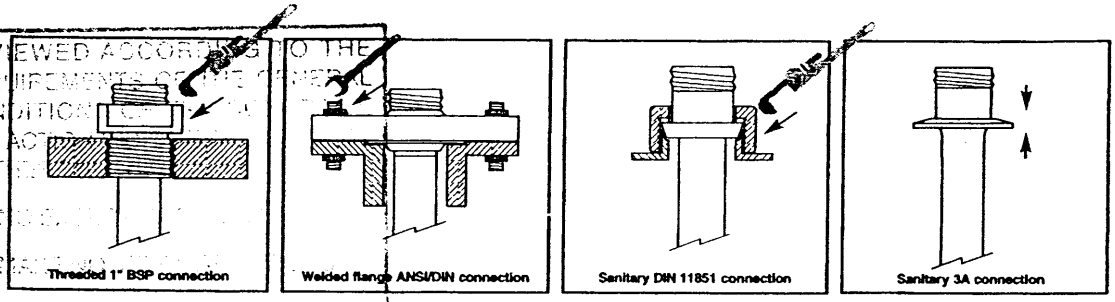
Unpack the instrument carefully. Make sure all components have been removed from the foam protection. Inspect all components for damage. Report any concealed damage to the carrier within 24 hours. Check the contents of the carton/crates against the packing slip and report any discrepancies to Magnetrol. Check the nameplate model number (Model number/approvals as per inserted separate sheet) to be sure it agrees with the packing slip and purchase order. Check and record the serial number for future reference when ordering parts.



MOUNTING



① Flanged models are downrated to the design pressure of the selected flange



REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS ANY ACTION TO BE TAKEN

☑ [illegible]

☐ [illegible]

☐ [illegible]

☐ REJECTED

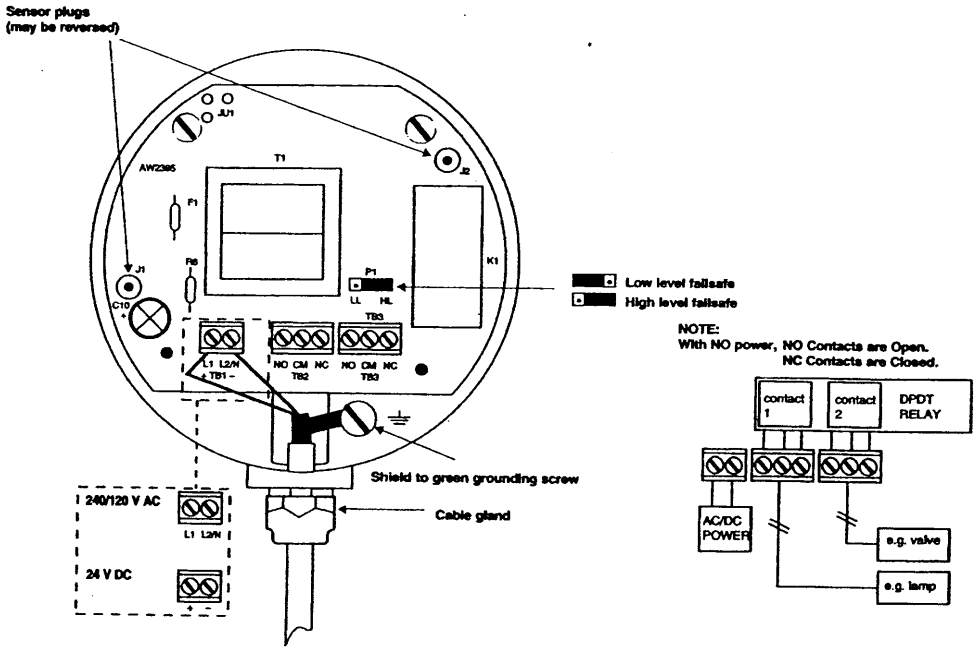
DATE 19 Aug 05 BY QC

EARTH TECH (CANADA) INC.

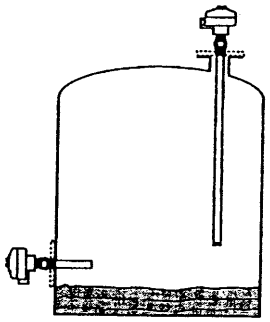
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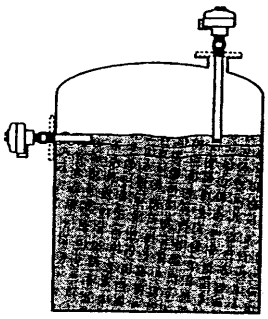
WIRING



FAILSAFE – ALARM STATUS



LOW LEVEL FAILSAFE



HIGH LEVEL FAILSAFE

ELECTRICAL SPECIFICATIONS: 910

Description		*Specification*
Line Voltage (±10%)		240/120 V AC, 50-60 Hz or 24 V DC
Power Consumption		2.5 VA Nominal
Electronics Temperature		-40°C to +70°C (-40°F to +160°F)
Process Pressure/Temperature		55 bar at -40°C to +120°C (800 PSIG at -40°F to +250°F)
Response Time		0.5 s. typical
Repeatability		2 mm. (0.078")
Output Relay	Goldflash relay	DPDT, 8.0 A resistive
	Hermetically sealed relay	DPDT, 5.0 A resistive
Housing		IP 65, anti-corrosive painted, cast aluminium
Failsafe		Field selectable high or low level alarm
ATEX (consult factory for FM/CSA approvals)		ATEX II 1/2 G EEx d IIC T6 / EEx e II T6

(2)

18.1

MODEL IDENTIFICATION

A complete measuring system consists of:

1. One code for ECHOTEL® series 910 electronics and transducer
2. Optional: Code for raised face mounting flanges, consult factory

HOUSING MATERIALS OF CONSTRUCTION

A	Standard –	3/4" NPT	dual cable entry, anti corrosive coated aluminium, non-hazardous
V	ATEX –	3/4" NPT	dual cable entry, anti-corrosive coated aluminium, explosion proof
W	ATEX –	M 20 x 1.5	dual cable entry, anti corrosive coated aluminium, explosion proof
U	ATEX –	PG 13.5	dual cable entry, anti corrosive coated aluminium, explosion proof
S	ATEX –	PG 16	dual cable entry, anti corrosive coated aluminium, explosion proof
5	ATEX –	3/4" NPT	single cable entry, stainless steel housing, explosion proof

PROCESS CONNECTION

A	Threaded 3/4" NPT connection
2	Threaded 1" NPT connection
9	Threaded G1 (1" BSP) connection
3	Sanitary connection - 1 1/2" (compatible with Tri-Clover Tri-Clamp® fittings)
4	Sanitary connection - 2" (compatible with Tri-Clover Tri-Clamp® fittings)
5	Sanitary connection - Din 11851 DN 25
6	Sanitary connection - Din 11851 DN 32
7	Sanitary connection - Din 11851 DN 40
8	Sanitary connection - Din 11851 DN 50
1	Ansi flange raised flange - 1" 150 lbs
C	Ansi flange raised flange - 1 1/2" 150 lbs
D	Ansi flange raised flange - 2" 150 lbs
E	Ansi flange raised flange - 1" 300 lbs
F	Ansi flange raised flange - 1 1/2" 300 lbs
G	Ansi flange raised flange - 2" 300 lbs
H	Ansi flange raised flange - 1" 600 lbs
J	Ansi flange raised flange - 2" 600 lbs
K	Din flange Din 2527 Form B - DN 25/PN 16
L	Din flange Din 2527 Form B - DN 40/PN 16
M	Din flange Din 2527 Form B - DN 50/PN 16
N	Din flange Din 2527 Form B - DN 25/PN 25
P	Din flange Din 2527 Form B - DN 40/PN 25
Q	Din flange Din 2527 Form B - DN 50/PN 25
R	Din flange Din 2527 Form B - DN 25/PN 40
S	Din flange Din 2527 Form B - DN 40/PN 40
T	Din flange Din 2527 Form B - DN 50/PN 40
U	Din flange Din 2527 Form E - DN 25/PN 64
V	Din flange Din 2527 Form E - DN 40/PN 64
W	Din flange Din 2527 Form E - DN 50/PN 64
X	Din flange Din 2527 Form E - DN 25/PN 100
Y	Din flange Din 2527 Form E - DN 40/PN 100
Z	Din flange Din 2527 Form E - DN 50/PN 100

INPUT POWER/RELAY

1	240 V AC/8 A DPDT goldflash relay	J	240 V AC/5 A DPDT herm. sealed relay
2	24 V DC/8 A DPDT goldflash relay	K	24 V DC/5 A DPDT herm. sealed relay
0	120 V AC/8 A DPDT goldflash relay	H	120 V AC/5 A DPDT herm. sealed relay

TRANSDUCER SPECIFICATION PER CM (0.39") INCREMENTS

0 0 3	30 mm (1.2") - minimum insertion length
0 0 5	50 mm (2.0") - min length for 1" BSP and flanged process connection
2 5 4	2540 mm (100.0") - maximum length

Note: Transducer lengths are measured in accordance with process connection style.
– Consult dimensional drawings on page 4.

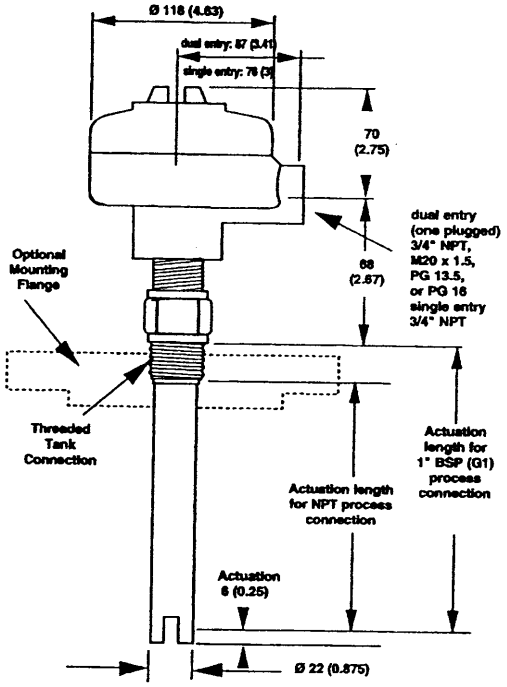
9 1 0 – A M A 2 – 0 4 0 **complete code for Echotel 910 alarm switch**

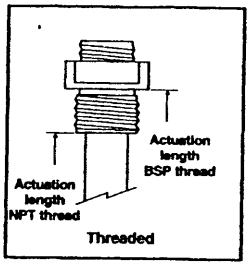
A1A2-016 (LENGTH IN INCH) AMERICAN PART #
A1A2-10 (LENGTH IN INCH)

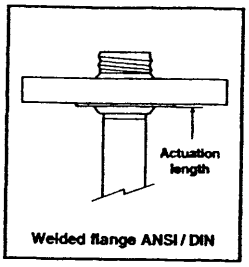
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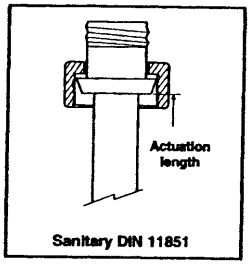
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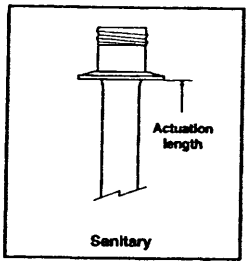
DIMENSIONS



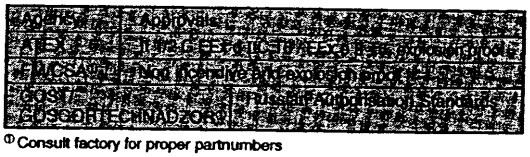






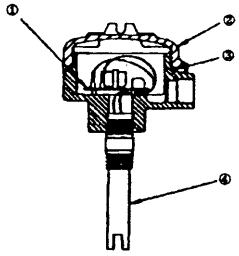


AGENCY APPROVALS



① Consult factory for proper partnumbers

REPLACEMENT PARTS



No.	Description		Part Number
1	PC board - goldflash relay	240 V AC	30-2043-004
		120 V AC	30-2043-003
		24 V DC	30-2043-002
	PC board - hermetically sealed relay	240 V AC	30-2043-012
		120 V AC	30-2043-011
		24 V DC	30-2043-010
2	Cover		*Consult factory*
3	O-Ring		12-2101-345
4	Transducer		*Consult factory*

UNDER RESERVE OF MODIFICATIONS

BULLETIN N°: BE 51-604.14
EFFECTIVE: SEPTEMBER 2003
SUPERSEDES: October 2001

Magnetrol®

WARRANTY 2 YEARS

ISO 9001

www.magnetrol.com

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Tel. 02204 / 9536-0 • Fax. 02204 / 9536-53 • E-Mail: vertrieb@magnetrol.de

ITALIA Via Arese 12, I-20159 Milano
Tel. (02) 607.22.98 (R.A.) • Fax. (02) 668.66.52 • E-Mail: mlt.gen@magnetrol.it

INDIA E-22, Anand Niketan, New Delhi - 110 021
Tel. 91 (11) 6186211 • Fax 91 (11) 6186418 • E-Mail: magnetrolindia@vsnl.com

(4)

18.1

Echotel®
Model 910

Installation and Operating Manual



Ultrasonic

Level

Switch

Magnetrol®

STI

18.1

Read this Manual Before Installing

This manual provides information on the Echotel Model 910 Ultrasonic Liquid Level Switches. It is important that all instructions are read carefully and followed in sequence. Detailed instructions are included in the Installation section of this manual.

Conventions Used in this Manual

Certain conventions are used in this manual to convey specific types of information. General technical material, support data, and safety information are presented in narrative form. The following styles are used for notes, cautions, and warnings.

Notes

Notes contain information that augments or clarifies an operating step. Notes do not normally contain actions. They follow the procedural steps to which they refer.

Cautions

Cautions alert the technician to special conditions that could injure personnel, damage equipment, or reduce a component's mechanical integrity. Cautions are also used to alert the technician to unsafe practices or the need for special protective equipment or specific materials. In this manual, a caution box indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Warnings

Warnings identify potentially dangerous situations or serious hazards. In this manual, a warning indicates an imminently hazardous situation which, if not avoided, could result in serious injury or death.

Safety Messages

The Echotel Model 910 is designed for use in Category II, Pollution Degree 2 installations. Follow all standard industry procedures for servicing electrical and computer equipment when working with or around high voltage. Always shut off the power supply before touching any components. Although high voltage is not present in this system, it may be present in other systems.

Electrical components are sensitive to electrostatic discharge. To prevent equipment damage, observe safety procedures when working with electrostatic sensitive components.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

WARNING! Explosion hazard. Do not connect or disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

Low Voltage Directive

For use in Category II installations. If equipment is used in a manner not specified by manufacturer, protection provided by equipment may be impaired.

Notice of Trademark, Copyright, and Limitations

Echotel is a registered tradename of Magnetrol International.

Copyright © 2005 Magnetrol International, Incorporated. All rights reserved.

Magnetrol/STI reserves the right to make changes to the product described in this manual at any time without notice. Magnetrol/STI makes no warranty with respect to the accuracy of the information in this manual.

Warranty

All Magnetrol/STI Model 910 Level Switches are warranted free of defects in materials or workmanship for two full years from the date of original factory shipment.

If returned within the warranty period; and, upon factory inspection of the control, the cause of the claim is determined to be covered under the warranty; then, Magnetrol/STI will repair or replace the control at no cost to the purchaser (or owner) other than transportation.

Magnetrol/STI shall not be liable for misapplication, labor claims, direct or consequential damage or expense arising from the installation or use of equipment. There are no other warranties expressed or implied, except special written warranties covering some Magnetrol/STI products.

Quality Assurance

The quality assurance system in place at Magnetrol/STI guarantees the highest level of quality throughout the company. Magnetrol/STI is committed to providing full customer satisfaction both in quality products and quality service.

Magnetrol's quality assurance system is registered to ISO 9001 affirming its commitment to known international quality standards providing the strongest assurance of product/service quality available.



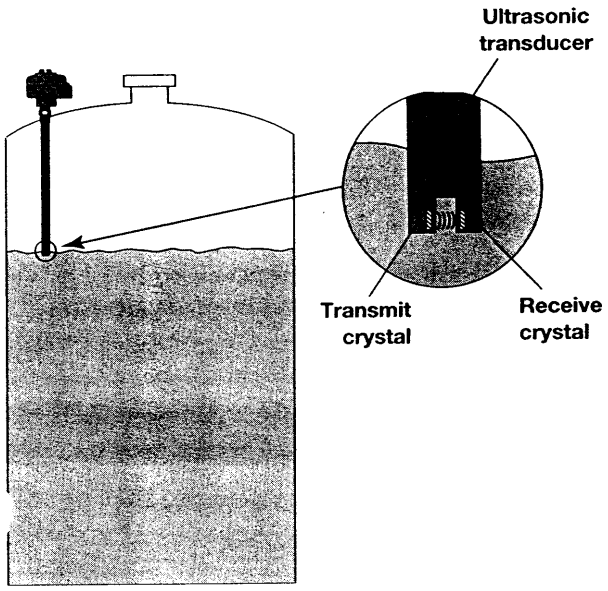
18.1

1.0 Introduction

Echotel Model 910 Level Switches utilize ultrasonic contact technology for measuring level in clean liquid applications.

1.1 Principle of Operation

The Model 910 Level Switch uses ultrasonic energy to detect the presence or absence of liquid in a transducer gap. The basic principle behind ultrasonic contact technology is that high-frequency sound waves are easily transmitted across a transducer gap in the presence of a liquid medium, but are severely attenuated when the gap is dry. The Model 910 uses an ultrasonic frequency of 3 MHz to perform this liquid level measurement in a wide variety of process media and application conditions.



Ultrasonic signal transmission across transducer gap

Figure 1

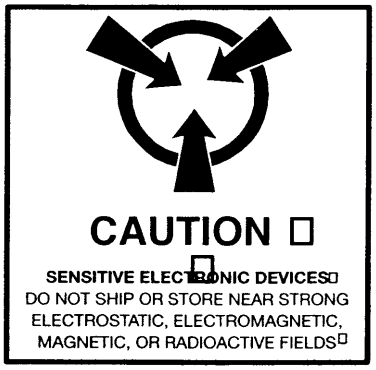
The transducer uses a pair of piezoelectric crystals that are encapsulated in epoxy at the tip of the 316 stainless steel transducer. The crystals are made of a ceramic material, that vibrates at a given frequency when subjected to an applied voltage. The transmit crystal converts an electrical signal from the Model 910 electronics into an ultrasonic signal. When liquid is present in the gap, the receive crystal is able to sense the ultrasonic signal from the transmit crystal and convert it back to an electrical signal. This signal is sent to the electronics to indicate the presence of liquid in the transducer gap. When there is no liquid present, the ultrasonic signal is attenuated, and is not detected by the receive crystal.

2.0 Installation

2.1 Unpacking

Unpack the instrument carefully. Inspect all units for damage. Report any concealed damage to carrier within 24 hours. Check the contents of the packing slip and purchase order. Check and record the serial number for future reference when ordering parts.

7
18.1



2.2 Electrostatic Discharge (ESD) Handling Procedure

Magnetrol/STI's electronic instruments are manufactured to the highest quality standards. These instruments use electronic components that may be damaged by static electricity present in most work environments.

The following steps are recommended to reduce the risk of component failure due to electrostatic discharge.

- Ship and store circuit boards in anti-static bags. If an anti-static bag is not available, wrap the board in aluminum foil. Do not place boards on foam packing materials.
- Use a grounding wrist strap when installing and removing circuit boards. A grounded workstation is recommended.
- Handle circuit boards only by the edges. Do not touch components or connector pins.
- Make sure that all electrical connections are completely made and none are partial or floating. Ground all equipment to a good, earth ground.

2.3 Preliminary Operational Check

After unpacking and before installation, perform the following operational check on the unit in a non-hazardous area:

1. Apply proper operating voltage to terminals L1 and L2/N. Power supply ground should be connected to the green ground screw in housing base.
2. Fill a suitable container with liquid.
3. Place transducer gap in the liquid. The relay output should actuate.
4. Remove transducer from the liquid. The relay output should de-actuate. In case of malfunction, consult *Section 3.1, Troubleshooting* on page 6.

Caution: This unit contains CMOS electronics which may become damaged by static electricity. Do not touch any semiconductor devices unless you are properly grounded.

2.4 Mounting

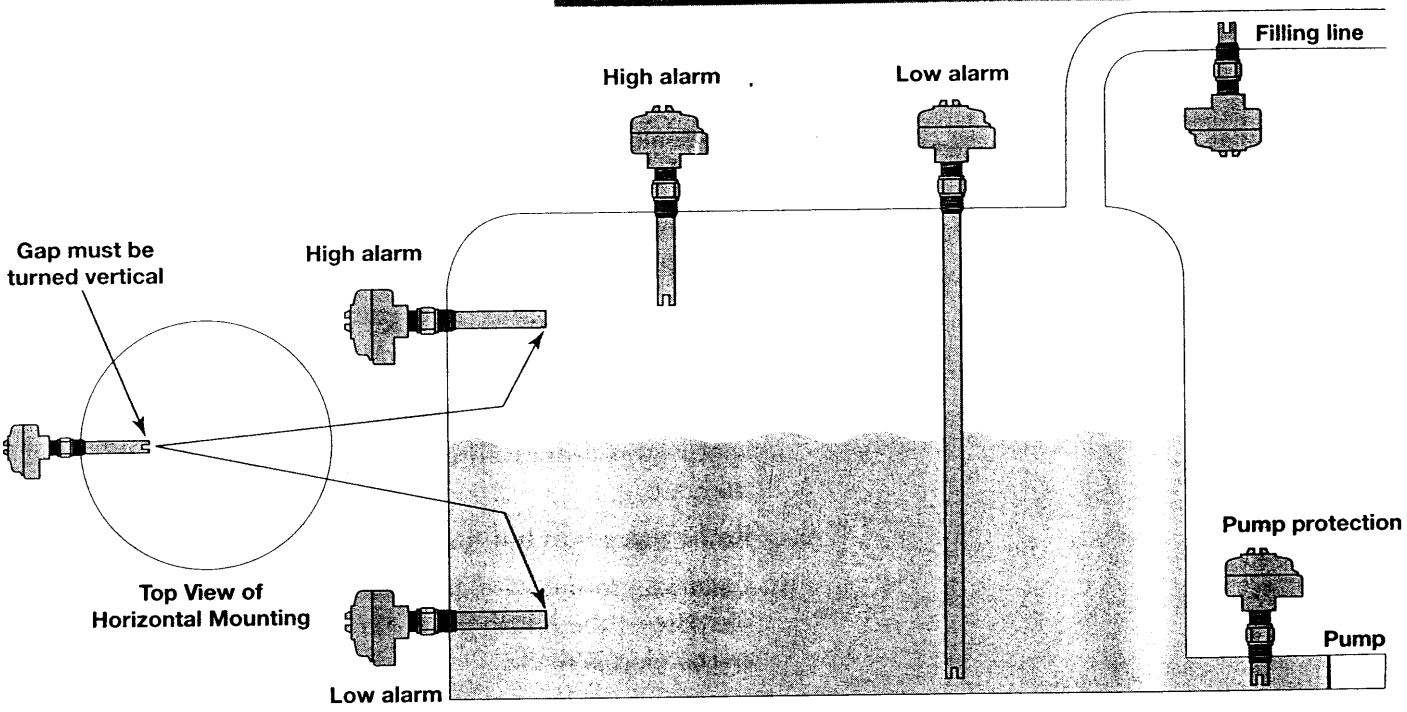


Figure 2
Typical Mounting Orientations

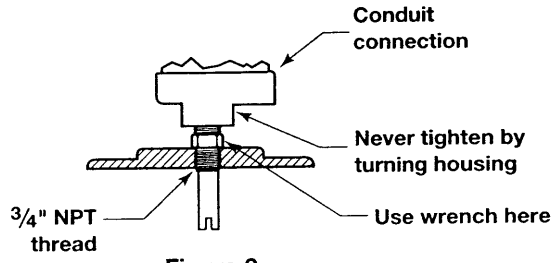


Figure 3
Vertical Mounting

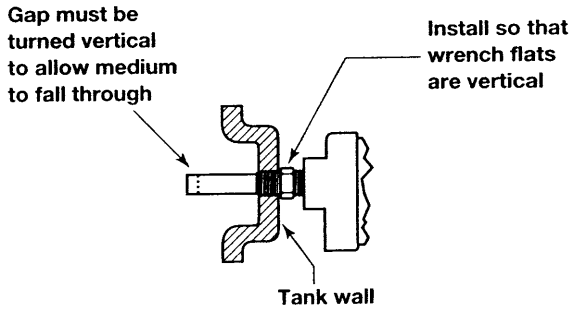


Figure 4
Horizontal Mounting

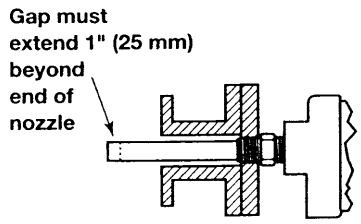


Figure 5
Nozzle Mounting

Model 910 level switches are shipped as integral units with the electronics assembled to the transducer. They may be mounted in a variety of positions as shown in Figures 2 through 5.

Proper orientation of the transducer gap will provide maximum performance in difficult applications. When the switch is mounted horizontally, the transducer gap must be turned vertical to allow proper drainage of the liquid media. See Figures 2 and 4.

Screw transducer into the opening using pipe compound or thread tape. If flanged, bolt unit to mating flange with proper gasket.

Caution: Never tighten unit on the tank connection by turning the housing. Use a wrench on the transducer mounting nut flats. Use thread tape or suitable pipe compound on the threads. Do not overtighten.

When installed in a nozzle or pipe, the transducer gap must extend into the tank at least one inch beyond the inside tank wall. Refer to Figure 5.

2.5 Wiring

2.5.1 Power

Power connèctions are made at the two-position terminal block labeled TB1 within the electronics enclosure. Use of 14–22 AWG twisted shielded pair wire is recommended.

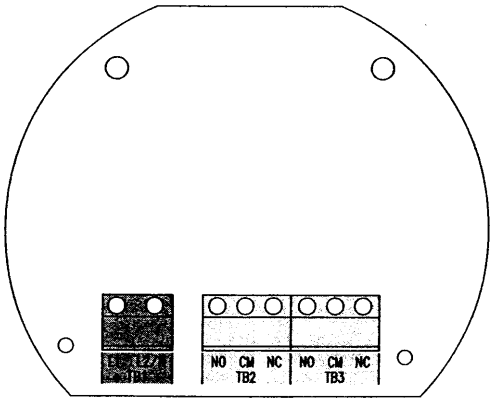
NOTE: Observe all applicable electrical codes and proper wiring procedures.

1. Make sure the power is turned off.
2. Unscrew and remove the housing cover.
3. Prevent moisture seepage into housing by installing an approved seal-drain fitting in the conduit run leading to the unit.
4. Route wires into housing.
5. Connect ground wire to green ground screw located in the base of the housing. DO NOT proceed until ground connection is made.
6. After grounding is complete, connect the power leads to proper terminals as follows:

VAC Units	VDC Units
L1, L2/N	+, –

Caution: In hazardous areas, do not power the unit until the conduit is sealed and the enclosure cover is screwed down securely.

7. Dress wiring to ensure no interference or contact with cover or circuit board components.

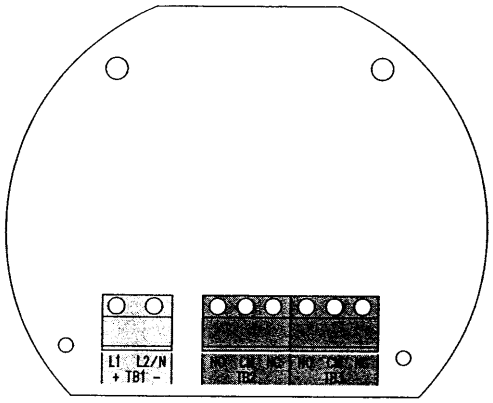


TB1 Power Wiring

2.5.2 Relay

Model 910 switches have a number of possible relay wiring options. The table below lists the relay contact positions for all possible combinations of power failure, condition of the transducer gap, and fail-safe jumper position. The user must decide which combinations constitute fail-safe and alarm conditions, and then select the appropriate relay wiring and fail-safe position.

1. Run relay output wiring to the terminal blocks labeled TB2 and TB3. Ensure that the load to be controlled is within the relay's rated capacity as shown in *Section 3.3.2, Electrical* on page 6.



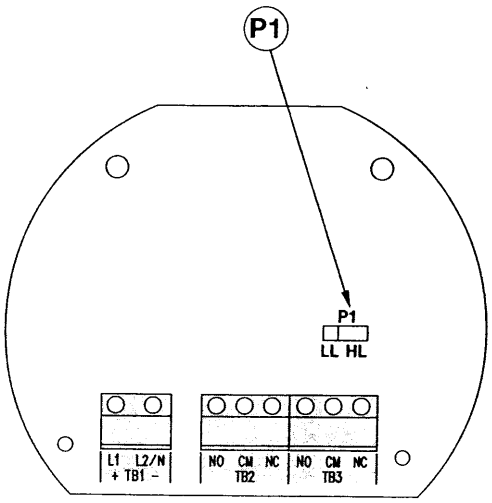
Relay Output Wiring

2. Select high or low fail-safe using the P1 jumper.

P1 Fail-safe Jumper Position	Line Power	Transducer Gap	Relay Terminals	
			CM to NC	CM to NO
Low level	On	Dry	Closed	Open
		Wet	Open	Closed
	Failure	Dry	Closed	Open
		Wet	Closed	Open
High level	On	Dry	Open	Closed
		Wet	Closed	Open
	Failure	Dry	Closed	Open
		Wet	Closed	Open

3. Replace housing cover. Installation is complete.

Caution: Never tighten unit to the tank connection by turning the housing. Use a wrench on the transducer mounting nut flats. Use thread tape or suitable pipe compound on threads. Do not over tighten.



P1 Fail-safe Jumper

3.0 Reference Information

3.1 Troubleshooting

Caution: In hazardous areas, do not remove housing cover until power is disconnected and atmosphere is determined to be safe.

3.1.1 No signal with level change

a. Verify power and control circuit wiring.
b. Make sure liquid is filling the transducer gap.
c. Check for dense foam on surface or dried product in the gap. Unit will not function properly if either condition exists.
d. Check transducer phone plugs for proper insertion in J1 and J2.
e. If control circuit does not actuate, consult factory.

3.1.2 Calibration

Model 910 switches do not require field calibration. The set point is not adjustable.

3.1.3 Switch chatter

a. Check voltage to make sure it is within tolerances shown in Section 3.3.2.
b. Check for turbulence. Relocate control or isolate from turbulence.
c. Check for excessive aeration.
d. Consult factory.

3.1.4 Control output will not de-actuate

a. Check transducer for plugged gap.
b. Check for dense foam or liquid in gap.
c. If control circuit does not de-actuate, consult factory.

3.2 Agency Approvals

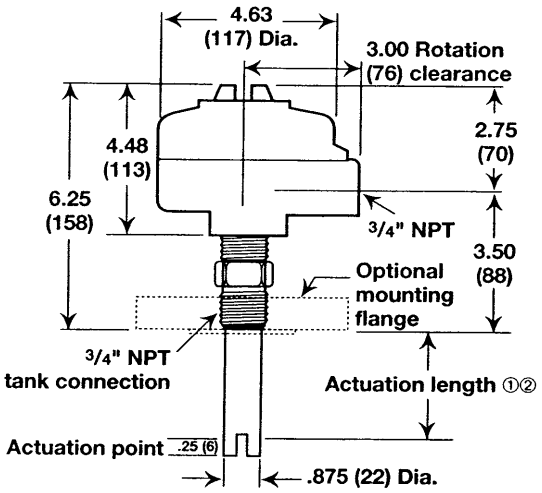
AGENCY	APPROVED MODEL	PROTECTION METHOD	AREA CLASSIFICATION
FM FM APPROVED	910-XXXX-XXX	Explosion Proof	Class I, Div. 1; Groups C & D Class II, Div. 1; Groups E, F, & G Class III, NEMA Type 4X
	910-XXXX-XXX	Non-Incendive	Class I, Div. 2; Groups A, B, C, & D Class II, Div. 2; Groups F & G Class III, NEMA Type 4X
CSA	910-XXXX-XXX	Explosion Proof	Class I, Div. 1; Groups C & D Class II, Div. 1; Group E, F, & G Class III, Type 4X
	910-XXXX-XXX	Non-Incendive	Class I, Div. 2; Groups A, B, C, & D Class II, Div. 2; Groups E, F, & G Class III, Type 4X
ATEX	910-5XXX-XXX 910-PXXX-XXX		Ⓔx II 1/2 G EEx d II C T6/EEx e II T6

CE These units have been tested to EN 50081-2 and EN 50082-2 and are in compliance with the EMC Directive 89/336/EEC.

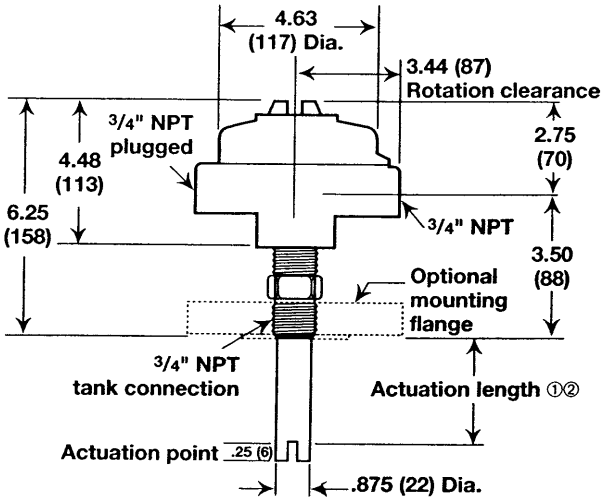
3.3 Specifications

3.3.1 Physical

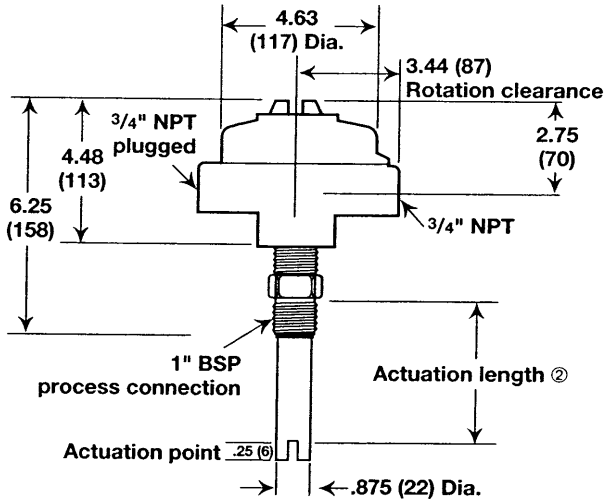
inches (mm)



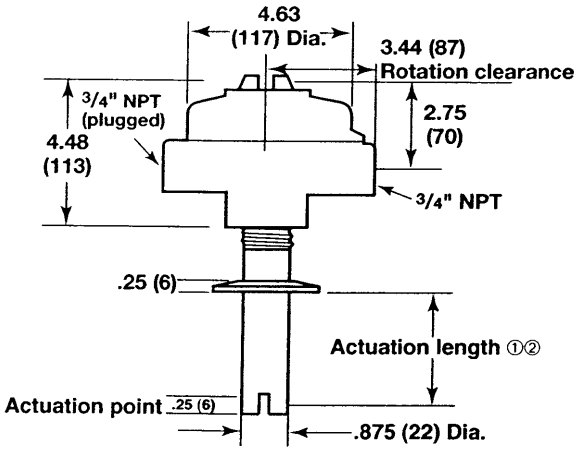
316 stainless steel housing
(Single 3/4" NPT conduit)



Aluminum sand cast housing
(Dual 3/4" NPT conduits)



Aluminum sand cast housing
(Dual 3/4" NPT conduit w/1" BSP process connection)



Aluminum sand cast housing
(Dual 3/4" NPT conduit with sanitary flange)

① 1" (Code 001) minimum with NPT threaded process connections.
2" (Code 002) minimum with sanitary or ANSI flanged process connections.

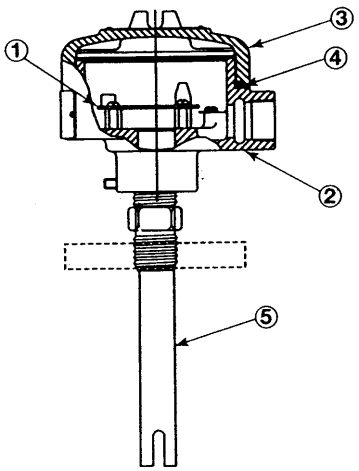
② 25 (Code 003) mm minimum with NPT threaded process connections.
50 (Code 005) mm minimum with 1" BSP, and sanitary or ANSI flanged process connections.

3.3.2 Electrical

Power Supply:	120 VAC (+10%/-15%), 50/60 Hz 240 VAC (+10%/-15%), 50/60 Hz 24 VDC (±10%)
Power Consumption:	2.5 VA nominal
Relay Output:	Gold flash DPDT relay: 10 amps @ 120 VAC, 240 VAC, 24 VDC ① Hermetically sealed DPDT relay: 5 amps @ 120 VAC, 24 VDC, and 3 amps @ 240 VAC
Repeatability:	0.078" (2 mm)
Fail-safe Configuration:	Field selectable high or low
Calibration:	None required
Ambient Temperature:	Electronics: -40° to +160° F (-40° to +71° C)
Process Temperature:	Transducer: -40° to +250° F (-40° to +121° C)
Operating/Non-Operating Pressure:	800/1500 psig (55/103 bar)
Shock	ANSI/ISA-S71.03 Class SA1
Vibration	ANSI/ISA-S71.03 Class VC2

① Gold flash DPDT relay is rated at 8 amps when used with Housing codes 5 or P

3.4 Replacement Parts



No.		Description	Part Number
1	PC Board	120 VAC w/10 amp relay	Z30-2043-003
		240 VAC w/10 amp relay	Z30-2043-004
		24 VDC w/10 amp relay	Z30-2043-002
		120 VAC w/5 amp HS relay	Z30-2043-011
		240 VAC w/3 amp HS relay	Z30-2043-012
		24 VDC w/5 amp HS relay	Z30-2043-010
2	Housing Base	Aluminum w/FM and CSA	004-9182-002
		Aluminum w/all 3 approvals	004-9182-008
		316 SS w/FM and CSA	004-9140-001
		316 SS w/CENELEC	004-9140-001
3	Housing Cover	Aluminum w/FM and CSA	004-9105-001
		Aluminum w/all 3 approvals	004-9105-005
		316 SS w/FM and CSA	004-9142-001
		316 SS w/CENELEC	004-9142-001
4	O-Ring		012-2101-345
5	Transducer		Consult factory

WARNING! Explosion hazard — Substitution of components may impair suitability for Class 1, Division 2 rating.

WARNING! Explosion hazard — Do not disconnect equipment unless power has been switched off, or the area is known to be non-hazardous.

3.5 Model Numbers

3.5.1 Model 910

HOUSING

A	Aluminum sand cast with ¾" NPT dual conduit, FM and CSA approvals
Y	316 stainless steel with ¾" NPT single conduit, FM and CSA approvals
P	Aluminum sand cast with ¾" NPT dual conduit, FM, CSA and ATEX approvals
5	316 stainless steel with ¾" NPT single conduit, ATEX approval

TRANSDUCER UNIT OF LENGTH

1	English (actuation length in inches)
M	Metric (actuation length in centimeters)

PROCESS CONNECTION

A	¾" NPT
2	1" NPT
9	1" BSP
3	1½" sanitary flange, 16 amp (Compatible with Tri-Clover Tri-Clamp® fittings)
4	2" sanitary flange, 16 amp (Compatible with Tri-Clover Tri-Clamp® fittings)
1	1" 150 lb. ANSI raised face flange
C	1½" 150 lb. ANSI raised face flange
D	2" 150 lb. ANSI raised face flange
E	1" 300 lb. ANSI raised face flange
F	1½" 300 lb. ANSI raised face flange
G	2" 300 lb. ANSI raised face flange

INPUT POWER

0	120 VAC with 10 amp DPDT gold flash relay
1	240 VAC with 10 amp DPDT gold flash relay
2	24 VDC with 10 amp DPDT gold flash relay
H	120 VAC with 5 amp DPDT hermetically sealed relay
J	240 VAC with 3 amp DPDT hermetically sealed relay
K	24 VDC with 5 amp DPDT hermetically sealed relay

ACTUATION LENGTH

1" to 96" in 1" increments (with Transducer Unit of Length code 1) Example: 4 inches = 004 ① ③
3 cm to 244 cm in 1 cm increments (with Transducer Unit of Length code M) Examples: 6 centimeters = 006 ② ③

9	1	0	—			.			—			

① 1" (code 001) minimum with NPT process connections, 2" (code 002) minimum with sanitary or ANSI flanged process connections.

② 2.5 cm (code 003) minimum with NPT process connections, 5 cm (code 005) minimum with 1" BSP, or sanitary or ANSI flanged process connections.

③ Consult factory for longer lengths.

Service Policy

Owners of Magnetrol/STI controls may request the return of a control or any part of a control for complete rebuilding or replacement. They will be rebuilt or replaced promptly. Controls returned under our service policy must be returned by Prepaid transportation. Magnetrol/STI will repair or replace the control at no cost to the purchaser (or owner) other than transportation if:

1. Returned within the warranty period; and
2. The factory inspection finds the cause of the claim to be covered under the warranty.

If the trouble is the result of conditions beyond our control; or, is NOT covered by the warranty, there will be charges for labor and the parts required to rebuild or replace the equipment.

In some cases it may be expedient to ship replacement parts; or, in extreme cases a complete new control, to replace the original equipment before it is returned. If this is desired, notify the factory of both the model and serial numbers of the control to be replaced. In such cases, credit for the materials returned will be determined on the basis of the applicability of our warranty.

No claims for misapplication, labor, direct or consequential damage will be allowed.

Return Material Procedure

So that we may efficiently process any materials that are returned, it is essential that a "Return Material Authorization" (RMA) number be obtained from the factory, prior to the material's return. This is available through Magnetrol/STI's local representative or by contacting the factory. Please supply the following information:

1. Company Name
2. Description of Material
3. Serial Number
4. Reason for Return
5. Application

Any unit that was used in a process must be properly cleaned in accordance with OSHA standards, before it is returned to the factory.

A Material Safety Data Sheet (MSDS) must accompany material that was used in any media.

All shipments returned to the factory must be by prepaid transportation.

All replacements will be shipped F.O.B. factory.

NOTE: See Electrostatic Discharge Handling Procedure on page 2.

Magnetrol

5300 Belmont Road • Downers Grove, Illinois 60515-4499 • 630-969-4000 • Fax 630-969-9489 • www.magnetrol.com
145 Jardin Drive, Units 1 & 2 • Concord, Ontario Canada L4K 1X7 • 905-738-9600 • Fax 905-738-1306
Heikensstraat 6 • B 9240 Zele, Belgium • 052 45.11.11 • Fax 052 45.09.93
Regent Business Ctr., Jubilee Rd. • Burgess Hill, Sussex RH15 9TL U.K. • 01444-871313 • Fax 01444-871317

STI

5300 Belmont Road • Downers Grove, Illinois 60515-4499 • 630-969-4028 • Fax 630-969-9489 • www.sticontrols.com

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BULLETIN: 51-604.14
EFFECTIVE: January 2005
SUPERSEDES: July 2004

Siemens Milltronics Process Instruments

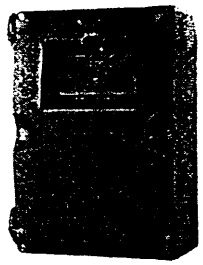
MultiRanger

MultiRanger is a high-performance ultrasonic level controller that offers reliable and consistent performance. Using non-contacting ultrasonic technology, it provides continuous level measurement for virtually any short- to medium-range application up to 15 m (50 ft). MultiRanger can be used on a wide range of materials, including fuel oil, municipal waste, acids, woodchips, or on materials with high angles of repose.

MultiRanger offers true dual point monitoring, digital communications with built-in Modbus RTU via RS-485, as well as compatibility with Dolphin Plus, allowing PC configuration and set-up. MultiRanger features Sonic Intelligence® advanced echo-processing software for increased reading reliability.

MultiRanger 100 offers cost-effective level alarming, as well as on/off and alternating pump control. MultiRanger 200 will monitor open channel flow and features more advanced relay alarming and pump control functions as well as volume conversion.

It is compatible with chemical-resistant Echomax® transducers that can be used in hostile environments at temperatures as high as 145°C (293°F).



LE/LIT-101
LE/LIT-102

Product Features

- Digital communications with built-in Modbus RTU via RS-485
- Compatible with SmartLinx system and Dolphin Plus configuration software
- Dual point level monitoring (optional)
- 3 relays standard, 6 relays optional
- Differential transducer input for improved signal-to-noise ratio
- MultiRanger 100: level measurement , simple pump control and level alarming
- MultiRanger 200: level, volume, open channel measurement, differential, advanced pump control and alarming

LEVEL MEASUREMENT
CONTINUOUS LEVEL

Technical Specifications

Power
- ac version: 100-230 Vac ± 15%, 50 / 60 Hz, 36 VA (17W)
- dc version: 12-30 Vdc (20W)

Environment
- location: indoor/outdoor
- altitude: 2000 m max.
- ambient temperature: -20 to 50°C (-5 to 122°F)
- relative humidity: suitable for outdoor (Type 4X / NEMA 4X / IP65 enclosure)
- installation category: II
- pollution degree: 4

Range
- 0.3 to 15 m (1 to 50 ft) dependent on transducer

Accuracy
- 0.25% of maximum range or 6 mm (0.24"), whichever is greater

Resolution
- 0.1% of program range* or 2 mm (0.08"), whichever is greater

Programming
- primary: hand held programmer
- secondary: PC running Dolphin Plus software

Display
- 100 x 40 mm (4 x 1.5") multi-field back lit LCD

Enclosure
- Type 4X / NEMA 4X / IP65, polycarbonate

Temperature Compensation
- Range: -40 to 150°C (-58 to 302°F)
- Source: integral transducer sensor, TS-3 temperature sensor, ANY programmable fixed temperature

Temperature Error
- sensor: 0.09% of range
- fixed: 0.5% / °C deviation from programmed value

Outputs

mA outputs (2)
- 0-20 mA or 4-20 mA, max. loading 750 Ω, 0.1% resolution, isolated

Transducer Drive
- 315 V peak

Relays
- three, 2 Form 'A' / 1 Form 'C'
- six, 4 Form 'A' / 2 Form 'C'
- all relays rated 5A at 250 V ac, non-inductive

Communication
- RS-232 running Modbus RTU or ASCII via RJ-11 connector
- RS-485 running Modbus RTU or ASCII via terminal blocks
- optional: Smartlinx® cards or RS-485 modem kit

Inputs

mA (analog) (1) (MultiRanger 200 only)
- 0-20 or 4-20 mA, from alternate device, scaleable

Discrete (2)
- 10-50 Vdc switching level
- logical 0= <0.5 Vdc
- logical 1 = 10 to 50 Vdc
- 3 mA maximum draw

Transducer
- compatible models: Echomax® series and ST-H series (44 kHz)

Cable
- transducer and mA output signal to be 2-3 copper conductors, twisted, with shield** and drain wire, 300V 0.5-0.75mm^2 (22-18AWG)

Weight
- 1.37 kg (3.02 lbs)

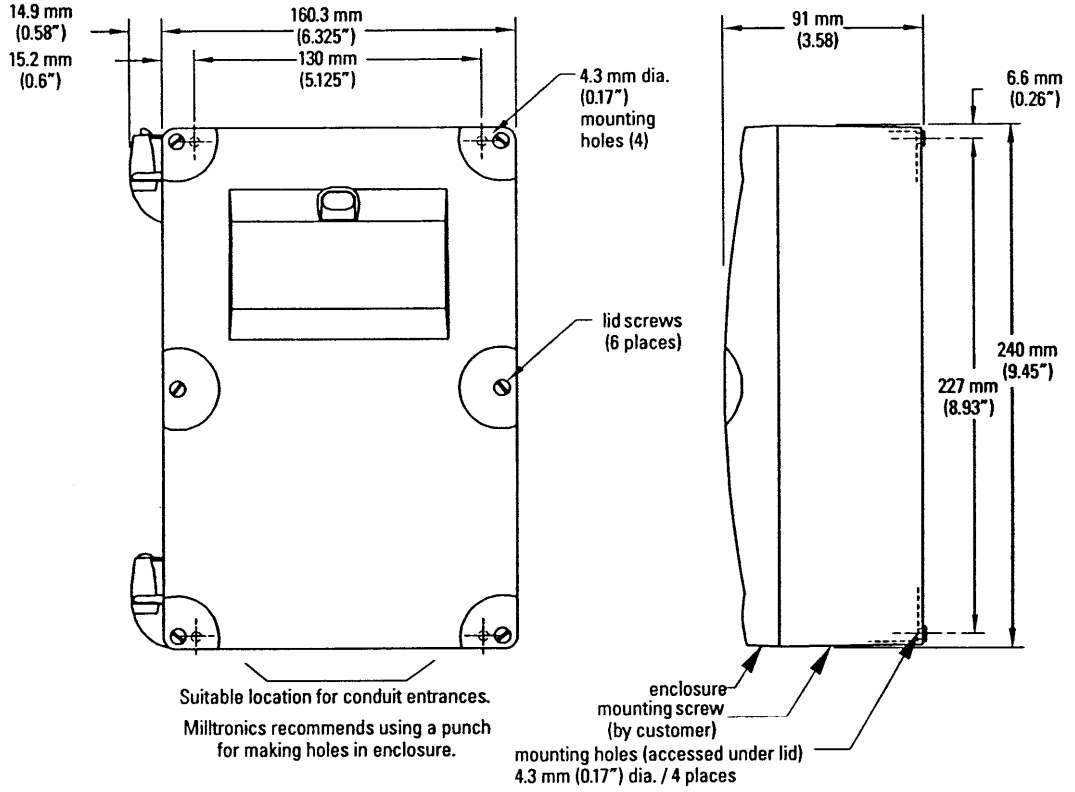
Approvals
- CE***, FM, CSA$_{US/C}$, UL Listed
- CSA Class I, Div. 2, Group A, B, C and D; Class II, Div. 2, Group F and G; Class III (pending)

* Program range is defined as the empty distance to the face of the transducer plus any range extension.
** Shielding preferred - braided screen
***EMC performance available upon request.
Specifications are subject to change without notice.

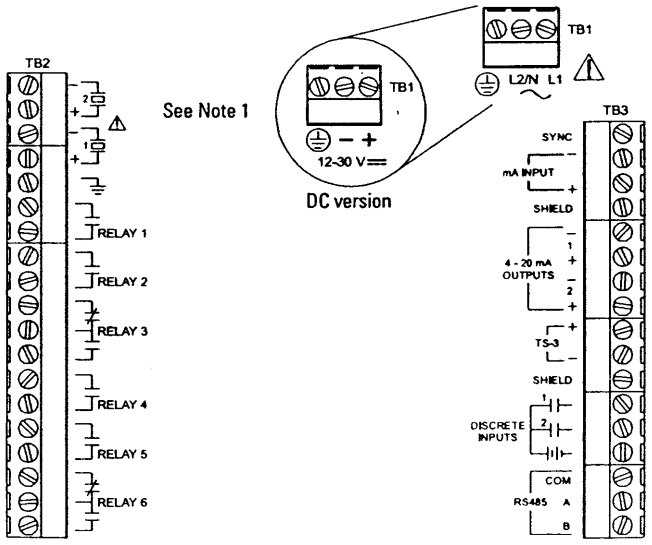
REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT. ANY PROGRAMMING INDICATED IS SUBJECT TO SPECIFIC REQUIREMENTS.
☑ NO EXCEPTIONS TAKEN
☐ MAKE NOTED CORRECTIONS
☐ REVISE & RESUBMIT
☐ REJECTED
DATE July 21/05 BY SDK
EARTH TECH (CANADA) INC.

MultiRanger

Dimensions



Wiring



Relays shown in de-energized position.

Notes

1) *Use 2-3 copper conductors, twisted with shield, for extensions up to 365 m (1200 ft). Run in grounded metal conduit, separate from other wiring.*

- Verify that all system components are installed in accordance with instructions.
- Connect all cable shields to the MultiRanger Shield Connections. Avoid differential ground potentials by not connecting cable shields to ground (earth) anywhere else.
- Keep exposed conductors on shielded cables as short as possible to reduce noise on the line caused by stray transmissions and noise pickup.

Flow Line Options
PO Box 1115
Medina, OH 44258
Phone/Fax: 330-722-2552
www.flo-corp.com
mailto:sales@flo-corp.com

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

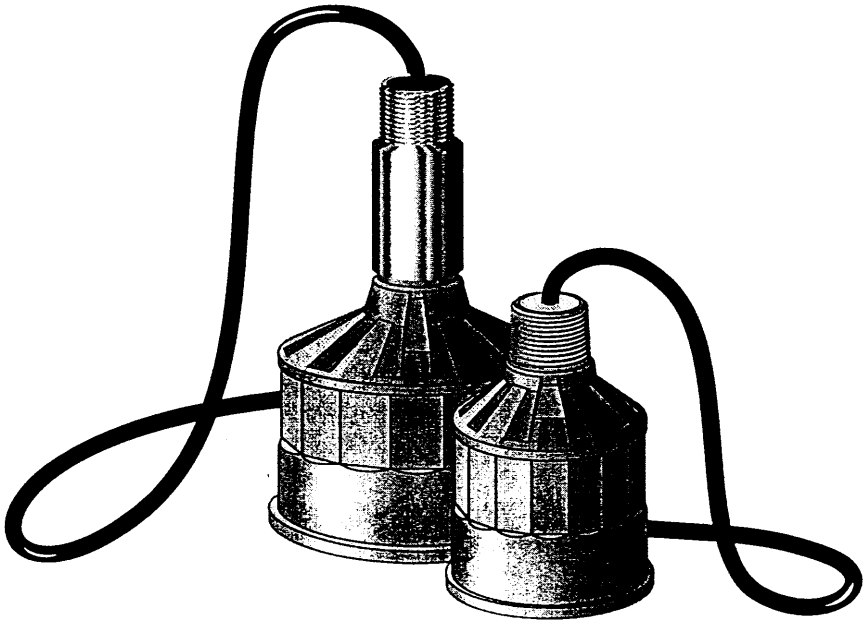
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18.2

MILLTRONICS

XPS-10/15 F SERIES TRANSDUCER

Instruction Manual PL-551 January 2001



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

33455510
Rev. 2.2

1/27 18.3

Safety Guidelines

Warning notices must be observed to ensure personal safety as well as that of others, and to protect the product and the connected equipment. These warning notices are accompanied by a clarification of the level of caution to be observed.

Qualified Personnel

This device/system may only be set up and operated in conjunction with this manual. Qualified personnel are only authorized to install and operate this equipment in accordance with established safety practices and standards.

Warning: This product can only function properly and safely if it is correctly transported, stored, installed, set up, operated, and maintained.

Note: Always use product in accordance with specifications.

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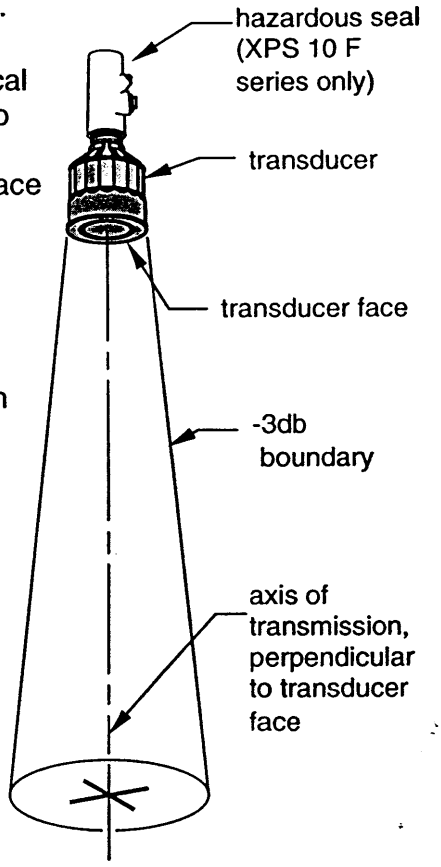
Installation Diagram for the XPS 10 F 26

4

About Milltronics' Transducers

The Echomax XPS F series of transducers operates in association with Milltronics ultrasonic level monitoring products.

The transducer operates by converting electrical pulses that are provided by the transceiver into *ultrasonic pulses*. When transmitted, these ultrasonic pulses reflect from the material surface and echo back to the transducer. The echo is converted back to an electrical signal, and is interpreted by the Milltronics tranceiver using our proven Sonic Intelligence™ algorithms.



The effective acoustical energy is emitted from the transducer face and radiated outward, decreasing in amplitude at a rate inversely proportional to the square of the distance.

Maximum power is radiated axially (perpendicular) from the transducer face in a line referred to as the axis of transmission. Where power is reduced by half (– 3 dB), a conical boundary defining the sound beam, centered about the axis of transmission, is established. The diametric measurement of the cone in degrees defines the beam angle. Impedance matching techniques are used to optimize the transfer of power from the transducer into air and vice versa.

The XPS F series transducers incorporate an integral temperature sensor that reports the air temperature at the transducer to the transceiver. The connection is transparent, in that both the ultrasonic and temperature components of the transducer use the same leads.

Hazardous Area Applications

The Echomax XPS F series of transducers can be used in hazardous areas.

For the XPS 10 F series transducer, a hazardous seal must be used to suit hazardous area classification. This seal is **not** supplied by Milltronics.

The XPS 15 F comes equipped with a stainless steel coupling suitable for use in hazardous locations.

(5)
18.3

Specifications

XPS 10 F Series Transducers

Measurement Range:

- 0.3 – 10m (1 – 33ft)

Frequency:

- 43kHz

Beam Angle:

- 12°

Environmental

- location: indoor/outdoor
- altitude: 2000m maximum
- ambient temperature: -20 to 95°C (-4 to 203°F)
- pollution degree: 4

Construction

- exposure: Kynar®[1]
- colour: slate gray
- mounting: 1" NPT conduit connection
- options:
  - factory flange to suit ANSI standard
  - submergence shield, where flooding can occur
  - split flange for field mounting to suit ANSI
- cable: 2-wire shielded / twisted, 0.5 mm^2 (20 AWG) PVC jacket

Supply Source

- Transducer shall only be supplied by a Milltronics certified controller.

Weight[2]

- 0.8kg (1.8lb)

Separation

- 365m (1200ft) from transducer

Approvals

- FM Class 1 Div 1, Group A, B, C and D
- FM Class 2 Div 1, Group E, F, and G
- see nameplate or consult Milltronics for other current approvals

---

[1] Kynar® is registered trade mark of ELF Atochem.
[2] approximate shipping weight of transducer with standard cable length

7

18.3

XPS 15 F Series Transducers

Specifications

Measurement Range:

- 0.45 – 15m (1.5 – 50ft)

Frequency:

- 43kHz

Beam Angle:

- 6°

Environmental

- location: indoor/outdoor
- altitude: 2000m maximum
- ambient temperature: -20 to 95°C (-4 to 203°F)
- pollution degree: 4

Construction

- exposure: Kynar®[3]
- colour: slate gray
- mounting: 1" NPT conduit connection
- options:
  - factory flange to suit ANSI standard
  - submergence shield, where flooding can occur
  - split flange for field mounting to suit ANSI
- cable: 2-wire shielded / twisted, 0.5 mm^2 (20 AWG) PVC jacket

Supply Source

- Transducer shall only be supplied by a Milltronics certified controller.

Weight[4]

- 2.0 kg (4.4lb)

Separation

- 365m (1200ft) from transducer

Approvals

- FM Class 1 Div 1, Group A, B, C and D
- FM Class 2 Div 1, Group E, F, and G
- see nameplate or consult Milltronics for other current approvals

---

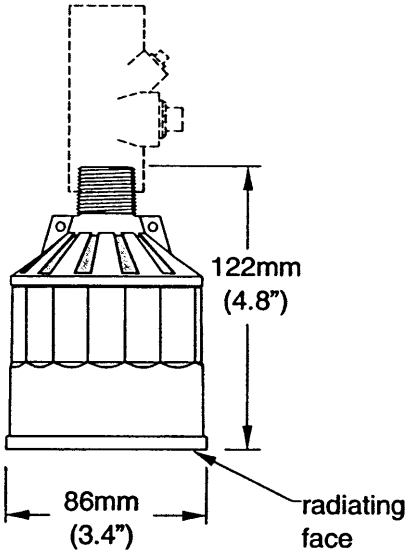
[3] Kynar® is registered trade mark of ELF Atochem

[4] approximate shipping weight of transducer with standard cable length

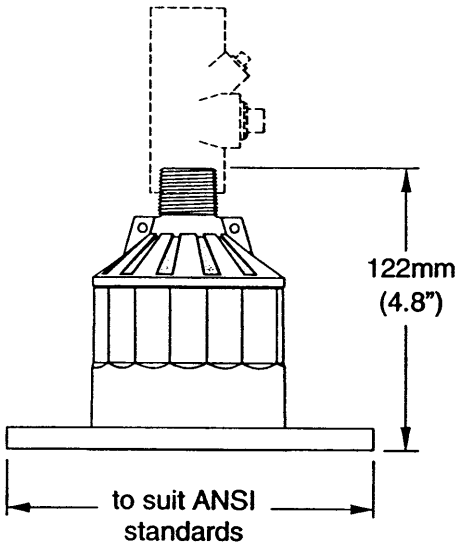
Outline and Dimensions

XPS 10 F Series Transducers

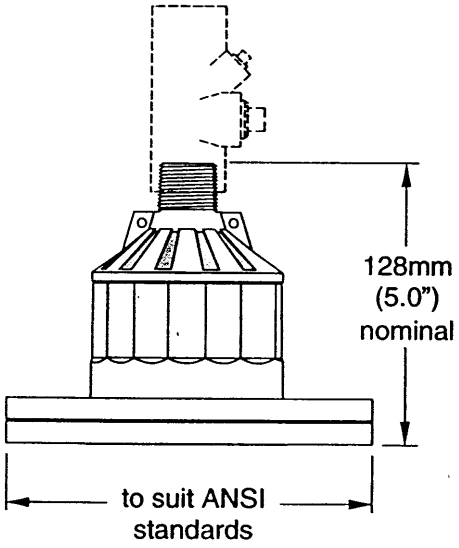
Standard



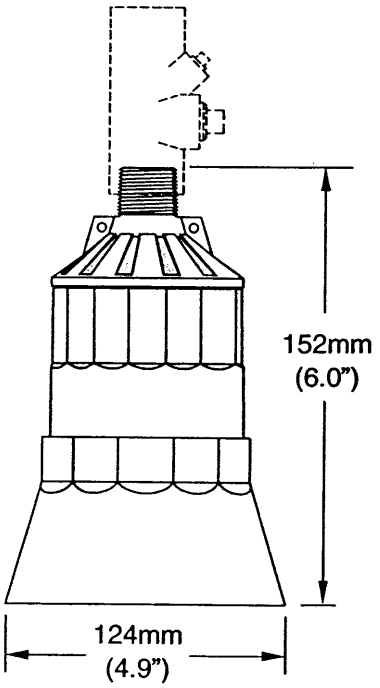
Flange (optional)



Split Flange (optional)



Submergence Shield (optional)



Refer to submergence shield instructions
(Milltronics' manual number PL-530)

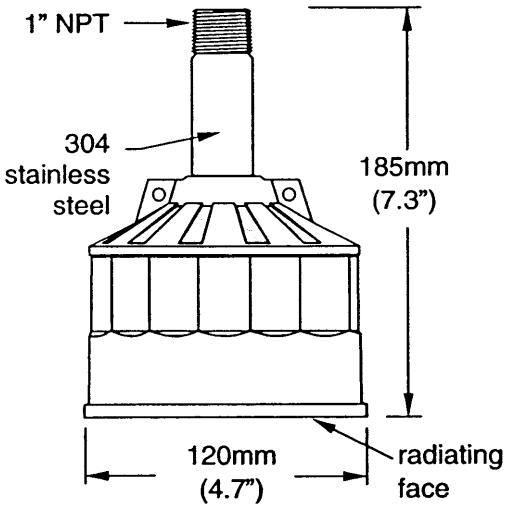
Note:
For the XPS 10 F series transducer, a hazardous seal must be used to suit hazardous area classification. This seal is **not** supplied by Milltronics. For more information, refer to page 26.

(9)

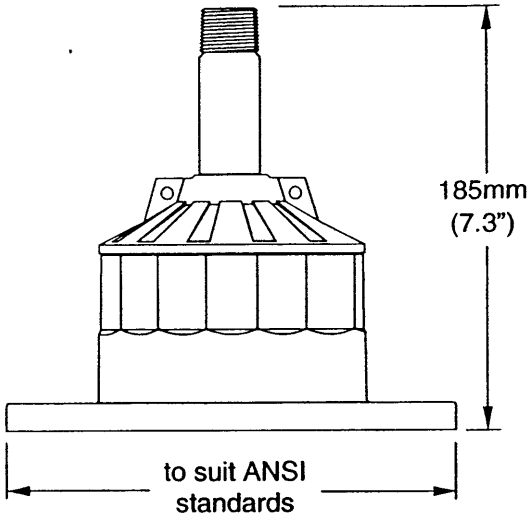
18.3

XPS-15 F Series Transducers

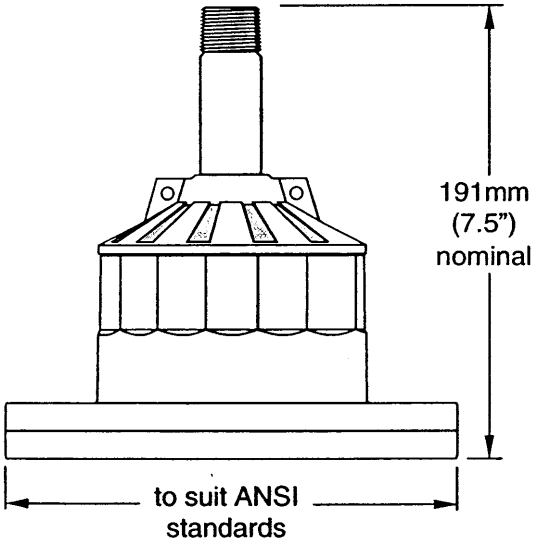
Standard



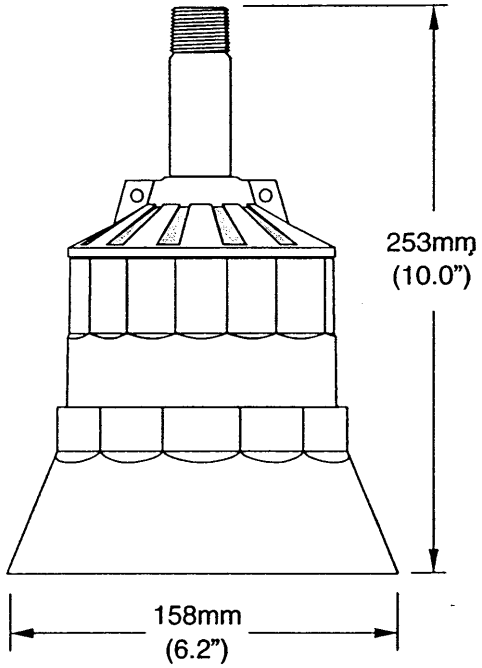
Flange (optional)



Split Flange (optional)



Submergence Shield (optional)



Refer to submergence shield instructions
(Milltronics' manual number PL-530)

Note:
The XPS 15 F comes equipped with a stainless steel coupling suitable for use in hazardous locations.

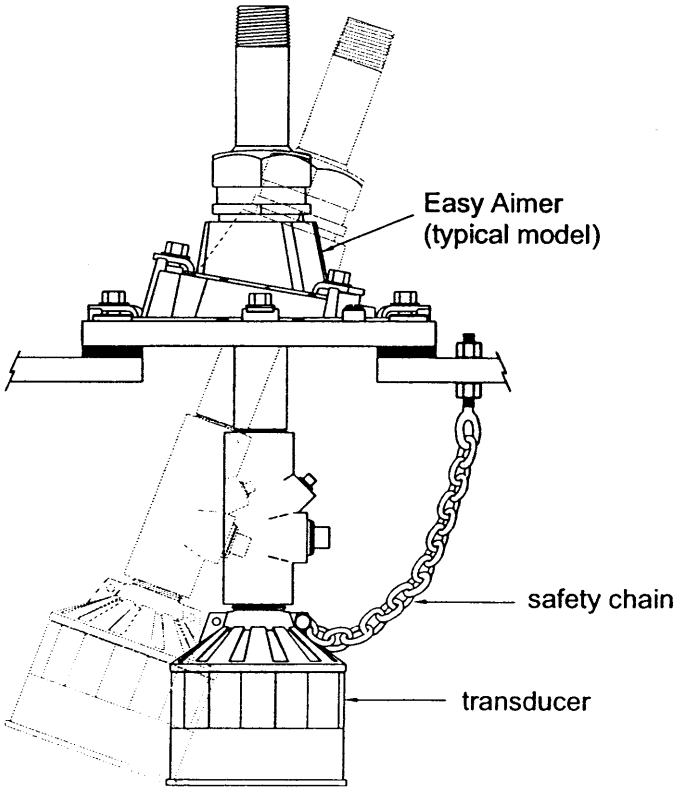
(10)
18.3

Mounting

Recommendations

- Special handling precautions must be taken to protect the face of the transducer from any damage.
- Mount the transducer so that it is *above the maximum material level by at least the blanking value (0.3m for XPS 10 F and 0.45m for XPS 15 F).* Refer to the associated transceiver manual for instructions on setting the blanking value.
- On liquid applications, the transducer must be mounted so that the axis of transmission is perpendicular to the liquid surface.
- On solids applications, a Milltronics Easy Aimer should be used to facilitate aiming of the transducer.
- *Do not over-tighten mounting.* Hand tightening of the mounting hardware is sufficient.
- Secure installation by connecting a safety chain from the transducer to a structural member.
- Consider the optional *temperature sensor* when mounting the transducer.

Solids Applications (XPS 10 F shown)



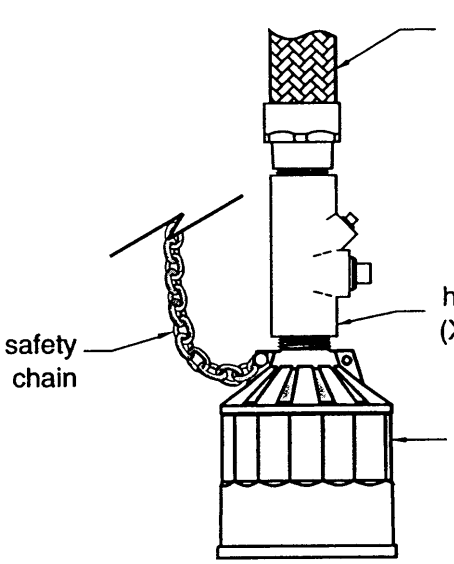
Note:
For the XPS 10 F series transducer, a hazardous seal must be used to suit hazardous area classification. This seal is not supplied by Milltronics. For more information, refer to page 26.

Liquid Applications

Notes:

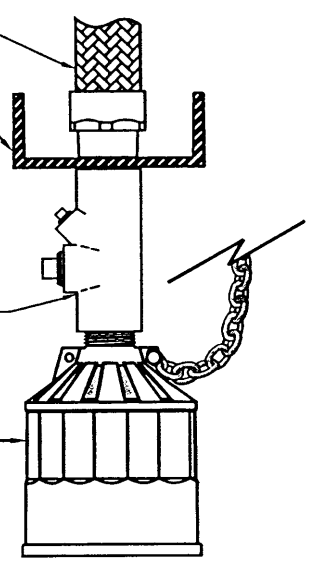
- In, the examples that follow, an XPS 10 F Series transducer is shown using a hazardous seal. This seal is **not** supplied by Milltronics.
- An XPS 15 F transducer can also be used in these applications, but, because it comes equipped with a stainless steel coupling, no hazardous seal is required.

Flexible Conduit (XPS 10 F shown)

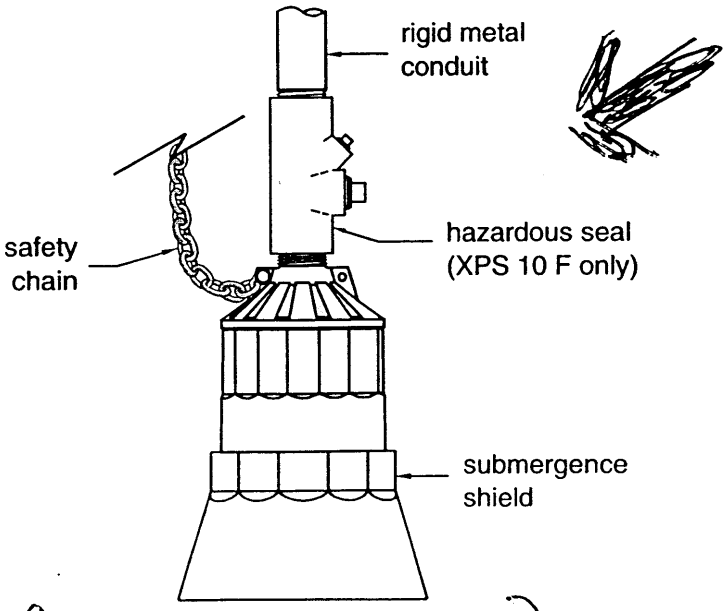


Flexible conduit transducer should not be subjected to wind, vibration or jarring.

Bracket (XPS 10 F shown)



Submersible (XPS 10 F shown)



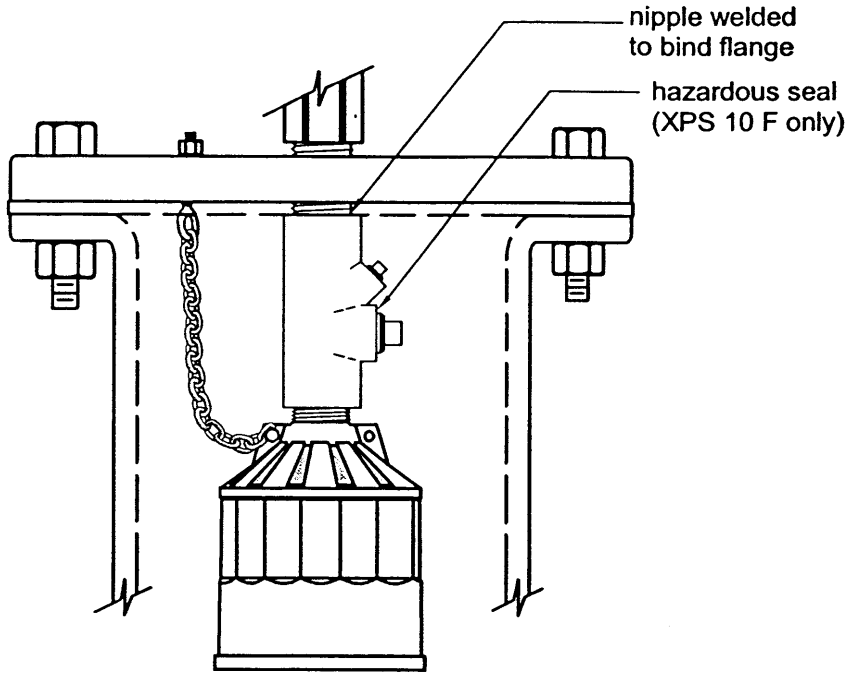
Submersible transducer, used in applications where flooding is possible.

Mounting

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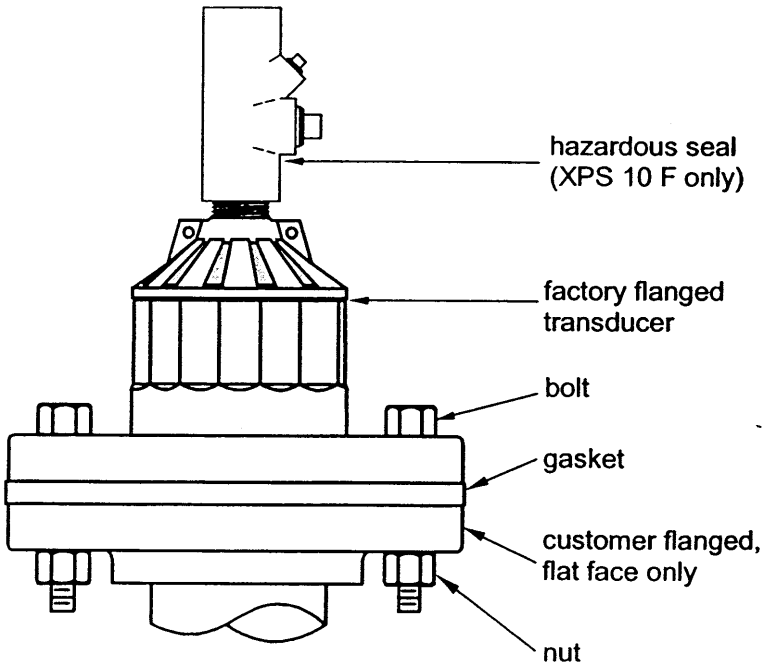
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Blind Flange (XPS 10 F shown)



Flange, gasket, hazardous seal and hardware supplied by customer.
Refer to page 19

Flanged (XPS 10 F shown)



Flange, gasket, and hardware supplied by customer.
Refer to page 19

Note: Tighten the flange bolts evenly in order to ensure a good seal between the mating flanges.
Caution: Over-tightening can cause performance degradation.

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18.3

Interconnection

Note:
Installation should only be performed by qualified personnel and in accordance with local governing regulations.

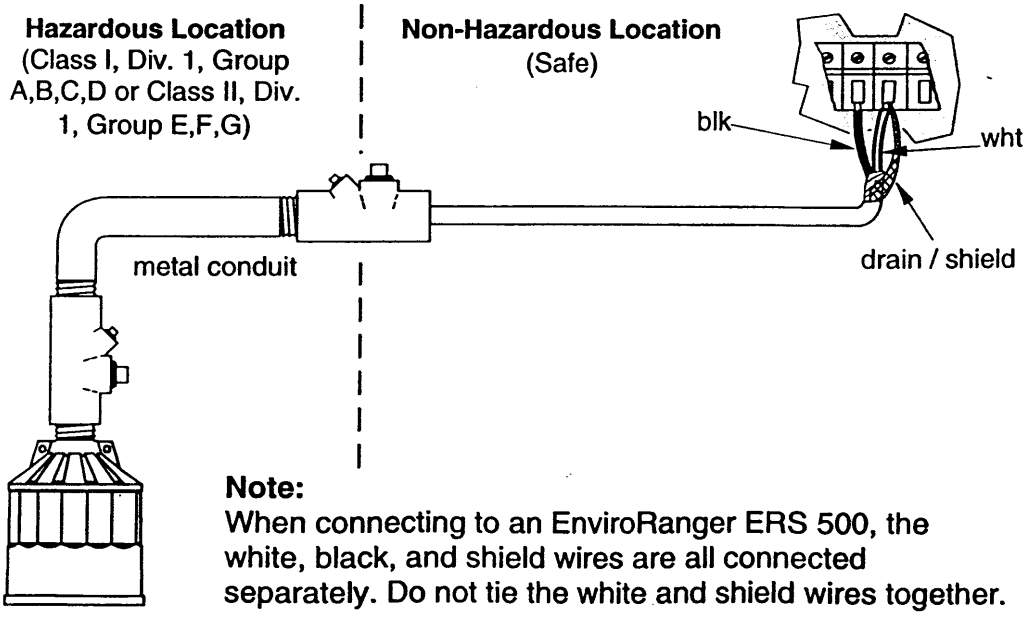
Recommendations

- When using an XPS 15 F transducer, configure the electronic transceiver for an XCT-12. These two transducers use the same settings.
- Do not route cable openly.
- For optimum isolation against electrical noise, run cable separately in a grounded metal conduit.
- Seal all thread connections to prevent ingress of moisture.
- Do not run cable near high voltage or current runs, contactors and SCR control drives.

Note:
In the interconnection examples that follow:

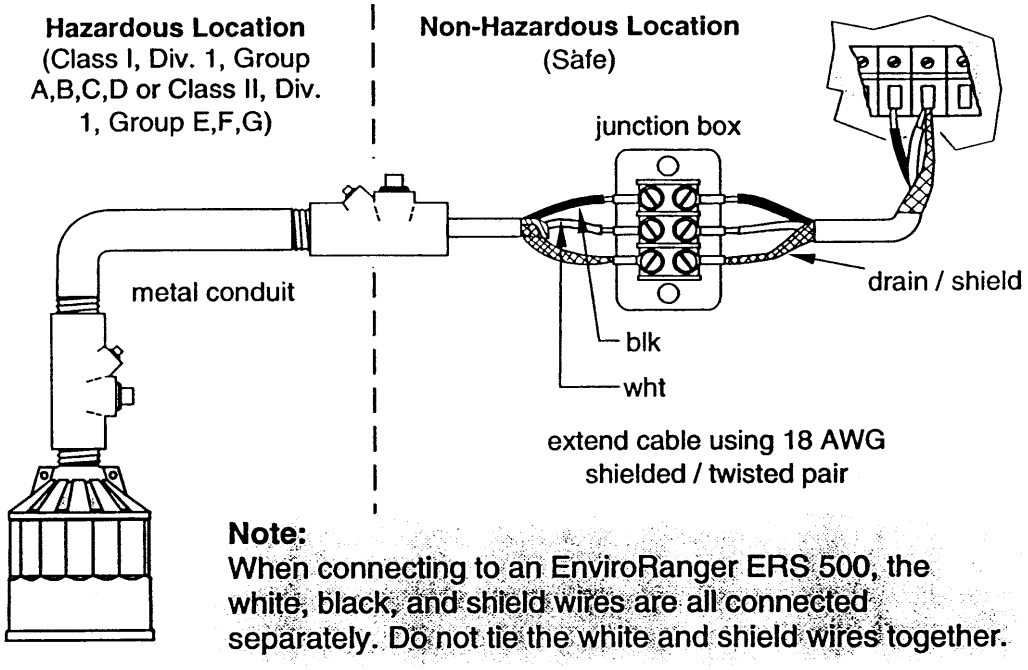
- an XPS 10 F Series transducer is shown. An XPS 15 F transducer can also be used, but no hazardous seal is required.
- assume that the transducer is located in a Hazardous location (Class I, Div. 1, Group A,B,C,D or Class II, Div. 1, Group E,F,G.) and the transceiver in a Non-Hazardous (Safe) Location.

Direct Connection (XPS 10 F shown)



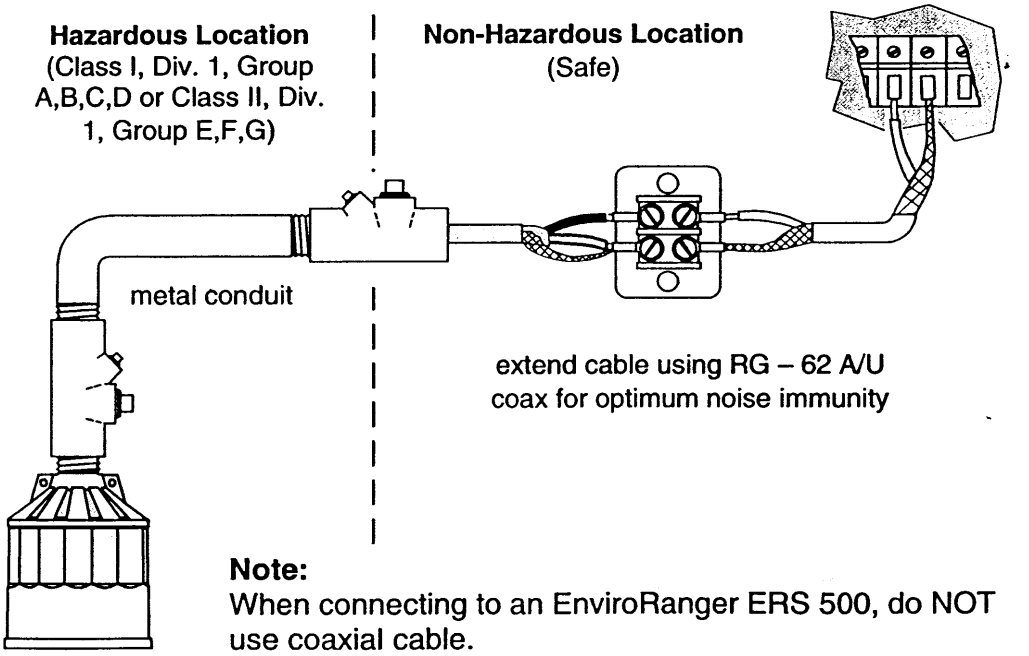
Note:
When connecting to an EnviroRanger ERS 500, the white, black, and shield wires are all connected separately. Do not tie the white and shield wires together.

2-Wire Extension (XPS 10 F shown)



Note:
When connecting to an EnviroRanger ERS 500, the white, black, and shield wires are all connected separately. Do not tie the white and shield wires together.

Coaxial Cable (XPS 10 F shown)



Note:
When connecting to an EnviroRanger ERS 500, do NOT use coaxial cable.

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18.3

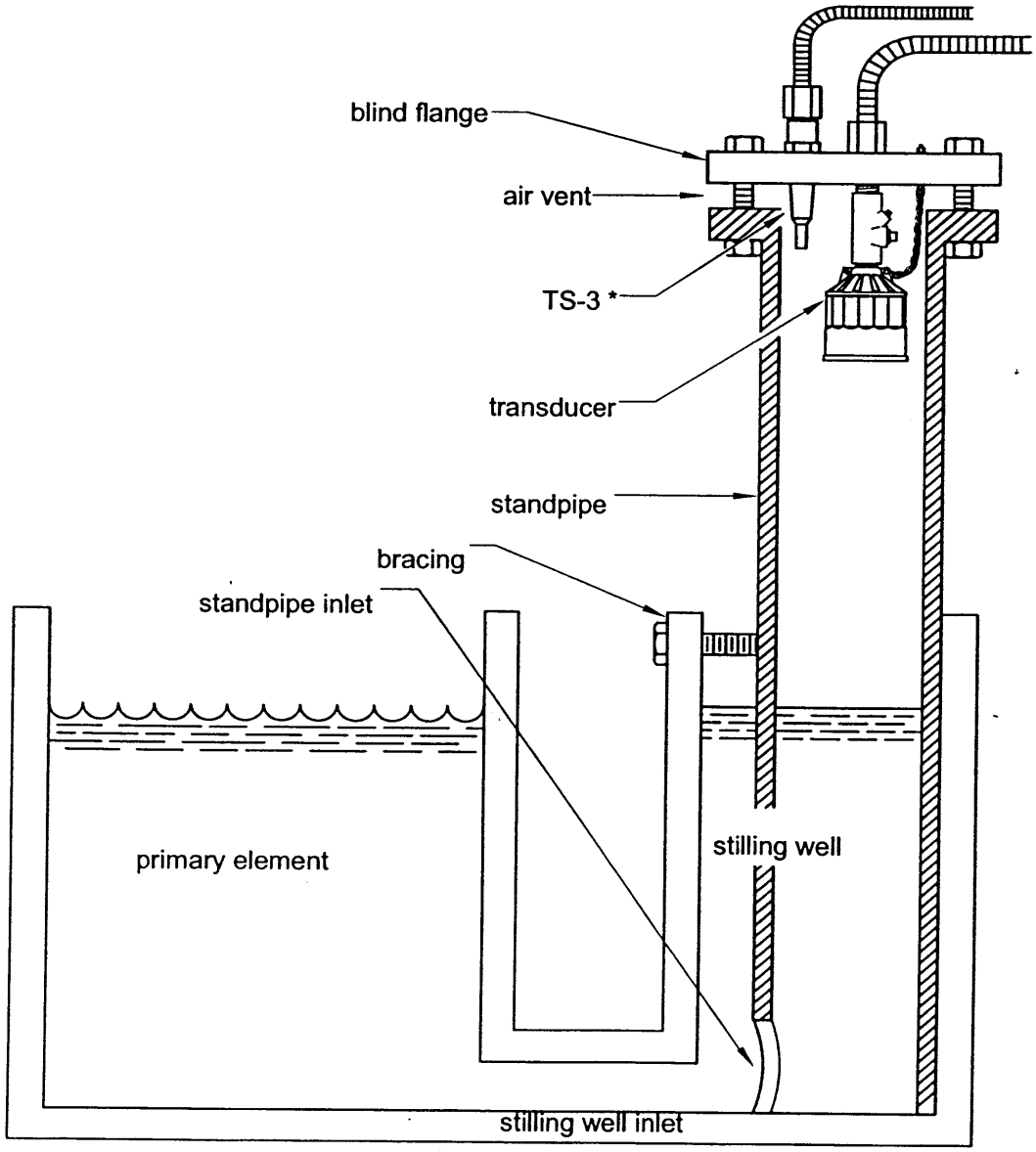
Applications

Notes:

- The transducer is to be used only in the manner outlined in this instruction manual.
- Normally, the transducer requires no cleaning or maintenance. However, if performance changes are observed, immediately shut down the level measurement system and perform a thorough inspection, especially on the transducer.
- An XPS 10 F Series transducer is shown in these examples. An XPS 15 F transducer can also be used, but no hazardous seal is required.

Liquid Applications

Stilling Well / OCM



Refer to page 19.

* the use of a TS-3 temperature sensor provides better temperature tracking in applications where the temperature can change quickly.

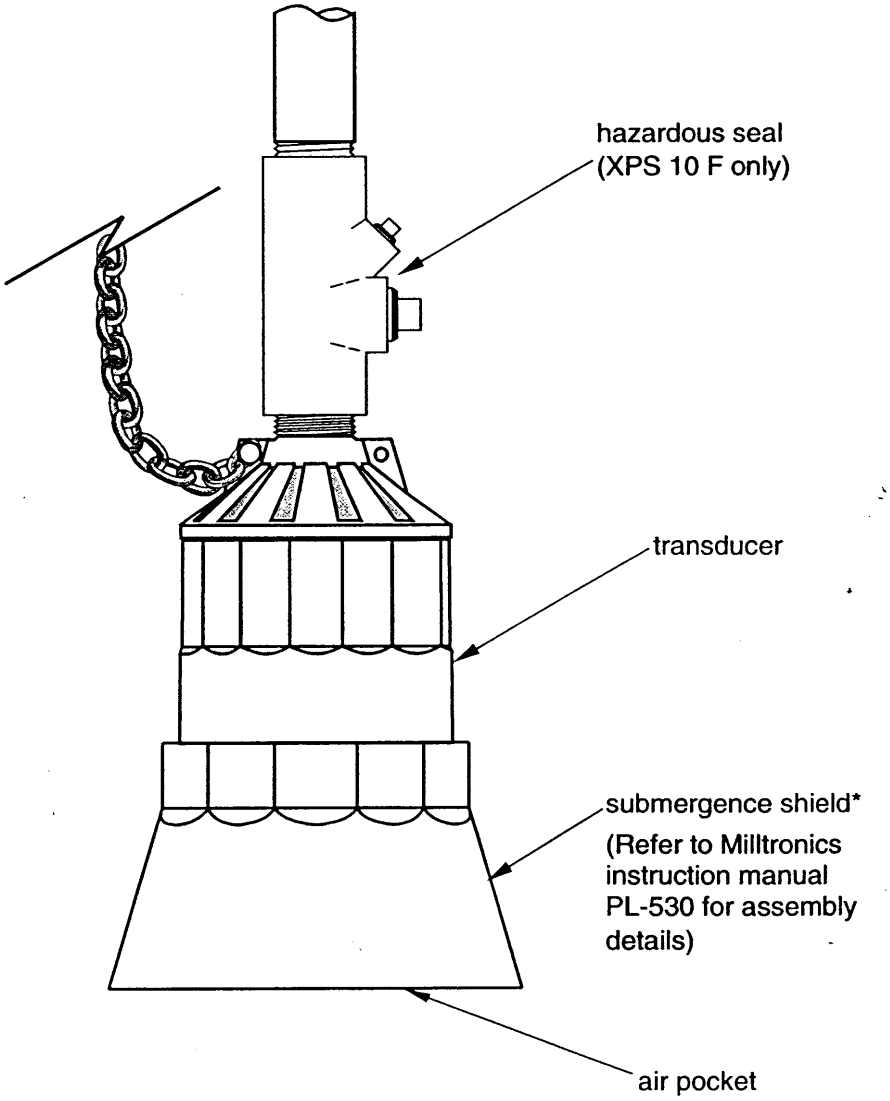
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18.3

Submergence

In applications where flooding is possible, the transducer can be fitted with a submergence shield*. The shield acts as a bell to create an air pocket in front of the transducer face. The associated transceiver* interprets this as a flooding condition, and reacts accordingly.

Note:
Refer to transceiver manual for programming requirements.



* on applicable models

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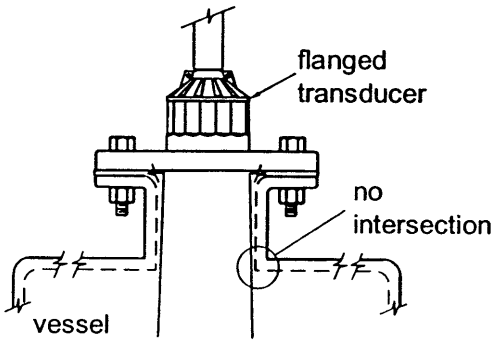
18.3

Standpipes

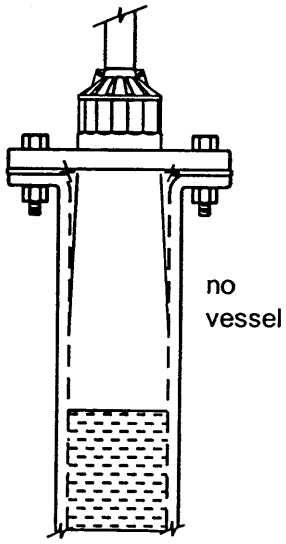
In many applications, access must be made via a standpipe. In such cases, Milltronics can provide factory bonded flanged transducers or a split flange kit that will readily mate to the flanged standpipe. Another option is to hang the transducer from a blind flange.

The standpipe length should be as short and the diameter as large as possible. As a rule of thumb, the -3 dB cone of the sound beam should not intersect the standpipe wall in applications opening into a vessel or larger area. Otherwise, additional blanking will be required to compensate for the interference zone created by the opening.

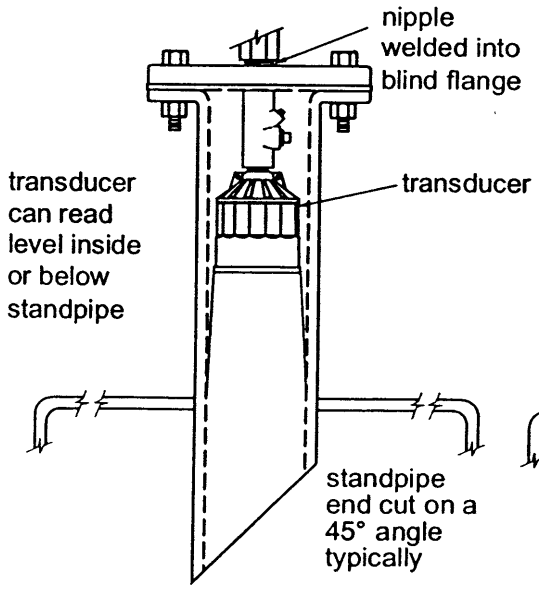
Note: When using a stilling well, make sure there is no build-up, welds, couplings, or other debris on the inside of the well wall. This can affect reliability of measurement.



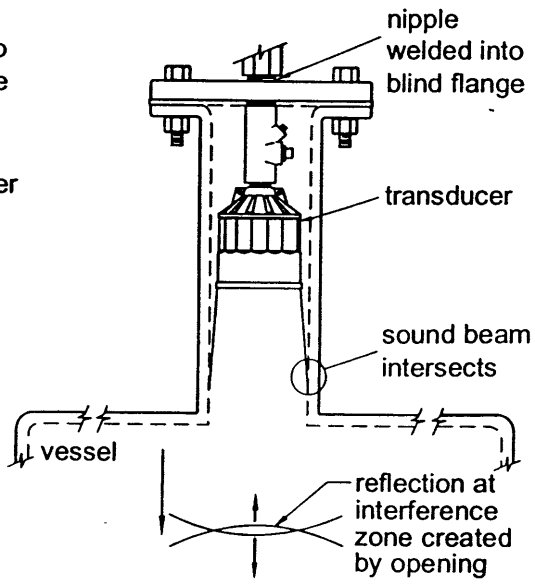
no additional blanking required



no additional blanking required



no additional blanking required

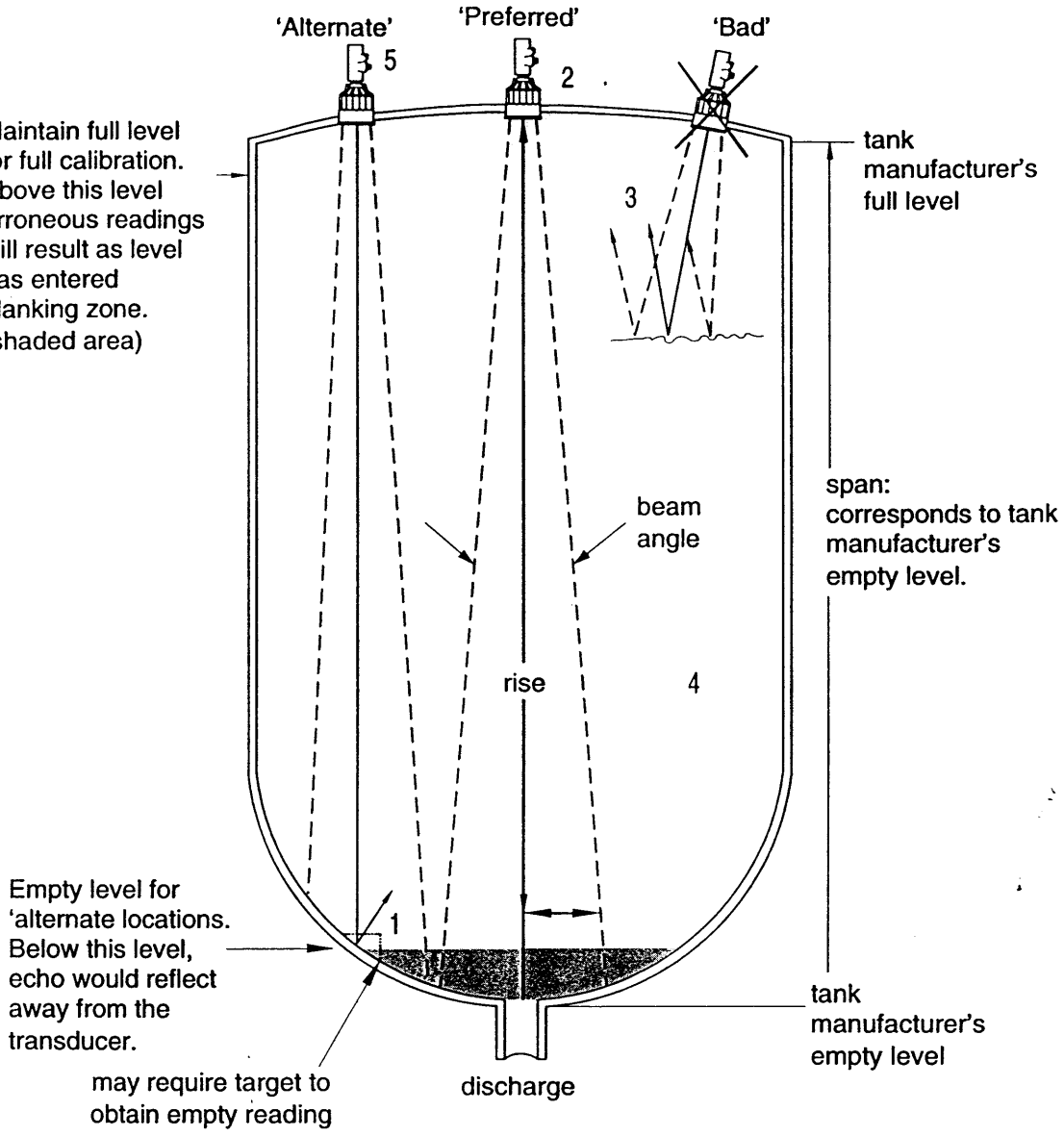


near blanking extension of 150 mm (6")

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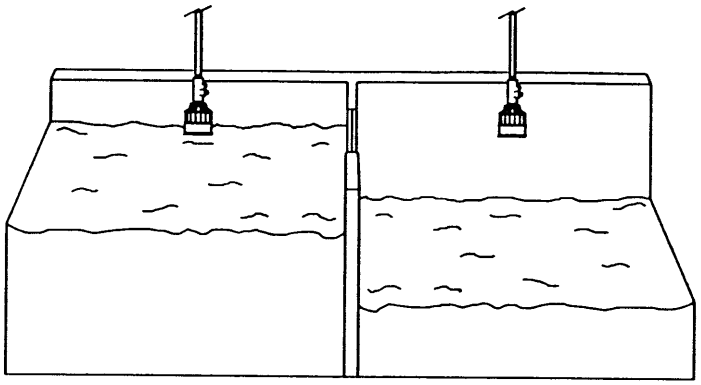
Volume



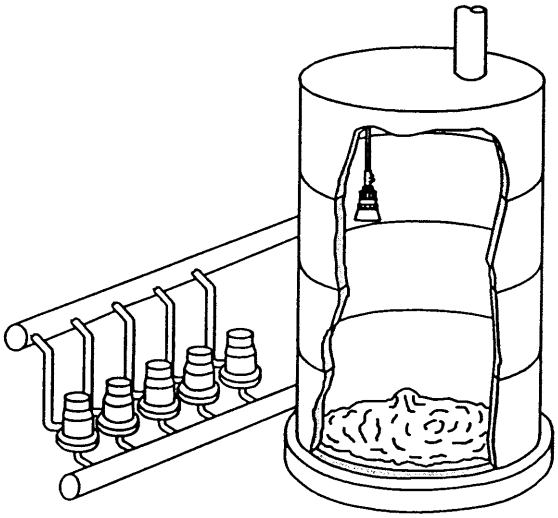
1. Beam should not detect bin bottom. If this occurs, use range extension parameters (on transceivers where available) to omit false echoes. A 6° beam angle (XPS 15 F) represents a rise:run of about 20:1 (10:1 for the 12° beam angle of the XPS 10 F). In most tanks, the transducer should be centered as much as possible (without interference from inlet) for optimum reading range.
2. Sound beam must be perpendicular to liquid surface. If standpipe is used, refer to page 19.
3. Echo has missed improperly levelled transducer.
4. When performing an empty or full calibration, the tank must contain its normal vapour and be at its normal temperature.
5. When used in hazardous areas, the XPS 10 F series transducer (shown) must use a hazardous seal. This seal is **not** supplied by Milltronics. The XPS 15 F Series transducer comes equipped with a stainless steel coupling suitable for use in hazardous locations.

Water / Wastewater

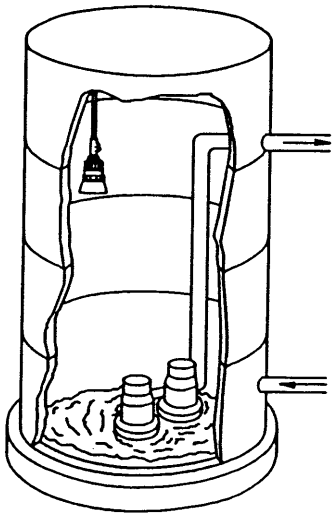
Differential Level



Pump Control



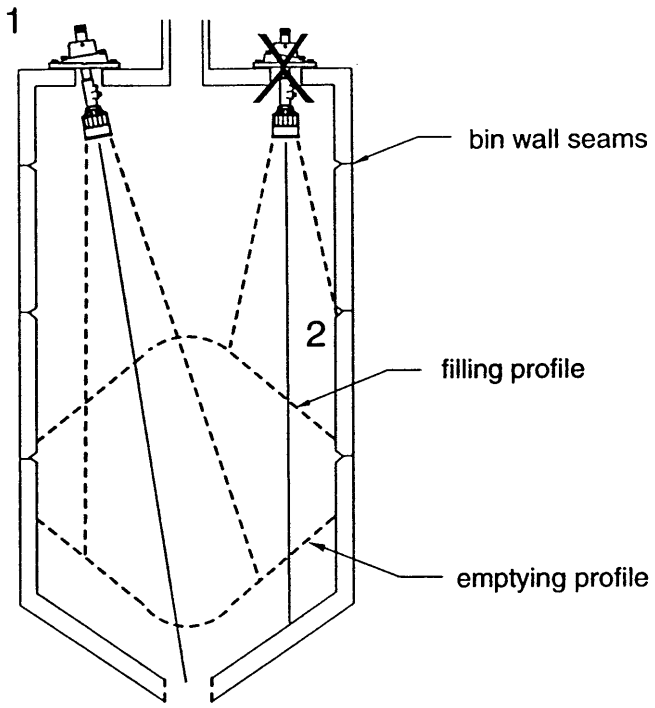
Sewage Lift



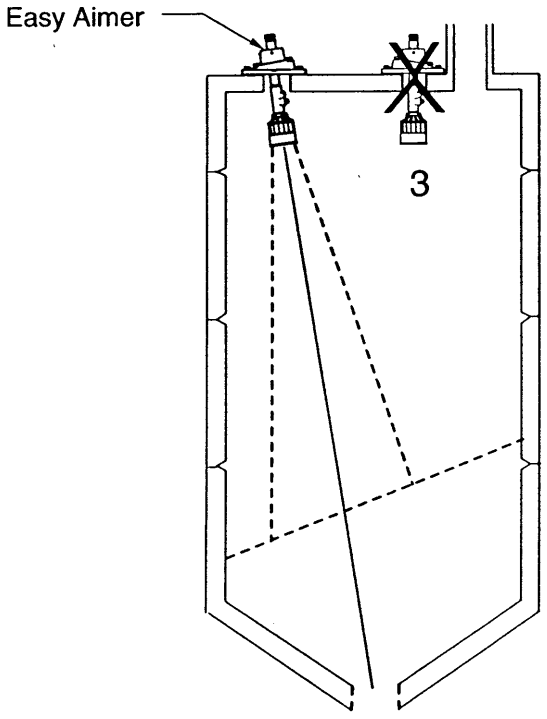
Solids Applications

Typical

1. Transducer angled to avoid seams in bin wall and aimed at discharge in order to read bin when empty.
2. Avoid intersecting bin wall seams, structural members and wall irregularities.



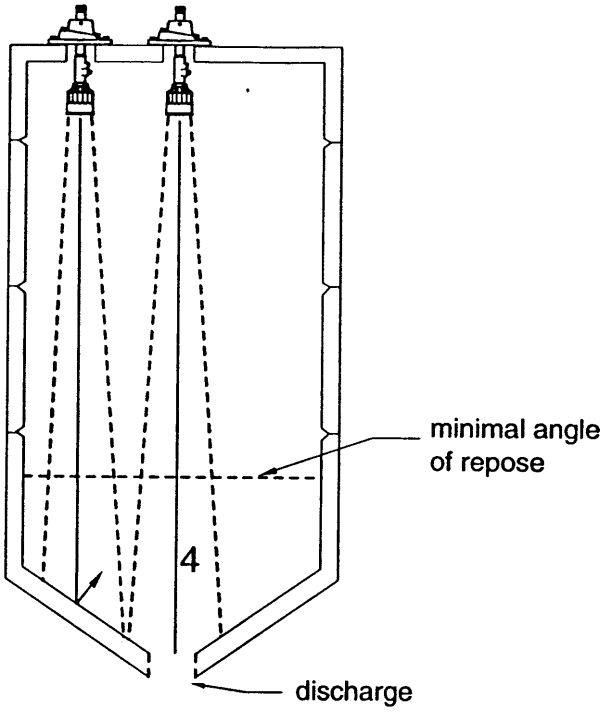
3. Transducer too close to material inlet. Falling material will intersect sound beam and cause erroneous readings or loss of echo.



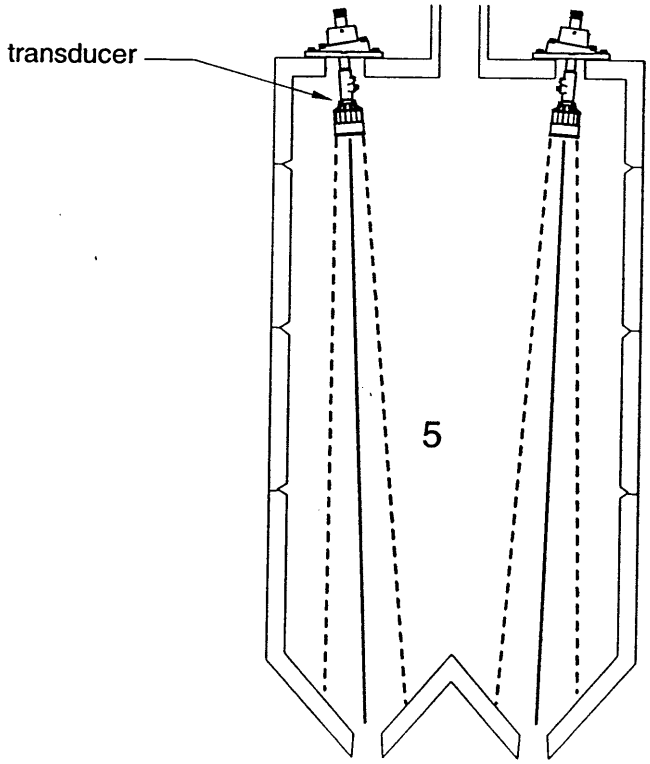
22

8.3

4. On fluid like solids, aim transducer perpendicular to material surface.



5. On dual discharge bins, aim each transducer at the discharge point.



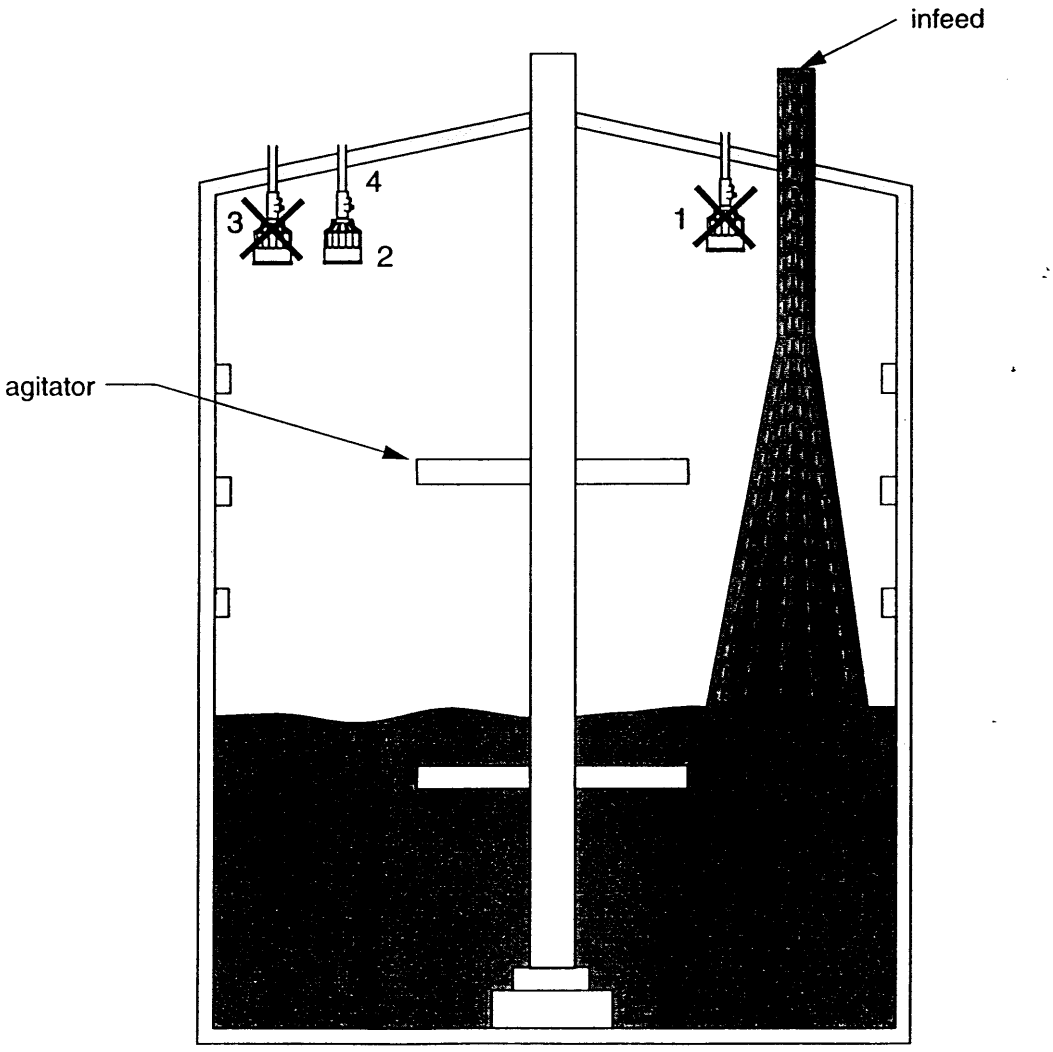
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18.3

Special

Storage Bin with Agitator

1. Transducer should be kept away from infeed.
2. Where agitators are in use, use the Agitator Discrimination parameter on transceivers where available.
3. Transducer should be aimed away from wall projections.
4. When used in hazardous areas, the XPS 10 F series transducer (shown) must use a hazardous seal. This seal is **not** supplied by Milltronics. The XPS 15 F Series transducer comes equipped with a stainless steel coupling suitable for use in hazardous locations.

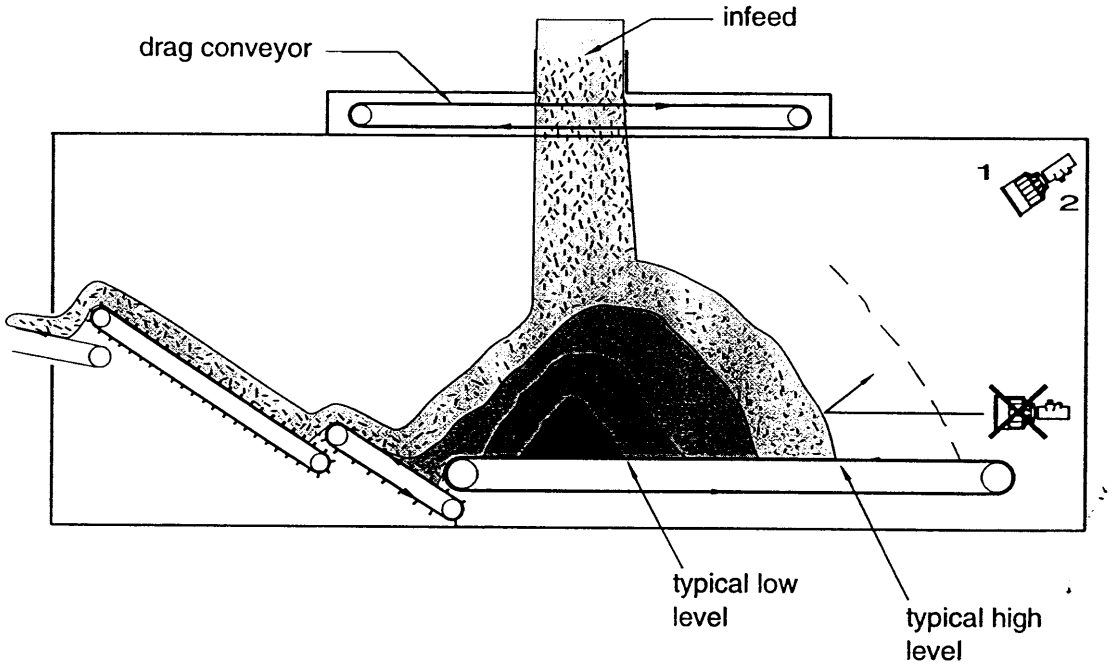


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18.3

Dryer - Wood Chips

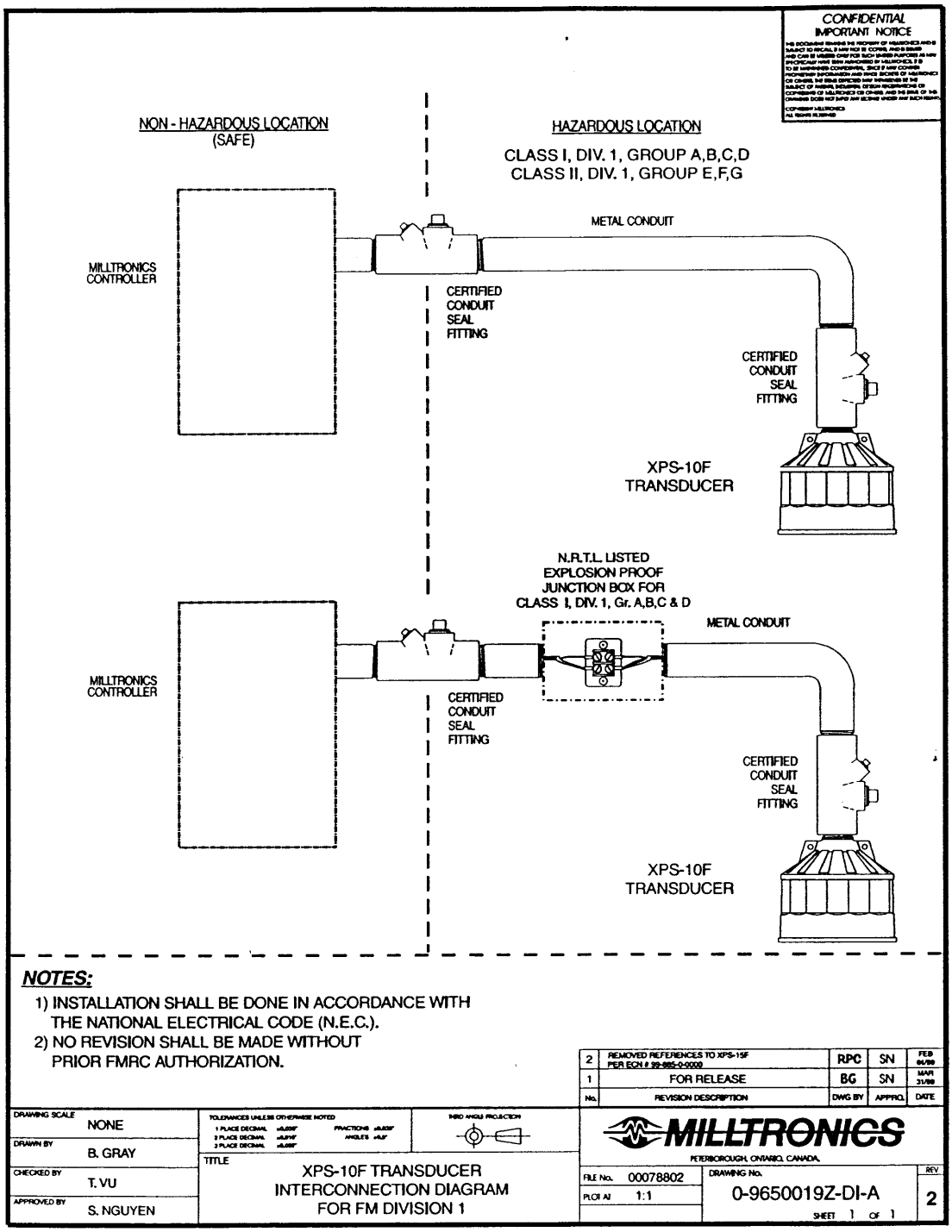
1. Transducer should be mounted perpendicular to slope of wood chips.
2. When used in hazardous areas, the XPS 10 F series transducer (shown) must use a hazardous seal. This seal is **not** supplied by Milltronics. The XPS 15 F Series transducer comes equipped with a stainless steel coupling suitable for use in hazardous locations.



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Installation Diagram for the XPS 10 F



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Subject to change without prior notice

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MILLTRONICS

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Printed in Canada

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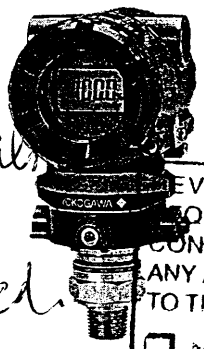
General Specifications

Model EJA510A and EJA530A Absolute and Gauge Pressure Transmitter

GS 01C21F01-00E

[Style: S2]

The absolute and gauge pressure transmitter model EJA510A and EJA530A can be used to measure liquid, gas, or steam pressure. Both output a 4 to 20 mA DC signal corresponding to the measured pressure, and also feature remote setup and monitoring through communications with the BRAIN™ terminal and CENTUM CS™ or μXL™ or HART® 275 host.



■ STANDARD SPECIFICATIONS

□ PERFORMANCE SPECIFICATIONS

Zero-based calibrated span, linear output, wetted parts material code 'S' and silicone oil.

Reference Accuracy of Calibrated Span
(including the effects of zero-based linearity, hysteresis, and repeatability, values are in absolute for EJA510A)

±0.2 % of Span

±0.075 % of Span, when/ HAC is specified (EJA530A: A, B and C capsule)

±0.12 % of Span, when/ HAC is specified (EJA530A: D capsule)

For spans below *X*,

$\pm[0.05+0.15\frac{X}{\text{Span}}]$ % of Span

$\pm[0.025+0.05\frac{X}{\text{Span}}]$ % of span, when/ HAC is specified (EJA530A: A, B and C capsule)

$\pm[0.03+0.09\frac{X}{\text{Span}}]$ % of span, when/ HAC is specified (EJA530A: D capsule)

Where *X* equals:

Capsule	*X* MPa {psi}
A	20 kPa {2.9}
A with/ HAC	40 kPa {5.8}
B	0.2 {29}
C	1 {145}
D	8 {1160}

Ambient Temperature Effects
Total Effects per 28 °C (50 °F) Change
±[0.15% Span + 0.15% URL]

Stability
±0.1% of URL per 12 months

Vibration Effects
±0.1 % of URL
(5 to 15Hz; 4mm peak-to-peak constant displacement, 15 to 150Hz; 2g, 150 to 2000Hz; 1g)

Power Supply Effects
±0.005 % per Volt (from 21.6 to 32 V DC, 350 Ω)

□ FUNCTIONAL SPECIFICATIONS

Span & Range Limits
(Values are in absolute for EJA510A)

Measurement Span and Range		MPa	psi (/D1)	bar (/D3), kgf/cm² (/D4)	
A	Span	10 to 200 kPa	1.45 to 29	0.1 to 2	0.1 to 2
	Range	0 to 200 kPa	0 to 29	0 to 2	0 to 2
B	Span	0.1 to 2	14.5 to 290	1 to 20	1 to 20
	Range	0 to 2	0 to 290	0 to 20	0 to 20
C	Span	0.5 to 10	72.5 to 1450	5 to 100	5 to 100
	Range	0 to 10	0 to 1450	0 to 100	0 to 100
D	Span	5 to 50	720 to 7200	50 to 500	50 to 500
	Range	0 to 50	0 to 7200	0 to 500	0 to 500

T01E.EPS

URL is defined as the Upper Range Limit from the table above.

Zero Adjustment Limits
Zero can be fully elevated or suppressed, within the Lower and Upper Range Limits of the capsule.

External Zero Adjustment
External zero is continuously adjustable with 0.01 % incremental resolution of span. Span may be adjusted locally using the digital indicator with range switch.

Mounting Position Effect
Rotation in diaphragm plane has no effect. Tilting up to 90° will cause zero shift up to 0.27 kPa {1.1 inH_2O} which can be corrected by the zero adjustment.

Output
Two wire 4 to 20 mA DC output with digital communications. BRAIN or HART FSK protocol are superimposed on the 4 to 20 mA signal.

REVIEWED ACCORDING TO THE REQUIREMENTS OF THE GENERAL CONDITIONS OF THE CONTRACT
ANY ACTION INDICATED IS SUBJECT TO THESE REQUIREMENTS
☐ NO EXCEPTIONS TAKEN
☑ MAKE NOTED CORRECTIONS
☐ REVISE & RESUBMIT
☐ REJECTED
DATE May 21/05 BY DC
EARTH TECH (CANADA) INC.

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

YOKOGAWA ◆
Yokogawa Electric Corporation
2-9-32, Nakacho, Musashino-shi, Tokyo, 180-8750 Japan
Phone: 81-422-52-5690 Fax.: 81-422-52-2018

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General Specifications

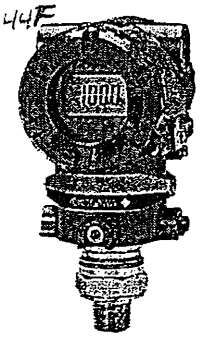
Model EJA510A and EJA530A Absolute and Gauge Pressure Transmitter

DPharp

GS 01C21F01-00E

[Style: S2]

EJA530A - EA54N-D2EE - CF1/D1/
M25/N1S - 44F



REVIEWED ACCORDING TO TH REQUIREMENTS OF THE GENERA CONDITIONS OF THE CONTRAC ANY ACTION INDICATED IS SUBJEC TO THESE REQUIREMENTS.

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

DATE 11 Aug 05 BY D.C
EARTH TECH (CANADA) INC

The absolute and gauge pressure transmitter model EJA510A and EJA530A can be used to measure liquid, gas, or steam pressure. Both output a 4 to 20 mA DC signal corresponding to the measured pressure, and also feature remote setup and monitoring through communications with the BRAIN™ terminal and CENTUM CS™ or μXL™ or HART® 275 host.

■ STANDARD SPECIFICATIONS

☐ PERFORMANCE SPECIFICATIONS

Zero-based calibrated span, linear output, wetted parts material code 'S' and silicone oil.

Reference Accuracy of Calibrated Span
(including the effects of zero-based linearity, hysteresis, and repeatability, values are in absolute for EJA510A)

±0.2 % of Span

±0.075 % of Span, when/ HAC is specified (EJA530A: A, B and C capsule)

±0.12 % of Span, when/ HAC is specified (EJA530A: D capsule)

For spans below *X*,

$\pm[0.05+0.15\frac{X}{\text{Span}}]$ % of Span

$\pm[0.025+0.05\frac{X}{\text{Span}}]$ % of span, when/ HAC is specified (EJA530A: A, B and C capsule)

$\pm[0.03+0.09\frac{X}{\text{Span}}]$ % of span, when/ HAC is specified (EJA530A: D capsule)

Where *X* equals:

Capsule	*X* MPa {psi}
A	20 kPa {2.9}
A with/ HAC	40 kPa {5.8}
B	0.2 {29}
C	1 {145}
D	8 {1160}

Ambient Temperature Effects
Total Effects per 28 °C (50 °F) Change
±[0.15% Span + 0.15% URL]

Stability
±0.1% of URL per 12 months

Vibration Effects
±0.1 % of URL
(5 to 15Hz; 4mm peak-to-peak constant displacement, 15 to 150Hz; 2g, 150 to 2000Hz; 1g)

Power Supply Effects
±0.005 % per Volt (from 21.6 to 32 V DC, 350 Ω)

☐ FUNCTIONAL SPECIFICATIONS

Span & Range Limits

(Values are in absolute for EJA510A)

Measurement Span and Range		MPa	psi (/D1)	bar (/D3)	kgf/cm²(/D4)
A	Span	10 to 200 kPa	1.45 to 29	0.1 to 2	0.1 to 2
	Range	0 to 200 kPa	0 to 29	0 to 2	0 to 2
B	Span	0.1 to 2	14.5 to 290	1 to 20	1 to 20
	Range	0 to 2	0 to 290	0 to 20	0 to 20
C	Span	0.5 to 10	72.5 to 1450	5 to 100	5 to 100
	Range	0 to 10	0 to 1450	0 to 100	0 to 100
D	Span	5 to 50	720 to 7200	50 to 500	50 to 500
	Range	0 to 50	0 to 7200	0 to 500	0 to 500

T01E.EPS

URL is defined as the Upper Range Limit from the table above.

Zero Adjustment Limits
Zero can be fully elevated or suppressed, within the Lower and Upper Range Limits of the capsule.

External Zero Adjustment
External zero is continuously adjustable with 0.01 % incremental resolution of span. Span may be adjusted locally using the digital indicator with range switch.

Mounting Position Effect
Rotation in diaphragm plane has no effect. Tilting up to 90° will cause zero shift up to 0.27 kPa {1.1 inH_2O} which can be corrected by the zero adjustment.

Output
Two wire 4 to 20 mA DC output with digital communications. BRAIN or HART FSK protocol are superimposed on the 4 to 20 mA signal.

YOKOGAWA ◆

Yokogawa Electric Corporation
2-9-32, Nakacho, Musashino-shi, Tokyo, 180-8750 Japan
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Failure Alarm

Output status at CPU failure and hardware error;
Up-scale: 110%, 21.6 mA DC or more (standard)
Down-scale: -5%, 3.2 mA DC or less

Damping Time Constant (1st order)

The sum of the amplifier and capsule damping time constant must be used for the overall time constant. Amp damping time constant is adjustable from 0.2 to 64 seconds.

Capsule (Silicone Oil)	A, B, C, and D
Time Constant (approx. sec)	0.2

Ambient Temperature Limits
(approval codes may affect limits)

-40 to 85 °C (-40 to 185 °F)
-30 to 80 °C (-22 to 176 °F) with LCD Display

Process Temperature Limits
(approval codes may affect limits)

-40 to 120 °C (-40 to 248 °F)

Ambient Humidity Limits

5 to 100 % RH @ 40 °C (104 °F)

Maximum Overpressure

	Capsule	
Capsule	EJA510A	EJA530A
A	4 MPa abs{580 psia}	4 MPa {580 psig}
B	4 MPa abs{580 psia}	4 MPa {580 psig}
C	20 MPa abs{2900 psia}	20 MPa {2900 psig}
D	60 MPa abs{8500 psia}	60 MPa {8500 psig}

Working Pressure Limits (Silicone Oil)
Maximum Pressure Limit

	Capsule	
Capsule	EJA510A	EJA530A
A	200 kPa abs{29 psia}	200 kPa {29 psig}
B	2 MPa abs{290 psia}	2 MPa {290 psig}
C	10 MPa abs{1450 psia}	10 MPa {1450 psig}
D	50 MPa abs{7200 psia}	50 MPa {7200 psig}

Minimum Pressure Limit
See graph below.

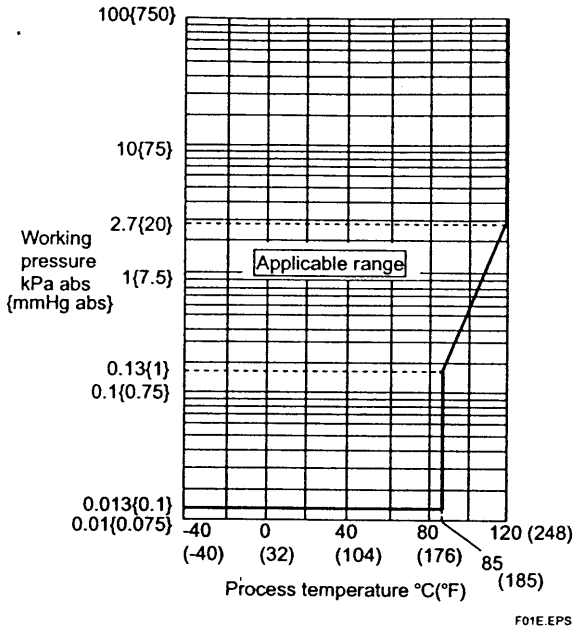


Figure 1. Working Pressure and Process Temperature [For model EJA510A]

Supply & Load Requirements

(Safety approvals can affect electrical requirements, see graph below)
With 24 V DC supply, up to a 570 Ω load can be used.

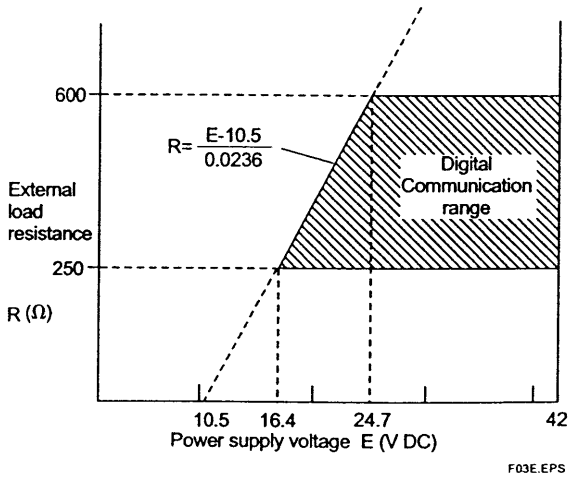


Figure 2. Relationship Between Power Supply Voltage and External Load Resistance

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Supply Voltage
10.5 to 42 V DC for operation
16.4 to 42 V DC for digital communications
(16.4 to 30 V DC for Intrinsically safe type)

Load
0 to 1335 Ω for operation
250 to 600 Ω for digital communication

EMC Conformity Standards: CE , C N200
EN61326, AS/NZS 2064

Communication Requirements

BRAIN

Communication Distance
Up to 2 km (1.25 miles) when using CEV polyethylene-insulated PVC-sheathed cables. Communication distance varies depending on type of cable used.

Load Capacitance
0.22 μF or less (see note)

Load Inductance
3.3 mH or less (see note)

Input Impedance of communicating device
10 kΩ or more at 2.4 kHz.

Note : For general-use and Flameproof type.
For Intrinsically safe type, please refer to 'OPTIONAL SPECIFICATIONS.'

HART

Communication Distance
Up to 1.5 km (1 mile) when using multiple twisted pair cables. Communication distance varies depending on type of cable used.

Use the following formula to determine cable length for specific applications:

$$L = \frac{65 \times 10^6}{(R \times C)} - \frac{(C_f + 10{,}000)}{C}$$

Where:
L = length in meters or feet
R = resistance in Ω (including barrier resistance)
C = cable capacitance in pF/m or pF/ft
C_f = maximum shunt capacitance of receiving devices in pF/m or pF/ft

☐ PHYSICAL SPECIFICATIONS

Wetted Parts Materials:

Diaphragm and Process connector
Refer to 'MODEL AND SUFFIX CODE.'

Non-wetted Parts Materials:

Housing
Low copper cast-aluminum alloy with polyurethane paint (Munsell 0.6GY3.1/2.0)

Degrees of Protection
IP67, NEMA4X, JIS C0920 immersion proof

Cover O-rings
Buna-N

Data plate and tag
SUS304

Fill Fluid
Silicone, Fluorinated oil (option)

Weight
1.6 kg (3.5 lb) without integral indicator, mounting bracket.

Connections
Refer to the model code to specify the electrical connection type.

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■ MODEL AND SUFFIX CODES

● Model EJA510A and EJA530A

Model	Suffix Codes		Description
EJA510A	·····		Absolute pressure transmitter
EJA530A	·····		Gauge pressure transmitter
Output Signal	-D ·····		4 to 20 mA DC with digital communication (BRAIN protocol)
	-E ·····		4 to 20 mA DC with digital communication (HART protocol, refer to GS 01C22T01-00E)
Measurement span (capsule)	A ·····		10 to 200 kPa{0.1 to 2 kgf/cm²}
	B ·····		0.1 to 2 MPa{1 to 20 kgf/cm²}
	C ·····		0.5 to 10 MPa{5 to 100 kgf/cm²}
	D ·····		5 to 50 MPa{50 to 500 kgf/cm²}
Wetted parts material			[Process Connection] [Diaphragm]
	S ·····		SUS316L Hastelloy C-276
	H ·····		Hastelloy C-276 Hastelloy C-276
Process connection	4 ·····		1/2 NPT female
	7 ·····		1/2 NPT male
	8 ·····		G 1/2 DIN 16 288 male
	9 ·····		M20×1.5 DIN 16 288 male
—	N ·····		Always N
—	-0 ·····		Always 0
Electrical connection		0 ·····	G1/2 female, one electrical connection
		2 ·····	1/2 NPT female, two electrical connections without blind plug
		3 ·····	Pg 13.5 female, two electrical connections without blind plug
		4 ·····	M20 female, two electrical connections without blind plug
		5 ·····	G1/2 female, two electrical connections and a blind plug
		7 ·····	1/2 NPT female, two electrical connections and a blind plug
		8 ·····	Pg 13.5 female, two electrical connections and a blind plug
		9 ·····	M20 female, two electrical connections and a blind plug
Integral indicator		D ···	Digital indicator
		E ···	Digital indicator with the range setting switch
		☆ N ···	(None)
Mounting bracket		E ··	SECC Carbon steel 2-inch pipe mounting
		F ··	SUS304 2-inch pipe mounting
		☆ N ··	(None)
Optional codes			/□ Optional specification

T02E.EPS

The '☆' marks indicate the most typical selection for each specification. Example: EJA530A-DAS4N-02NN/□

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■ OPTIONAL SPECIFICATIONS (For Explosion Protected types)

Item	Description	Code
Factory Mutual (FM)	FM Explosionproof Approval Explosionproof for Class I, Division 1, Groups B, C and D Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G Hazardous(classified) locations, indoors and outdoors(NEMA 4X) Temperature class: T6 Amb. Temp.: –40 to 60°C(–40 to 140°F) Electrical connection: 1/2 NPT female *1	FF1
	FM Intrinsically safe Approval *3 Intrinsically Safe for Class I, Division 1, Groups A, B, C & D, Class II, Division 1, Groups E, F & G and Class III, Division 1 Hazardous Locations. Nonincendive for Class I, Division 2, Groups A, B, C & D, Class II, Division. 2, Groups E, F & G, and Class III, Division 1 Hazardous Locations. Enclosure: "NEMA 4X," Temp. Class: T4, Amb. Temp.: –40 to 60°C(–40 to 140°F) Intrinsically Safe Apparatus Parameters [Groups A, B, C, D, E, F and G] Vmax=30 V, Imax=165 mA, Pmax=0.9 W, Ci=22.5 nF, Li=730 μH [Groups C, D, E, F and G] Vmax=30 V, Imax=225 mA, Pmax=0.9 W, Ci=22.5 nF, Li=730 μH Electrical connection: 1/2 NPT female *1	FS1
	Combined FF1 and FS1 *3 Electrical connection: 1/2 NPT female *1	FU1
CENELEC ATEX	CENELEC ATEX (KEMA) Flameproof Approval [PENDING] EExd IIC T4, T5, T6, Amb. Temp.: T4 and T6; –40 to 75°C(–40 to 167°F), T5; –40 to 80 °C(–40 to 176 °F) Max. process Temp.: T4; 120°C(248°F), T5; 100°C(212°F), T6; 85°C(185°F) Electrical connection: 1/2 NPT female and M20 female *2	
	CENELEC ATEX (KEMA) Intrinsically safe Approval *3 EEx ia IIC T4, Amb. Temp.: –40 to 60 °C(–40 to 140 °F) Ui=30 V, Ii=165 mA, Pi=0.9 W, Ci=22.5 nF, Li=730 μH Electrical connection: 1/2 NPT female and M20 female *2	KS2
	CENELEC ATEX Type of protection "n" *3 Ex nL IIC T4, Amb. Temp.: –40 to 60°C(–40 to 140°F) U=30 V, I=165 mA Electrical connection: 1/2 NPT female and M20 female *2	KN2
CENELEC (KEMA)	CENELEC (KEMA) Flameproof, Intrinsically safe, and Type n Approval Ex nA IIC T4, Amb. Temp.: –40 to 60°C(–40 to 140°F) U=30 V, I=165 mA Electrical connection: 1/2 NPT female, Pg 13.5 female and M20 female *4	KU1
Canadian Standards Association (CSA)	CSA Explosionproof Approval Explosionproof for Class I, Division 1, Groups B, C and D Dustignitionproof for Class II/III, Division 1, Groups E, F and G Division2 'SEALS NOT REQUIRED,' Temp. Class: T4, T5, T6 Encl Type 4x Max. Process Temp.: T4; 120°C(248°F), T5; 100°C(212°F), T6; 85°C(185°F) Amb. Temp.: –40 to 80°C(–40 to 176°F) Electrical connection: 1/2 NPT female *1	CF1
	CSA Intrinsically safe Approval *3 Class I, Groups A, B, C and D Class II and III, Groups E, F and G Encl Type 4x, Temp. Class: T4, Amb. Temp.: –40 to 60°C(–40 to 140°F) Vmax=30 V, Imax=165 mA, Pmax=0.9 W, Ci=22.5 nF, Li=730 μH Electrical connection: 1/2 NPT female *1	CS1
	Combined CF1 and CS1 *3 Electrical connection: 1/2 NPT female *1	CU1
Standards Association of Australia (SAA)	SAA Flameproof, Intrinsically safe and Non-sparking Approval *3 Ex d IIC T4/T5/T6, IP67 class I, Zone 1, Amb. Temp. : –40 to 80°C(–40 to 176°F) Max. Process Temp.: T4; 120°C(248°F), T5; 100°C(212°F), T6; 85°C 185°F) Ex ia IIC T4, IP67 class I, Zone 0 Ex n IIC T4, IP67 class I, Zone 2 Ui=30 V DC, Ii=165 mA DC, Wi=0.9 W, Amb. Temp.: –40 to 60°C(–40 to 140°F) Electrical connection: 1/2 NPT female, Pg 13.5 female and M20 female *2	SU1

T03E.EPS

*1: Applicable for Electrical connection code 2 and 7.
*2: Applicable for Electrical connection code 2, 4, and 7.
*3: Use the safety barrier certified by the testing laboratories(BARD-400 is not applicable).
*4: Applicable for Electrical connection code 2, 3, 4 and 7.

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