

MODEL P48 - 1/16 DIN PROCESS CONTROLLER

- PID CONTROL WITH REDUCED OVERSHOOT
- ACCEPTS 0 to 10 VDC or 0/4 to 20 mA DC INPUTS
- OPTIONAL TWO LINEAR DC OUTPUTS (0 to 10 V, 0/4 to 20 mA)
- OPTIONAL DUAL ALARM OUTPUTS
- OPTIONAL REMOTE SETPOINT INPUT (0/4 to 20 mA)
- OPTIONAL RS485 SERIAL COMMUNICATIONS
- SECOND SETPOINT SETTING
- SETPOINT RAMPING FOR PROCESS STARTUP
- PROGRAMMABLE USER INPUT (Digital) FOR ADDED FLEXIBILITY
- PARAMETER SECURITY VIA PROGRAMMABLE LOCKOUTS
- MANUAL/AUTOMATIC CONTROL MODES
- ON DEMAND AUTO-TUNING OF PID CONTROL SETTINGS
- DUAL LED DISPLAYS FOR SIMULTANEOUS INDICATION OF PROCESS AND SETPOINT



- STATUS INDICATORS FOR OUTPUTS AND CONTROL MODES
- PC SOFTWARE AVAILABLE FOR CONTROLLER CONFIGURATION
- NEMA 4X/IP65 BEZEL



UL Recognized Component,
 File # E156876

DESCRIPTION

The P48 Controller accepts either a 0 to 10 VDC or a 0/4 to 20 mA DC signal, precisely displays the input process signal according to the programmable scaling points, and provides an accurate output control signal (*time proportional or linear DC*) to maintain the process at the desired control point. The controller's comprehensive yet simple programming allows it to meet a wide variety of application requirements.

In the PID control mode the controller operates with on-demand auto-tune, which will establish the tuning constants. The PID tuning constants may be fine-tuned by the operator at any time and then locked out from further modification. The controller employs a unique overshoot suppression feature, which allows the quickest response without excessive overshoot. The unit can be transferred to operate in the manual mode, providing the operator with direct control of the output. The controller may also operate in the ON/OFF control mode with adjustable hysteresis. A second setpoint is available to allow quick selection of a different setpoint setting.

Dual 4-digit displays allow viewing of the process and setpoint simultaneously. Front panel indicators inform the operator of the controller and output status. On some models, the main control output and the alarm outputs are field replaceable.

Optional alarm(s) can be configured to activate according to a variety of actions (Absolute HI or LO, Deviation HI or LO, and Band IN or OUT) with

adjustable hysteresis. A standby feature suppresses the alarm during power-up until the process stabilizes outside the alarm region. The second alarm can be configured as a secondary PID output (heat/cool applications).

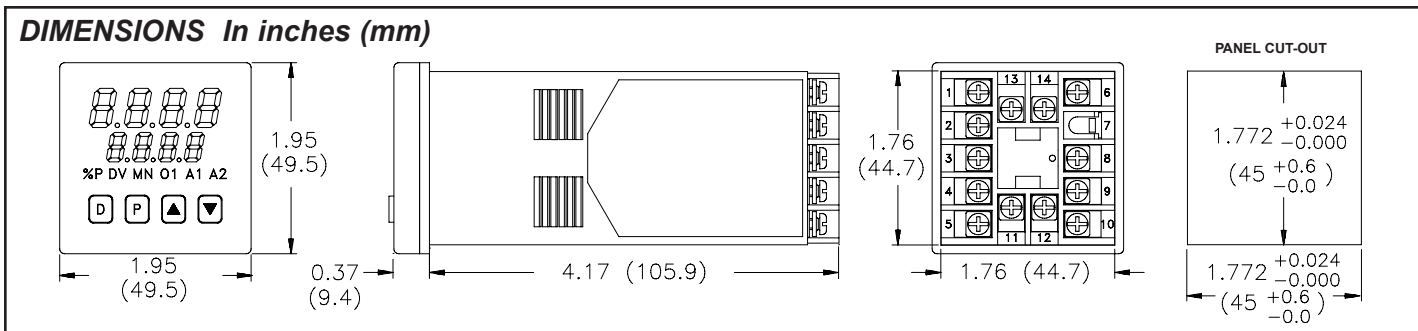
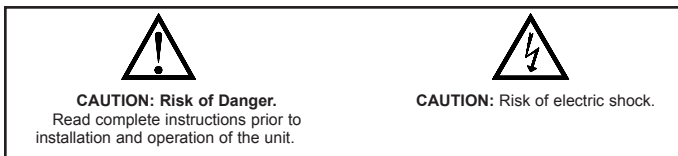
Optional Main Linear DC output (10 V or 20 mA) can be used for control or process re-transmission purposes. Programmable output update time reduces valve or actuator activity. The output range can be scaled independent of the input range.

Optional Second Linear DC output (10 V or 20 mA) provides an independent process re-transmission, while the main Linear DC output is being used for control. The output range can be scaled independent of the input range.

Optional Remote Setpoint input (0/4 to 20 mA) allows for cascade control loops; and allows for remotely driven setpoint signal from computers or other similar equipment. Straightforward end point scaling with independent filtering and local/remote transfer option expand the controller's flexibility.

The optional RS485 serial communication interface provides two-way communication between a P48 and other compatible equipment such as a printer, PLC, HMI, or a host computer. In multipoint applications (up to thirty-two), the address number of each P48 on the line can be programmed separately from 0 to 99. Data from the P48 can be interrogated or changed, and alarm output(s) may be reset by sending the proper command code via serial communications. PC software, SFCRM, allows for easy configuration of controller parameters. These settings can be saved to disk for later use or used for multi-controller down loading. On-line help is provided within the software.

The unit is constructed of a lightweight, high impact plastic case with a tinted front panel. The front panel meets NEMA 4X/IP65 specifications when properly installed. Multiple units can be stacked horizontally or vertically. Modern surface-mount technology, extensive testing, plus high immunity to noise interference makes the controller extremely reliable in industrial environments.



SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use the P48 to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the controller. An independent and redundant process limit indicator with alarm outputs is strongly recommended.

SPECIFICATIONS

1. DISPLAY: Dual 4-digit

Upper Process Display: 0.4" (10.2 mm) high red LED

Lower Auxiliary Display: 0.3" (7.6 mm) high green LED

Display Messages:

- "OLOL" - Appears when measurement exceeds + input range.
- "ULUL" - Appears when measurement exceeds - input range.
- "SENS" - Appears when measurement exceeds controller limits.
- "..." - Appears when display values exceed + display range.
- "..." - Appears when display values exceed - display range.

LED Status Annunciators:

- %P - Lower auxiliary display shows power output in (%).
- MN - Flashing: Controller is in manual mode.
 - On: Local Setpoint (Remote Setpoint option)
 - Off: Remote Setpoint
- DV - Lower auxiliary display shows deviation (*error*) from setpoint.
- O1 - Main control output is active.
- A1 - Alarm #1 is active (*for A1 option*).
- A2 - Alarm #2 is active OR
 - Secondary output (O2) is active.

2. POWER:

AC Versions: 85 VAC min. to 250 VAC max., 50 to 60 Hz, 8 VA max.

DC Versions:

DC Power: 18 to 36 VDC; 7 W

AC Power: 24 VAC $\pm 10\%$; 50 to 60 Hz, 9 VA

3. CONTROLS:

Four front panel push buttons for modification and setup of controller functions and one external user input for parameter lockout or other functions.

4. MEMORY:

Nonvolatile E² PROM retains all programmable parameters and values.

5. RANGE AND ACCURACY:

INPUT RANGE	ACCURACY * (18 to 28°C)	ACCURACY * (0 to 50°C)	IMPEDANCE	MAX CONTINUOUS OVERLOAD	RESOLUTION
10 VDC (-1 to 11)	0.10% of reading +0.02 V	0.30% of reading +0.03 V	1 M ohm	300 V	10 mV
20 mA DC (-2 to 22)	0.10% of reading +0.03 mA	0.30% of reading +0.04 mA	10 ohm	100 mA	10 μ A

* Accuracies are expressed as \pm percentages after 20 minutes warm-up. The controller's accuracy is specified in two ways: accuracy over an 18 to 28°C range at 10 to 75% RH environment; and accuracy over a 0 to 50°C range at 0 to 85% RH (non-condensing) environment. Accuracy over the wide sensor range reflects the coefficient of the internal circuitry.

6. MAIN SIGNAL INPUT:

Sample Period: 100 msec

Response Time: Less than 300 msec typ., 400 msec max. (*to within 99% of final value w/step input; typically, response is limited to response time of sensor*)

Normal Mode Rejection: 40 dB @ 50/60 Hz (improves with increased digital filtering.)

Common Mode Rejection: Greater than 120 dB, DC to 60 Hz

Protection: Input overload 120 VAC max. for 15 sec. max.

7. USER INPUT:

Internally pulled up to +5 VDC (1 M Ω).

$V_{IN\ MAX} = 5.25\ VDC$; $V_{IL} = 0.85\ V\ max.$; $V_{IH} = 3.65\ V\ min.$;

$I_{OFF} = 1\ \mu A\ max.$

Response Time: 120 msec max.

Functions:

Program Lock	Integral Action Lock
Auto/Manual Mode Select	Setpoint Ramp Enable
Reset Alarms	Setpoint 1/Setpoint 2 Select
Local/Remote Setpoint Select	Serial block print

8. CONTROL AND ALARM OUTPUTS:

Relay outputs with Form A contacts:

Contact Rating: 3 A @ 250 VAC or 30 VDC (resistive load)

1/10 HP @ 120 VAC (inductive load)

Life Expectancy: 100,000 cycles at max. load rating.

(Decreasing load and/or increasing cycle time, increases life expectancy.)

9. MAIN CONTROL:

Control: PID or ON/OFF

Output: Time proportioning or Linear DC

Cycle time: Programmable

Auto-tune: When selected, sets proportional band, integral time, and derivative time values.

10. ALARMS: 1 or 2 alarms (optional)

Modes:	Absolute high acting	Absolute low acting
	Deviation high acting	Deviation low acting
	Inside band acting	Outside band acting

Reset Action: Programmable; automatic or latched

Standby Mode: Programmable; enable or disable

Hysteresis: Programmable

Annunciator: LED backlight for "A1", "A2"

11. SECONDARY OUTPUT: Software selectable (overrides alarm 2)

Control: PID or ON/OFF

Output: Time Proportioning

Cycle time: Programmable

Proportional Gain Adjust: Programmable

Deadband /Overlap: Programmable

12. MAIN AND SECOND LINEAR DC OUTPUT: (optional)

Main: Control or re-transmission, programmable update rate from 0.1 sec to 250 sec

Second: Re-transmission only, fixed update rate of 0.1 sec

OUTPUT ** RANGE	ACCURACY * (18 to 28°C)	ACCURACY * (0 to 50°C)	COMPLIANCE	RESOLUTION
0 to 10 V	0.10% of FS + 1/2 LSD	0.30% of FS + 1/2 LSD	10k ohm min.	1/3500
0 to 20 mA	0.10% of FS + 1/2 LSD	0.30% of FS + 1/2 LSD	500 ohm max.	1/3500
4 to 20 mA	0.10% of FS + 1/2 LSD	0.30% of FS + 1/2 LSD	500 ohm max.	1/2800

* Accuracies are expressed as \pm percentages after 20 minutes warm-up. Output accuracy is specified in two ways: Accuracy over an 18 to 28°C range at 10 to 75% RH environment; and accuracy over a 0 to 50°C range at 0 to 85% RH (non-condensing) environment. Accuracy over the wide sensor range reflects the coefficient of the internal circuitry.

** Outputs are independently jumper selectable for either 10 V or 20 mA. The output range may be field calibrated to yield approximately 10% overrange and a small underrange (negative) signal.

13. REMOTE SETPOINT INPUT: (optional)

Input type: 0/4 to 20 mA

Input Resistance: 10 Ω

Overrange: -5% to 105%

Overload: 100 mA (continuous)

Scale Range: -999 to 9999

Resolution: 1 part in 10,000.

Accuracy:

At 25°C: $\pm(0.1\% \text{ of full scale } + \frac{1}{2} \text{ LSD})$

Over 0 to 50°C range: $\pm(0.2\% \text{ of full scale } + \frac{1}{2} \text{ LSD})$

Reading Rate: 10/sec.

Setpoint Filtering: Programmable Digital

Setpoint Ramping: Programmable, 1 to 9999 units/minute.

14. SERIAL COMMUNICATIONS: (optional)

Type: RS485 multipoint, balanced interface

Baud Rate: 300 to 9600

Data Format: 7O1, 7E1, 7N2, 8N1

Node Address: 0 to 99, max of 32 units per line

Transmit Delay: 2 to 100 msec or 100 to 200 msec

Data Encoding: ASCII

Isolation w.r.t Main Input Common: 500 Vrms for 1 min. (50 V working)

Not isolated w.r.t. Remote Setpoint or Analog Output common

Note: RS485 and the Analog Output commons are not internally isolated within the controller. The terminating equipment of these outputs must not share the same common (ie. earth ground).

15. ENVIRONMENTAL CONDITIONS:

Operating Range: 0 to 50°C

Storage Range: -40 to 80°C

Operating and Storage Humidity:

85% max. relative humidity (non-condensing) from 0°C to 50°C.

Altitude: Up to 2000 meters

16. ISOLATION BREAKDOWN RATINGS:

AC line with respect to all inputs and outputs: 250 V working (2300 V for 1 minute).

Main input with respect to Analog Outputs and Remote Setpoint Input: 50 V working (2300 V for 1 minute).

All other inputs and outputs with respect to relay contacts: 2000 VAC

Not isolated between Analog Output and Remote Setpoint commons.

17. CERTIFICATIONS AND COMPLIANCES:

SAFETY

- UL Recognized Component, File #E156876, UL873, CSA 22.2 No. 24
Recognized to U.S. and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.
Type 4X Enclosure rating (Face only), UL50
IECEE CB Scheme Test Certificate # UL1369-156876/USA,
CB Scheme Test Report # 96ME50224-040396
Issued by Underwriters Laboratories, Inc.
IEC 1010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.
IP65 Enclosure rating (Face only), IEC 529

ELECTROMAGNETIC COMPATIBILITY

Immunity to EN 50082-2

Electrostatic discharge	EN 61000-4-2	Level 2; 4 Kv contact Level 3; 8 Kv air
Electromagnetic RF fields	EN 61000-4-3	Level 3; 10 V/m ¹ 80 MHz - 1 GHz
Fast transients (burst)	EN 61000-4-4	Level 4; 2 Kv I/O Level 3; 2 Kv power
RF conducted interference	EN 61000-4-6	Level 3; 10 V/rms ² 150 KHz - 80 MHz
Power frequency magnetic fields	EN 61000-4-8	Level 4; 30 A/m
Simulation of cordless telephones	ENV 50204	Level 3; 10 V/m 900 MHz ± 5 MHz 200 Hz, 50% duty cycle

Emissions to EN 50081-2

RF interference	EN 55011	Enclosure class A Power mains class A
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Notes:

- No loss of performance during EMI disturbance at 10 V/m.
Unit is panel mounted in a metal enclosure (Buckeye SM7013-0 or equivalent) that provides at least 20 dB shielding effectiveness. Metal panel is connected to earth ground.
Power Line and I/O cables routed in metal conduit connected to earth ground.*
- Self-recoverable loss of performance during EMI disturbance at 10 Vrms:
Analog output may deviate during EMI disturbance.
For operation without loss of performance:
Install power line filter, RLC#LFIL0000 or equivalent.
OR
Install 2 ferrite cores, RLC#FCOR0000 or equivalent, to AC lines at unit for frequencies above 5 MHz.
I/O cables routed in metal conduit connected to earth ground.
Refer to the EMC Installation Guidelines section of the manual for additional information.*

18. **CONNECTION:** Wire clamping screw terminals

19. **CONSTRUCTION:** Black plastic alloy case and collar style panel latch. Panel latch can be installed for vertical or horizontal instrument stacking. One piece tinted plastic bezel. Bezel assembly with circuit boards can be removed from the case to change the output board without removing the case from the panel or disconnecting wiring. Unit meets NEMA 4X/IP65 requirements for indoor use, when properly installed. Installation Category II, Pollution Degree 2.

20. **WEIGHT:** 0.38 lbs (0.17 kgs)

BASIC OPERATION

The P48 controls a process by receiving a linear DC signal representing the process value, then calculating a control output power value by use of a modified PID control algorithm. The unit controls the system with the new output power value to keep the process at setpoint. The PID control algorithm incorporates features which provide for high control accuracy and low overshoot from process disturbances.

FRONT PANEL FEATURES

In the normal operating mode, the unit displays the process value in the upper display. One of the following parameters can be viewed in the lower display:

- Setpoint
- % Power Output
- Process Deviation
- Blank Display

The user scrolls through these parameters by pressing the D button. If enabled, the control setpoint or power output (manual mode only) can be directly modified in this mode.

In the normal operating mode, parameters are selected by use of the P button and modified by use of the UP and DOWN buttons. Parameters are then entered by the P button, which advances the user to the next parameter. Pressing the D button immediately returns the controller to the normal operating mode without changing the currently selected parameter.

HARDWARE FEATURES

A fast 100 msec input sampling rate provides quick controller response to a process disturbance, thus providing excellent process control. Measurement accuracy of 0.1% or better, provides close process control conforming to the desired control setpoint value.

Low-drift, highly stable circuitry ensures years of reliable and accurate process control. The recommended two year re-calibration interval is easily accomplished via the programming menu.

REMOTE SETPOINT INPUT

The remote setpoint input facilitates the use of a remote signal to drive the controller's setpoint. The remote signal can be scaled independent to that of the controller's range. The controller's response to local/remote setpoint transfers can be programmed. Also, the remote signal is filtered by use of an adaptive filter. With this filter, relatively large filtering time constants can be used without suffering from long settling times. The time constant and filter disable band are programmable. Additionally, the remote signal can also be velocity limited (or ramped) to slow the controller's response to changes in setpoint. This results in a steady control response with no overshoot.

LINEAR DC ANALOG OUTPUTS

The Main Linear DC output has independent scaling, programmable output update time and filter (damping) time. These parameters permit flexibility in process configuration. The output can be set for 0 to 10 V, 0 to 20 mA or 4 to 20 mA ranges and can be configured for control or for re-transmission of input or setpoint values.

A Second Linear DC output is dedicated for the re-transmission of the process input signal. The output can be scaled and converted independent of the input signal and Main Linear DC output. This output is isolated from the input.

SETPOINT FEATURES

The controller setpoint can be protected from out of range values by programming the setpoint range limit values. Additionally, safeguards from inadvertent data entry can be programmed.

A second setpoint can be selected by the user input and/or through the front panel.

The setpoint ramp feature can be used to control the setpoint value at start-up or any time a setpoint change is made, at a user programmable rate. This feature reduces shock to the process and helps to minimize overshoot.

INPUT FEATURES

A programmable input filter can be used to stabilize readings from a process with varying or oscillating process characteristics, helping to provide better control.

The programmable user input can be used to control a variety of functions, such as auto/manual transfer of the controller, reset alarm output(s), etc.

OUTPUT FEATURES

Programmable output power limits provide protection for processes where excessive power can cause damage. Programmable output cycle time, output hysteresis, and dampening can reduce output activity without degrading control accuracy. The main outputs can operate in PID, ON/OFF, or manual control modes.

CONTROL AND ALARM OUTPUTS

In addition to the Linear DC output, there are up to three relay outputs available. Relay outputs can switch user applied AC or DC voltages for control or alarm purposes.

AUTO-TUNE

The P48 has an auto-tune feature which, on demand, automatically determines the PID control parameters for a particular process. After completion of auto-tune, the PID parameters are automatically optimized for that process and loaded into non-volatile memory. The operator may view and modify the parameters as desired.

Auto-tune may be invoked either at start-up or at setpoint, depending on the process requirements. An auto-tune programmable dampening factor produces various levels of process control and response characteristics.

RS485 SERIAL COMMUNICATIONS

The RS485 communications option allows the connection of up to 32 devices on a single pair of wires with a distance of up to 4,000 feet and a maximum baud rate of 9600. Since the same pair of wires are used for both transmit and receive, only one way communication is possible at any given time. The controller has a programmable response time to allow the host device adequate time to release the communication line for a transmission.

Selected parameters from the P48 can be interrogated or changed, and alarm output(s) may be reset by sending the proper command code via serial communications. It is also possible to invoke Auto-tune through the serial port. Serial communications used with SFCRM software allows for easy controller parameter configuration by computer.

DUAL TIME PROPORTIONAL SYSTEMS

The P48 is available with dual time proportional outputs. The dual outputs can be used for level or heat/cool applications. The A2 output can be configured for Secondary (cool) control. This allows for dual PID control or ON/OFF control with unbalanced hysteresis.

CONTROLLER PROGRAMMING

Front Panel Program Disable allows all of the controller's set-ups to be locked-out from further operator intervention after the initial set-up.

The following four programming modes allow the controller to adapt to any required user-interface level:

- Unprotected Parameter Mode
- Protected Parameter Mode
- Hidden Function Mode
- Configuration Parameter Mode

UNPROTECTED PARAMETER MODE *

The Unprotected Parameter Mode is accessible from the Normal Display mode when program disable is inactive or when the proper access code number from the Protected Parameter Mode is entered. The Configuration Parameter Modes can be accessed only from this mode.

- "SP" - Enter setpoint
- "OP" - Enter output power
- "ProP" - Enter proportional band
- "Intt" - Enter integral time
- "dErt" - Enter derivative time
- "AL-1" - Enter value for alarm #1
- "AL-2" - Enter value for alarm #2
- "CNFP" - Select configuration access point
- "End" - Return to normal display mode

PROTECTED PARAMETERS MODE *

The Protected Parameters Mode is enabled when program disable is active. This mode prevents access to the configuration modes without the proper access code number. Only the parameters that are enabled in the Configuration 3 parameter (lock-out section) can be accessed.

- "ProP" - Enter proportional band
- "Intt" - Enter integral time
- "dErt" - Enter derivative time
- "AL-1" - Enter value for alarm #1
- "AL-2" - Enter value for alarm #2
- "CodE" - Enter value to access unprotected parameters and configuration parameters

HIDDEN FUNCTION MODE *

The Hidden Function Mode is accessible from the Normal Display Mode. The functions in this mode may be locked-out individually in Configuration 3 parameter (lock-out section).

- "SPSL" - Select local (SP1 or SP2) or remote setpoint
- "trnF" - Transfer between automatic (PID) control and manual control
- "tUNE" - Invoke/cancel PID Auto-tune
- "ALrS" - Reset latched alarms

CONFIGURATION PARAMETER MODE

The Configuration Parameter Mode allows the operator to set-up the basic requirements of the controller. It is divided into sections which group together related programming steps, such as inputs, outputs, alarms, etc. Upon completion of each section, the program returns to the Configuration Access Point allowing the user to return to the Normal Display Mode.

Configuration 1, Inputs (1-IN)

- "tYPE" - Select input signal type
- "dCpt" - Select scaled display decimal point position
- "rnd" - Enter rounding increment and trailing zeros for scaled display
- "FLtr" - Select level of input filtering
- "dSP1" - Scale main input
- "INP1" - Scale main input
- "dSP2" - Scale main input
- "INP2" - Scale main input
- "SPLO" - Enter setpoint lower limit
- "SPHI" - Enter setpoint higher limit
- "SPrP" - Enter setpoint ramp rate
- "INPt" - Select user input function

Configuration 2, Outputs (2-OP) *

- "CYCt" - Enter time proportioning cycle time
- "OPAC" - Select output control action
- "OPLo" - Enter output power low limit
- "OPHI" - Enter output power high limit
- "OPdP" - Enter output control dampening
- "CHYS" - Enter ON/OFF control hysteresis
- "tcOd" - Select auto-tuning dampening
- "ANtP" - Main Linear DC analog output range
- "ANAS" - Main Linear DC analog output source
- "ANut" - Main Linear DC analog output update time
- "ANLO" - Main Linear DC analog output scaling low
- "ANHI" - Main Linear DC analog output scaling high

Configuration 3, Parameter Lock-Outs (3-LC) *

- "SP" - Select setpoint access level
- "OP" - Select power access level
- "dEv" - Enable deviation display
- "bdSP" - Enable blank display
- "CodE" - Enter parameter access code
- "Pld" - Select PID access level
- "AL" - Select alarm access level
- "ALrS" - Enable alarm reset access
- "SPSL" - Enable local/remote selection
- "trnF" - Enable auto/manual mode selection
- "tUNE" - Enable auto-tune invocation

Configuration 4, Alarms (4-AL) *

- "ACT1" - Select operation mode of alarm #1, or select main output
- "rSt1" - Select reset mode of alarm #1
- "Stb1" - Enable activation delay of alarm #1
- "AL-1" - Enter value for alarm #1
- "ACT2" - Select operation mode of alarm #2, or select second output
- "rSt2" - Select reset mode of alarm #2
- "Stb2" - Enable activation delay of alarm #2
- "AL-2" - Enter value for alarm #2
- "AHYS" - Enter hysteresis value for both alarms

Configuration 5, Second Output (5-O2) *

- "CYC2" - Enter time proportioning cycle time
- "GAN2" - Enter relative gain
- "db-2" - Enter deadband or overlap

Configuration 6, Serial Communications (6-SC) *

- "bAUd" - Select baud rate
- "ConF" - Select character frame format
- "Addr" - Enter address
- "Abrv" - Select abbreviated or full transmission
- "PoPt" - Select print options

Configuration 7, Remote Setpoint Input (7-N2) *

- "dSP1" - Enter remote setpoint display scaling value #1
- "INP1" - Enter remote setpoint process scaling value #1
- "dSP2" - Enter remote setpoint display scaling value #2
- "INP2" - Enter remote setpoint process scaling value #2
- "FLtr" - Enter remote setpoint filter time constant
- "bAnd" - Enter remote setpoint filter disable band
- "trnF" - Select Local/Remote setpoint transfer response

Configuration 8, Second Linear DC Analog Output (8-A2) *

- "A2tP" - Second linear DC analog range
- "A2LO" - Second linear DC analog scaling low
- "A2HI" - Second linear DC analog scaling high

Configuration 9, Factory Service Operations (9-FS)

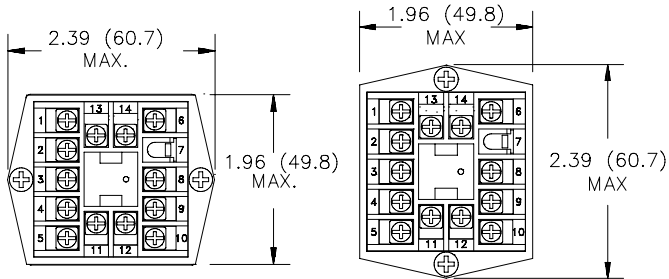
- "Code 48" - Calibrate Instrument
- "Code 66" - Reset parameters to factory setting

* These parameters may not appear due to option configuration or other programming.

MULTIPLE UNIT STACKING

The P48 is designed for close spacing of multiple units. Units can be stacked either horizontally or vertically. For vertical stacking, install the panel latch with the screws to the sides of the unit. For horizontal stacking, the panel latch screws should be at the top and bottom of the unit. The minimum spacing from center line to center line of units is 1.96" (49.8 mm). This spacing is the same for vertical or horizontal stacking.

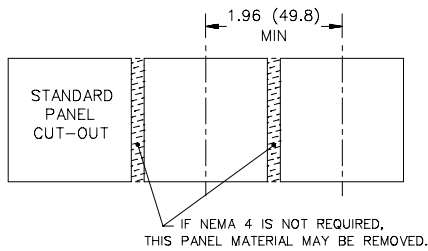
Note: When stacking units, provide adequate panel ventilation to ensure that the maximum operating temperature range is not exceeded.



PANEL LATCH INSTALLED FOR VERTICAL UNIT STACKING

PANEL LATCH INSTALLED FOR HORIZONTAL UNIT STACKING

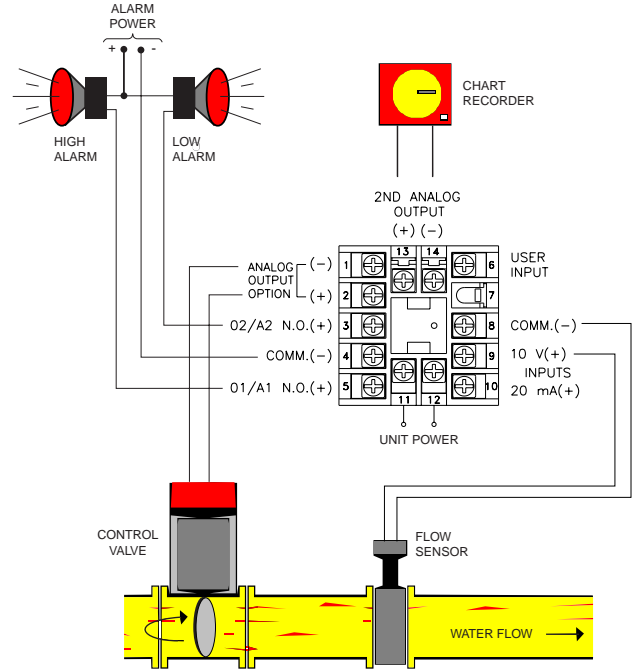
PANEL CUT-OUT SPACING FOR MULTIPLE UNIT STACKING. HORIZONTAL ARRANGEMENT SHOWN.



APPLICATION

WATER PROCESSING APPLICATION

A city water company needs to maintain a steady flow of water for their customer needs. They have an existing 0 to 10 VDC flow transmitter to measure the water flow. They need to control the water flow, have a high and low alarm, and keep a recorded chart of the flow for later reference. The Main Linear DC output of the P48 can be used to control the position of water output valves per the desired flow setpoint value. The P48 relay outputs can be programmed to give a high flow alarm and a low flow alarm. With the Second Linear DC output model, the flow measurement to the P48 can be converted from 0-10 V to 4-20 mA and retransmitted to a 4-20 mA chart recorder.



(Terminal assignments are model number dependent.)

ORDERING INFORMATION

Options and Output Boards are factory configured per the part number specified. Part numbers without replacement output boards listed must be returned to the factory for output board replacement.

DEDICATED MAIN CONTROL O1 OUTPUT	MAIN CONTROL O1 or A1(ALARM 1)*	DEDICATED ALARM 1 A1 OUTPUT	A2 (ALARM 2) OR O2 (SECONDARY)*	REMOTE SETPOINT INPUT @	RS485 @	MAIN ANALOG OUTPUT** @	SECOND ANALOG OUTPUT** @	REPLACEMENT OUTPUT BOARD	PART NUMBERS	
									18-36 VDC/24 VAC	85 to 250 VAC
						YES		NA	P4800011	P4800001
Relay								RBD48100	P4810010	P4810000
	Relay		Relay			YES		NA	P4810111	P4810101
	Relay		Relay	YES		YES		NA	P4810115	P4810105
	Relay		Relay		YES	YES		NA	P4810117	P4810107
	Relay		Relay			YES	YES	NA	P481011A	P481010A
Relay		Relay	Relay					RBD48111	P4811110	P4811100
Relay		Relay	Relay		YES			RBD48111	P4811112	P4811102

* These part numbers have a single output programmable as either Control (PID) or as an Alarm.

** These part numbers are jumper and program selectable for either a current or a voltage Linear DC output.

@ These part numbers are equipped with a second setpoint.

Option Boards are installed at the factory for the appropriate models. These boards are only needed for field replacement.

ACCESSORIES

MODEL NO.	DESCRIPTION	PART NUMBERS
SFCRM	Crimson 2 PC Configuration Software for Windows 98, ME, 2000 and XP (for RS485 models)	SFCRM
ICM4	RS232/RS485 Serial Converter Module	ICM40030
ICM5	Three Way Isolated RS232/RS485 Serial Converter Module	ICM50000

*Crimson Software is available for download from <http://www.redlion.net>

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LIMITED WARRANTY

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to two years from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company's liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company's option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

The customer agrees to hold Red Lion Controls harmless from, defend, and indemnify RLC against damages, claims, and expenses arising out of subsequent sales of RLC products or products containing components manufactured by RLC and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter.

No warranties expressed or implied are created with respect to The Company's products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.

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