EZ-ZONE® PM

User's Manual

Limit Controller Models

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TOTAL CUSTOMER SATISFACTION
3 Year Warranty

ISO 9001
Registered Company
Winona, Minnesota USA

0600-0057-0000 Rev. D

Made in the U.S.A.

June 2009

$8.00

Safety Information

We use note, caution and warning symbols throughout this book to draw your attention to important operational and safety information.

A "NOTE" marks a short message to alert you to an important detail.

A "CAUTION" safety alert appears with information that is important for protecting your equipment and performance. Be especially careful to read and follow all cautions that apply to your application.

A "WARNING" safety alert appears with information that is important for protecting you, others and equipment from damage. Pay very close attention to all warnings that apply to your application.

The electrical hazard symbol, ⚠ (a lightning bolt in a triangle) precedes an electric shock hazard CAUTION or WARNING safety statement.

Symbol	Explanation
	CAUTION – Warning or Hazard that needs further explanation than label on unit can provide. Consult users manual for further information.
	ESD Sensitive product, use proper grounding and handling techniques when installing or servicing product.
	Unit protected by double/reinforced insulation for shock hazard prevention.
	Do not throw in trash, use proper recycling techniques or consult manufacturer for proper disposal.
	Enclosure made of Polycarbonate material. Use proper recycling techniques or consult manufacturer for proper disposal.
	Unit can be powered with either alternating current (ac) voltage or direct current (dc) voltage.
	Unit is a Listed device per Underwriters Laboratories®. It has been evaluated to United States and Canadian requirements for Process Control Equipment. UL 61010 and CSA C22.2 No. 61010. File E185611 QUYX, QUYX7. See: www.ul.com
	Unit is compliant with European Union directives. See Declaration of Conformity for further details on Directives and Standards used for Compliance.
	Unit has been reviewed and approved by Factory Mutual as a Temperature Limit Device per FM Class 3545 standard. See: www.fmglobal.com
	Unit has been reviewed and approved by CSA International for use as Temperature Indicating-Regulating Equipment per CSA C22.2 No. 24. See: www.csa-international.org
	Unit has been reviewed and approved by ODVA for compliance with DeviceNet communications protocol. See: www.odva.org
	Unit has been reviewed and approved by ODVA for compliance with Ethernet/IP communications protocol. See: www.odva.org

Warranty

The EZ-ZONE® PM is manufactured by ISO 9001-registered processes and is backed by a three-year warranty to the first purchaser for use, providing that the units have not been misapplied. Since Watlow has no control over their use, and sometimes misuse, we cannot guarantee against failure. Watlow's obligations hereunder, at Watlow's option, are limited to replacement, repair or refund of purchase price, and parts which upon examination prove to be defective within the warranty period specified. This warranty does not apply to damage resulting from transportation, alteration, misuse or abuse. The purchaser must use Watlow parts to maintain all listed ratings.

Technical Assistance

If you encounter a problem with your Watlow controller, review your configuration information to verify that your selections are consistent with your application: inputs, outputs, alarms, limits, etc. If the problem persists, you can get technical assistance from your local Watlow representative (see back cover), by e-mailing your questions to wintechsupport@watlow.com or by dialing +1 (507) 494-5656 between 7 a.m. and 5 p.m., Central Standard Time (CST). Ask for for an Applications Engineer. Please have the following information available when calling:

- Complete model number
- All configuration information
- User's Manual
- Factory Page

you do not know why the product failed, contact an Application Engineer or Product Manager. All RMA's require:

- Ship-to address
- Bill-to address
- Contact name
- Phone number
- Method of return shipment
- Your P.O. number
- Detailed description of the problem
- Any special instructions
- Name and phone number of person returning the product.

2. Prior approval and an RMA number from the Customer Service Department is required when returning any product for credit, repair or evaluation. Make sure the RMA number is on the outside of the carton and on all paperwork returned. Ship on a Freight Prepaid basis.
3. After we receive your return, we will examine it and try to verify the reason for returning it.
4. In cases of manufacturing defect, we will enter a repair order, replacement order or issue credit for material returned. In cases of customer mis-use, we will provide repair costs and request a purchase order to proceed with the repair work.
5. To return products that are not defective, goods must be be in new condition, in the original boxes and they must be returned within 120 days of receipt. A 20 percent restocking charge is applied for all returned stock controls and accessories.
6. If the unit is unrepairable, you will receive a letter of explanation. and be given the option to have the unit returned to you at your expense or to have us scrap the unit.
7. Watlow reserves the right to charge for no trouble found (NTF) returns.

EZ-ZONE PM is covered by U.S. Patent No. 6,005,577 and Patents Pending

TC

Table of Contents

1 Chapter 1: Overview

The EZ-ZONE® PM takes the pain out of solving your thermal loop requirements.

Watlow's EZ-ZONE PM controllers offer options to reduce system complexity and the cost of control-loop ownership. You can also select from a number of serial communications options to help you manage system performance over a network.

It just got a whole lot easier to solve the thermal requirements of your system. Because the EZ-ZONE PM controllers are highly scalable, you only pay for what you need. So if you are looking for a Limit controller, the EZ-ZONE PM is the answer.

Standard Features and Benefits

EZ-ZONE configuration communications and software

- Saves time and improves the reliability of control ler set up

FM Approved Over-under Limit with Auxiliary Outputs

- Increases user and equipment safety for over-under temperature conditions

Parameter Save & Restore Memory

- Reduces service calls and down time

Agency approvals: UL Listed, CSA, CE, RoHS, W.E.E.E. FM

- Assures prompt product acceptance
- Reduces end product documentation costs
- FM approval on Limit Models
- Semi F47-0200

P3T Armor Sealing System

- NEMA 4X and IP66 offers water and dust resistance, can be cleaned and washed down
- Backed up by UL 50 independent certification to NEMA 4X specification

Three-year warranty

- Demonstrates Watlow's reliability and product support

Touch-safe Package

- IP2X increased safety for installers and operators

Removable cage clamp wiring connectors

- Reliable wiring, reduced service calls
- Simplified installation

EZ-Key/s

- Programmable EZ-Key enables simple one-touch operation of repetitive user activities (PM**6/8/9** only)

Programmable Menu System

- Reduces set up time and increases operator efficiency

Full-featured Alarms

- Improves operator recognition of system faults
- Control of auxiliary devices

A Conceptual View of the PM

The flexibility of the PM's software and hardware allows a large range of configurations. Acquiring a better understanding of the EZ-ZONE® family controller's and their overall functionality and capabilities while at the same time planning out how the controller can be used will deliver maximum effectiveness in your application.

It is useful to think of the controller in three parts: inputs, procedures and outputs. Information flows from an input to a procedure to an output when the controller is properly configured. A PM limit controller can carry out several procedures at the same tim, for instance, monitoring for several different alarm situations, monitoring and acting upon digital inputs and driving output devices such as lights and contactors. Each process needs to be thought out carefully and the controller's inputs, procedures and outputs set up properly.

Inputs

The inputs provide the information that any given programmed procedure can act upon. Simply stated, this information may come from an operator pushing a button or from a sensor monitoring the temperature of a part being heated or cooled.

Each analog input typically uses a thermocouple or RTD to read the process temperature. It can also read volts, current or resistance, allowing it to use various devices to read humidity, air pressure, operator inputs and others values. The settings in the Analog Input Menu (Setup Page) for each analog input must be configured to match the device connected to that input.

Each digital input reads whether a device is active or inactive. A PM with digital input/output hardware includes two sets of terminals where each of which can be used as either an input or an output. Each pair of terminals must be configured to function as either an input or output with the direction parameter in the Digital Input/Output Menu (Setup Page).

The Function or EZ Key/s (PM6/8/9 only) on the front panel of the PM also operates as a digital input by toggling the function assigned to it in the Digital Input Function parameter in the Function Key Menu (Setup Page).

Functions

Functions use input signals to calculate a value. A function may be as simple as reading a digital input to set a state to true or false, or reading a temperature to set an alarm state to on or off. Or, if a failure with the primary sensing device should occur the limit could trip a contactor removing power from the heating element to avoid damaging the load.

To set up a function, it's important to tell it what source, or instance, to use. For example, if the control is equipped with digital inputs they can be configured as an alarm. If configured as such the next step would be to define which of the four available alarm instances this digital input would be tied to. So, in this example the source would be Digital Input 5 or 6 where the instance would be selected as 1, 2, 3, or 4 corresponding to the alarm instances.

Keep in mind that a function is a user-programmed internal process that does not execute any action outside of the controller. To have any effect outside of the controller, an output must be configured to respond to a function.

Outputs

Outputs can perform various functions or actions in response to information provided by a function, such as removal of the control voltage to a contactor; turning a light on or off; unlocking a door; or turning on a buzzer.

Assign an output to a Function in the Output Menu or Digital Input/Output Menu. Then select which instance of that function will drive the selected output. For example, in using a Limit Control an output can be configured to respond to an alarm, i.e., (instance 4) or to a limit condition.

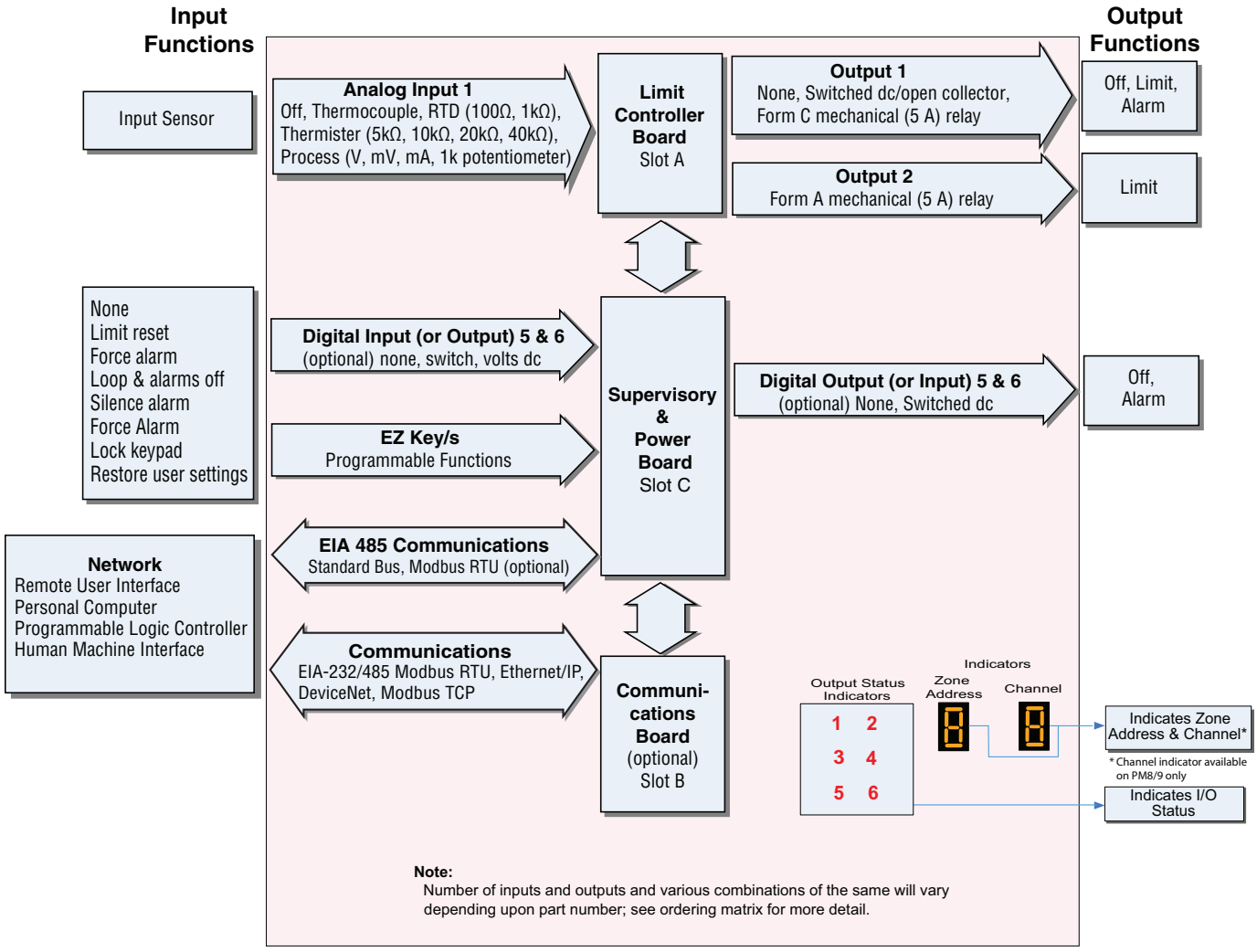
You can assign more than one output to respond to a single instance of a function. For example, alarm 2 could be used to trigger a light connected to output 1 and a siren connected to digital output 5.

Input Events and Output Events

Input events are internal states that are set by the digital inputs. Digital Input 5 provides the state of input event 1, and Digital Input 6 provides the state of input event 2. The setting of Digital Input Function (Setup Page, Digital Input/Output Menu) does not change the relationship between the input and the event. An input will still control the input event state, even if Digital Input Function is set to None.

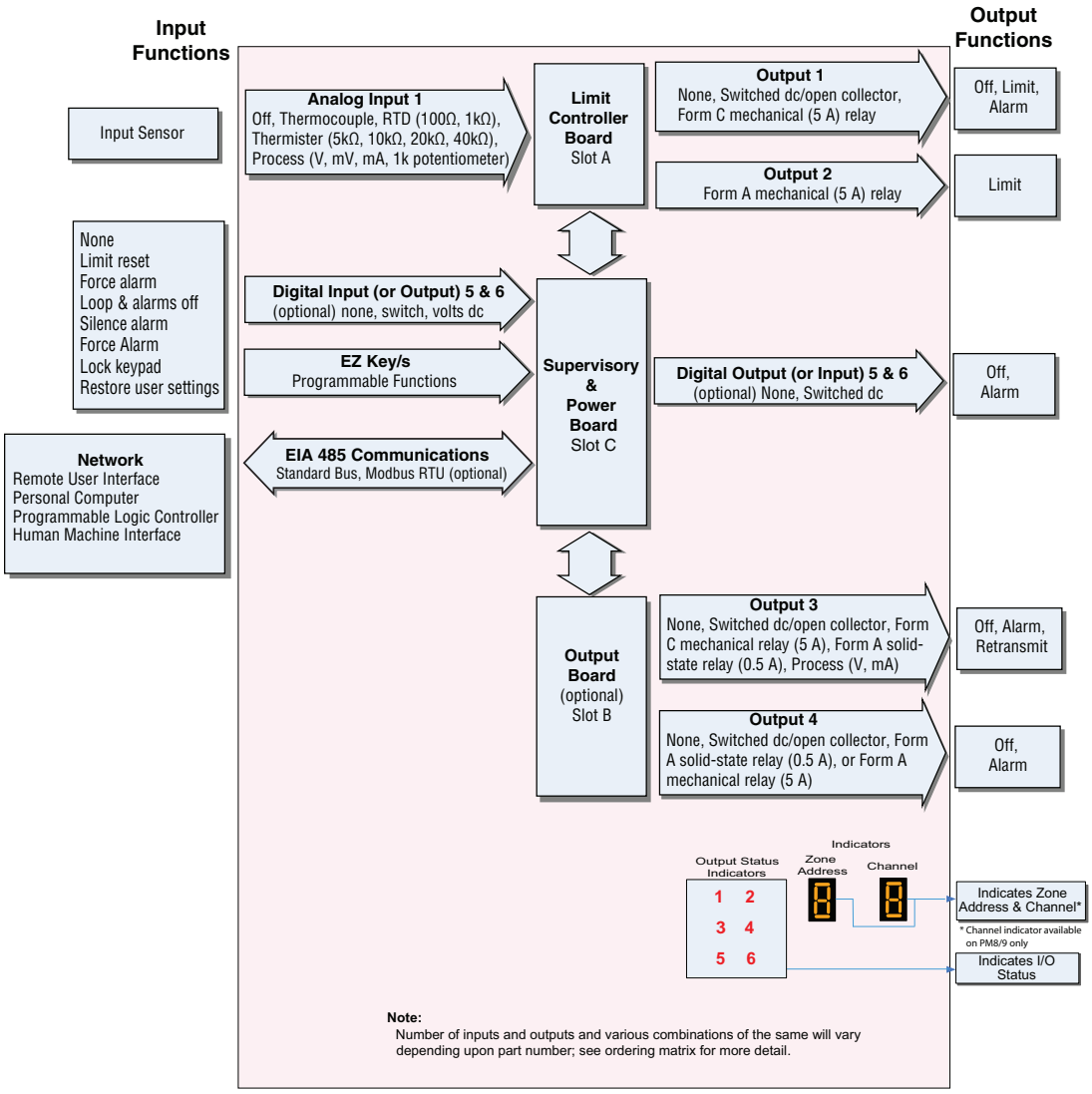
EZ-ZONE® PM Enhanced Limit PM6/8/9 Models - System Diagram (with communications options 2, 3 or 5)

Universal Sensor Input, Configuration Communications,
Red/Green 7-Segment Display



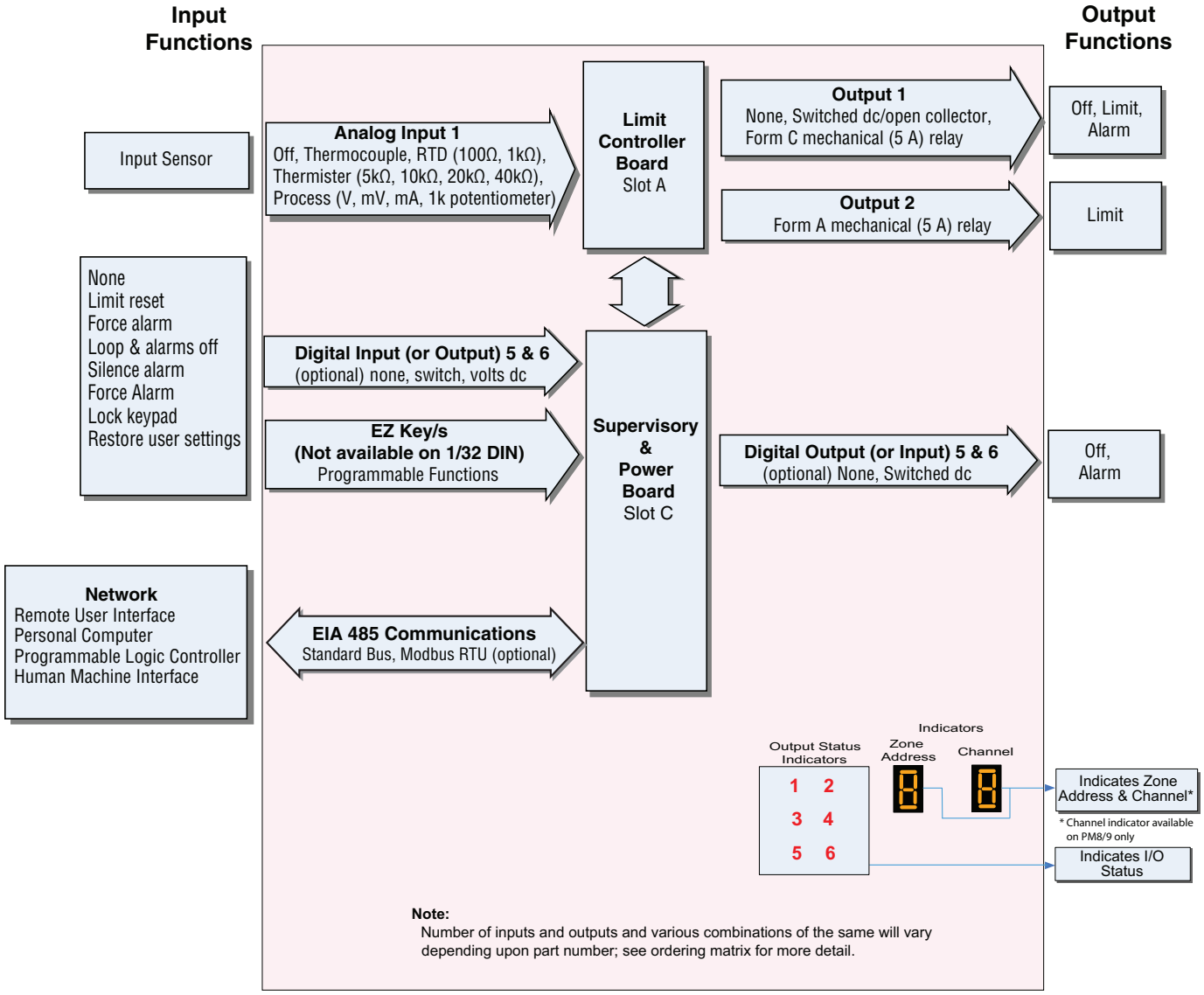
EZ-ZONE® PM Enhanced Limit PM6/8/9 Models - Input/Output (no communications options 2, 3 or 5)

Universal Sensor Input, Configuration Communications,
Red/Green 7-Segment Display



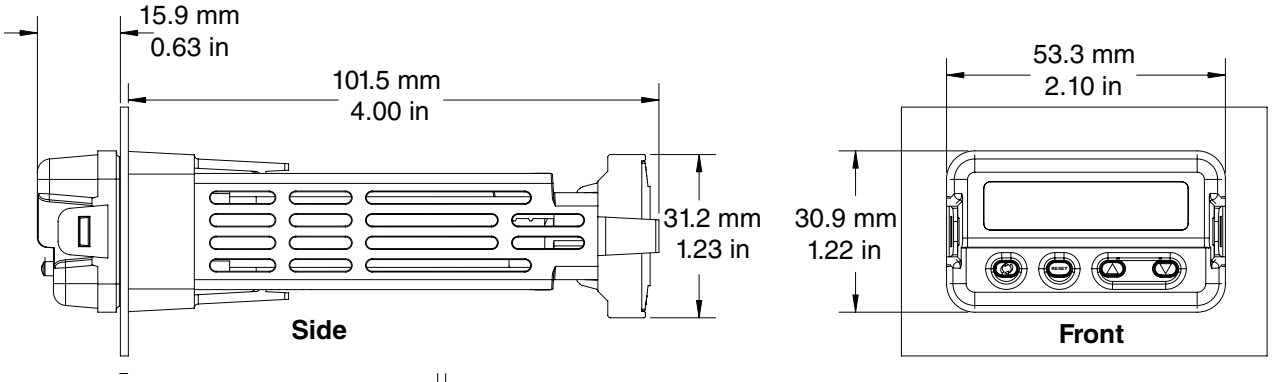
EZ-ZONE® PM Limit All Models System Diagram

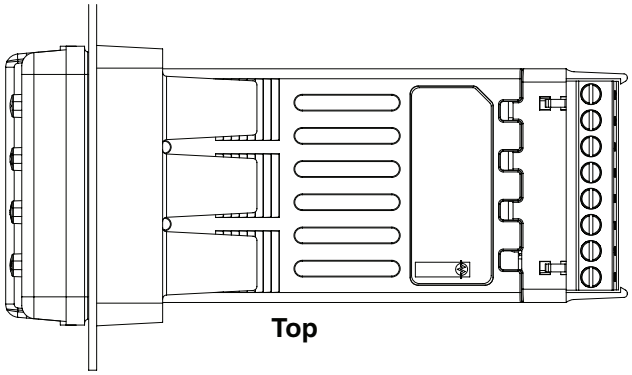
Universal Sensor Input, Configuration Communications,
Red/Green 7-Segment Display

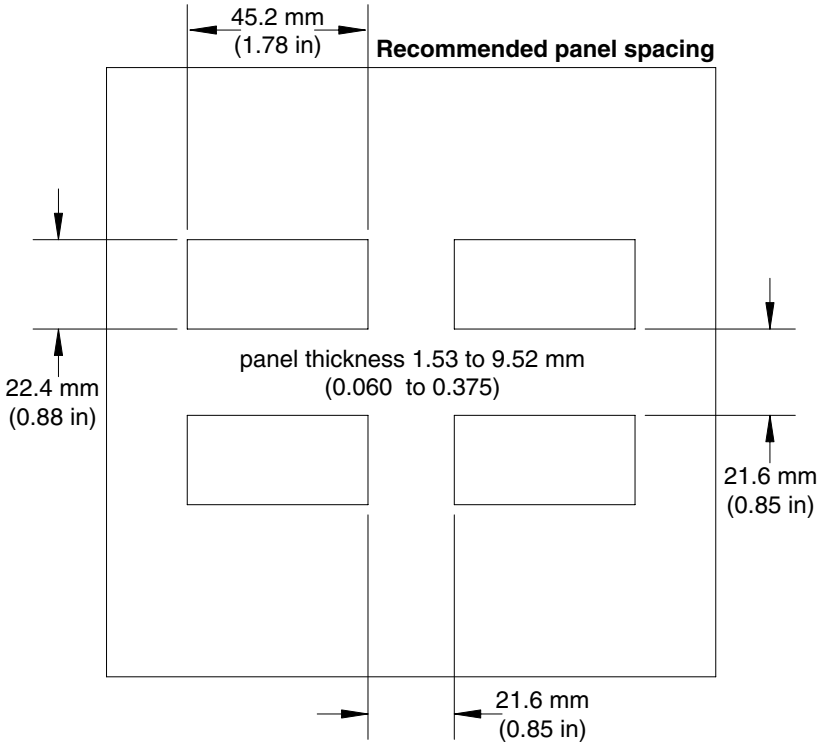


2 Chapter 2: Install and Wire

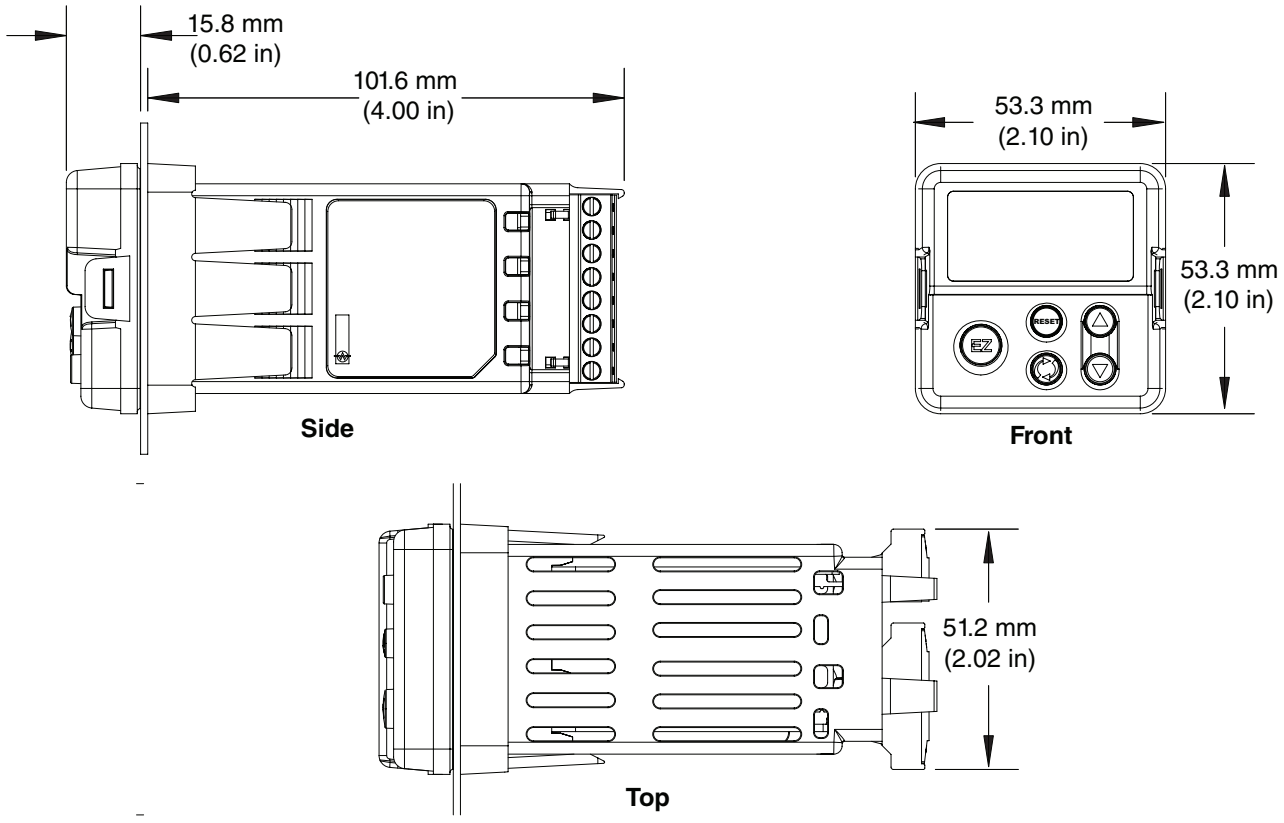
1/32 DIN Dimensions

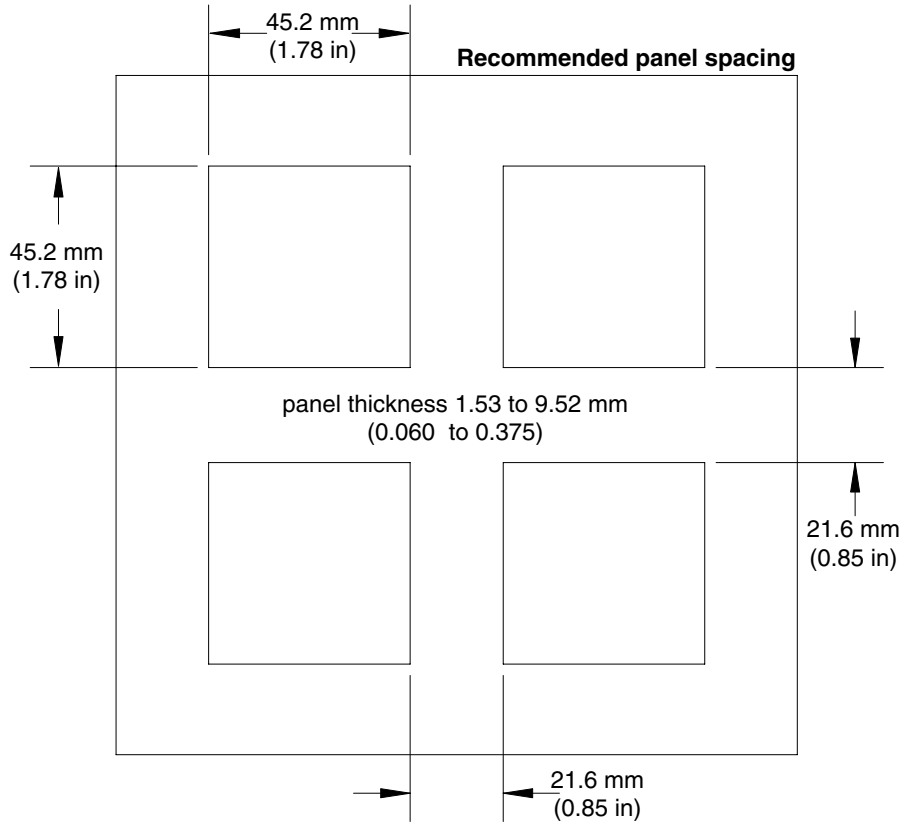




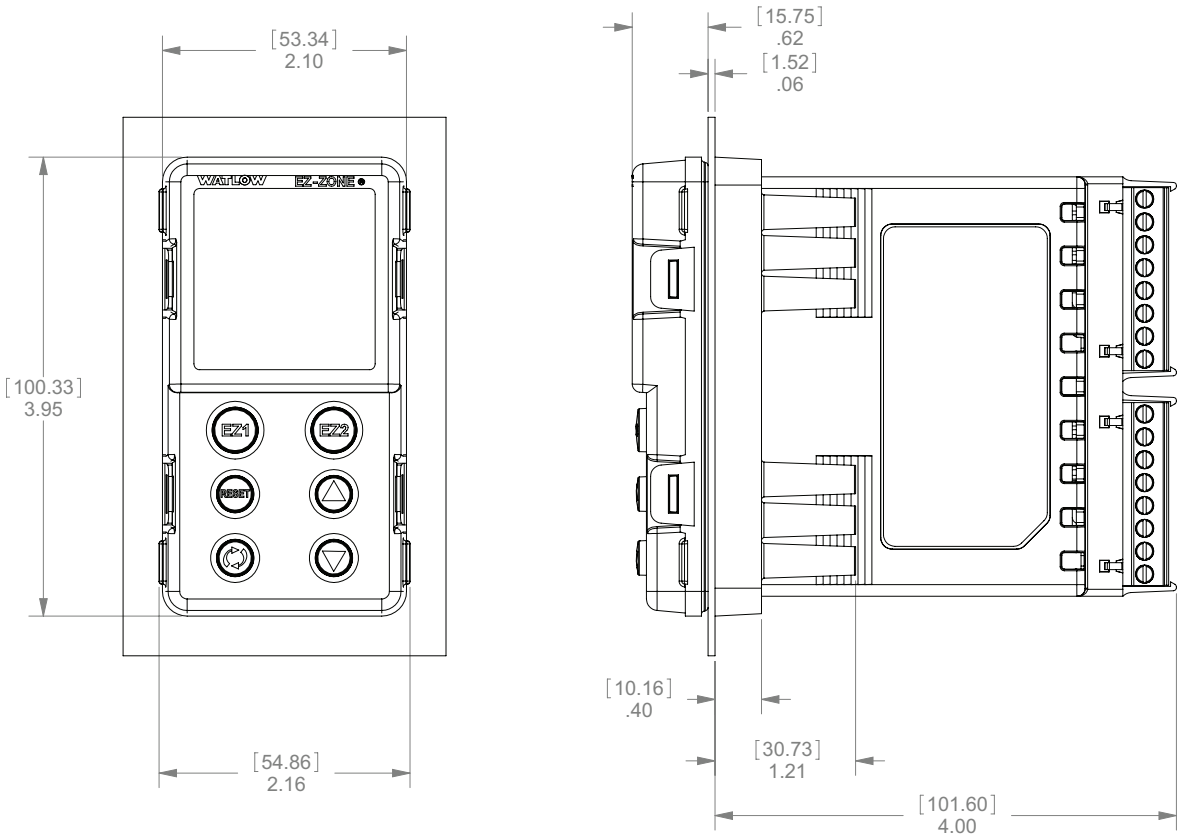


1/16 DIN Dimensions

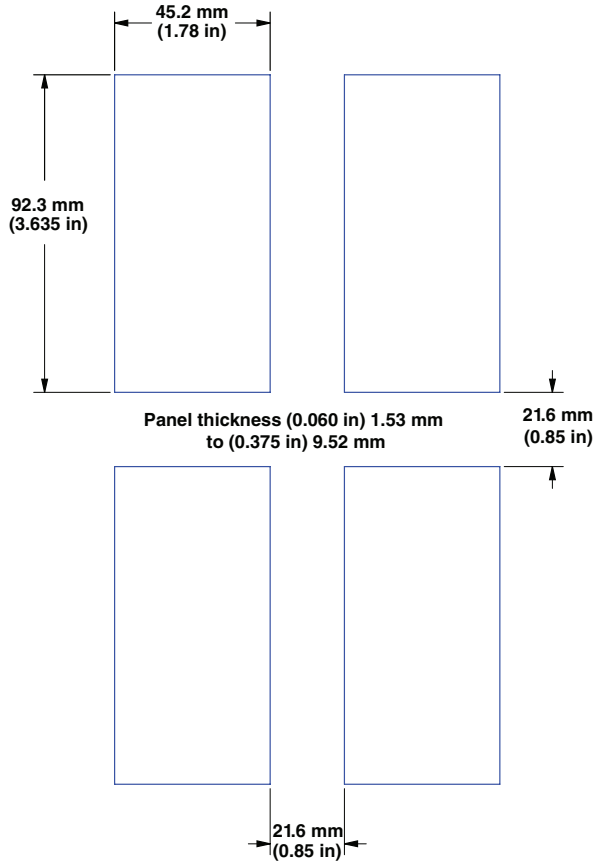




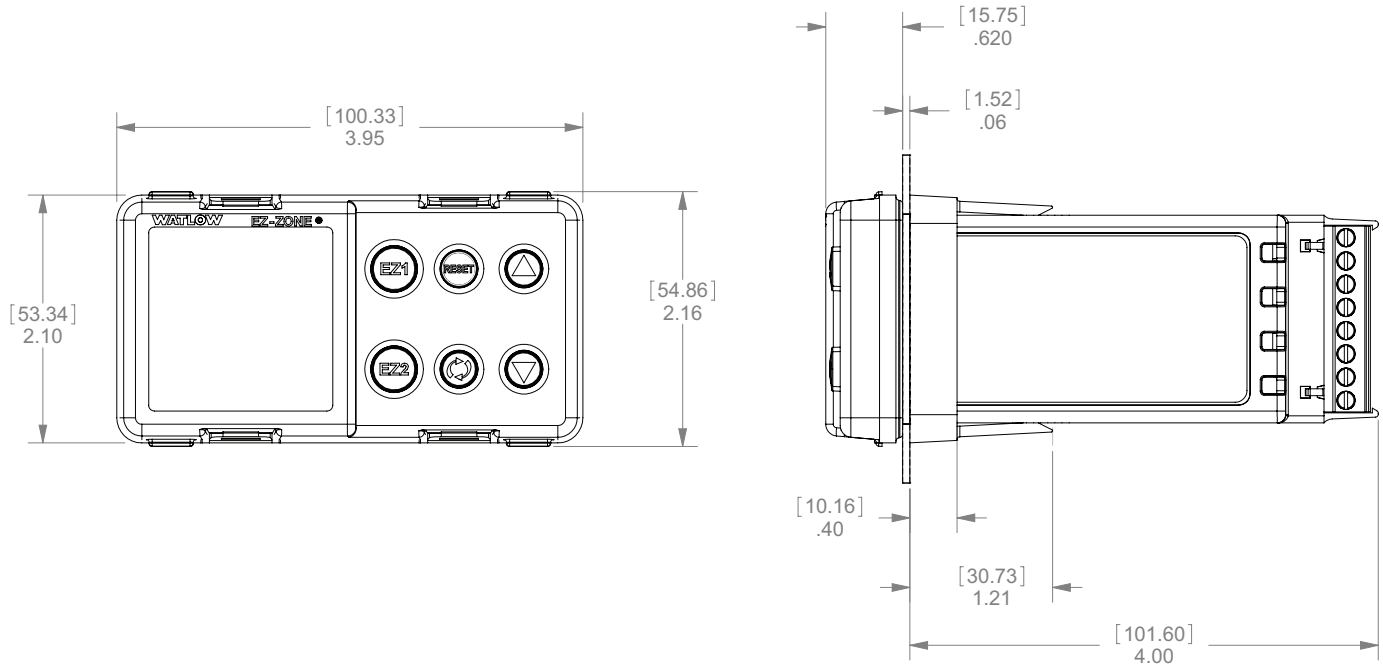
1/8 DIN (PM8) Vertical Dimensions



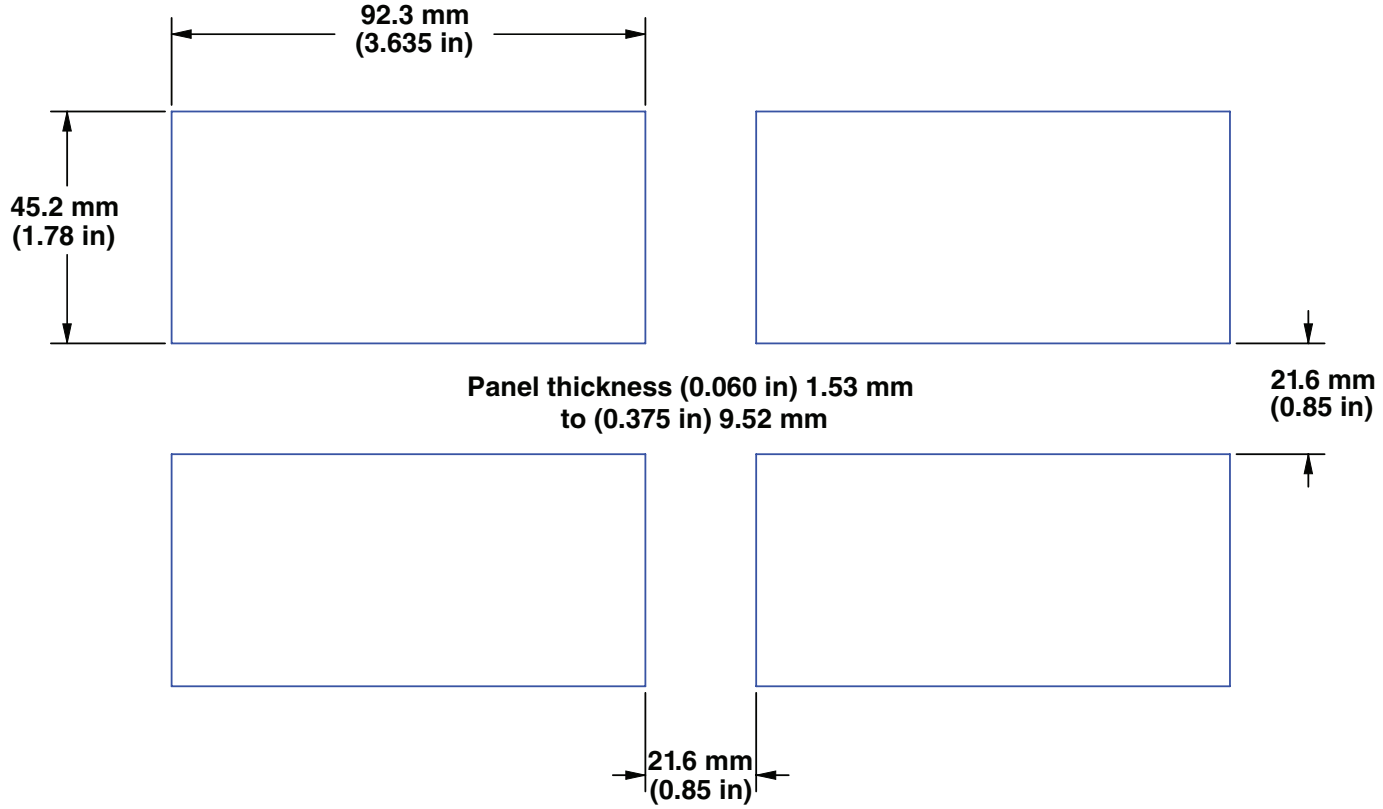
1/8 DIN (PM8) Vertical Recommended Panel Spacing



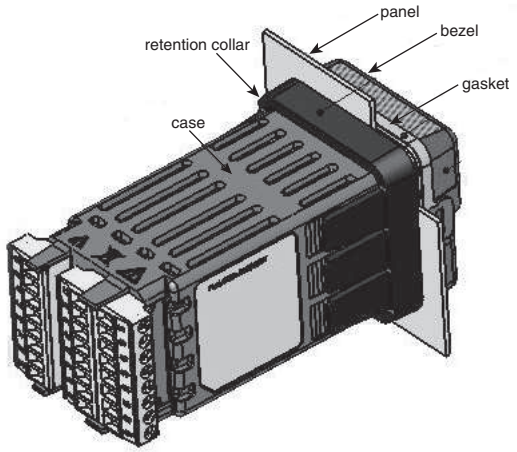
1/8 DIN (PM9) Horizontal Dimensions



1/8 DIN (PM9) Horizontal Recommended Panel Spacing



Installation

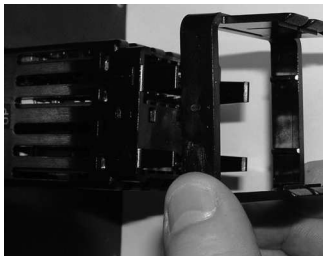


1. Make the panel cutout using the mounting template dimensions in this chapter.

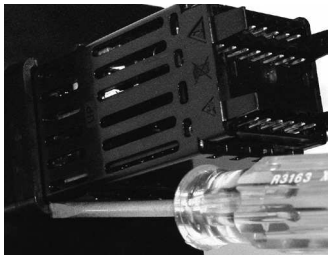
   Insert the case assembly into the panel cutout.

2. While pressing the case assembly firmly against the panel, slide the mounting collar over the back of the controller.

   If the installation does not require a NEMA 4X seal, slide the mounting collar up to the back of the panel tight enough to eliminate the spacing between the gasket and the panel.



Slide the mounting collar over the back of the controller.



Place the blade of a screwdriver in the notch of the mounting collar assembly.

3. For a NEMA 4X (UL50, IP66) seal, alternately place and push the blade of a screwdriver against each of the the four corners of the mounting collar assembly. Apply pressure to the face of the controller while pushing with the screwdriver. Don't be afraid to apply enough pressure to properly install the controller. The seal system is compressed more by mating the mounting collar tighter to the front panel (see pictures above). If you can move the case assembly back and forth in the cutout, you do not have a proper seal.

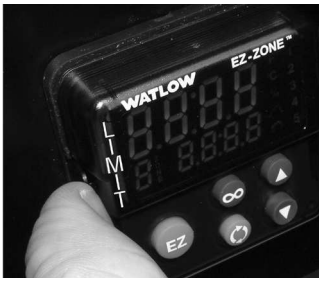
   The tabs on each side of the mounting collar have teeth that latch into the ridges on the sides of the controller. Each tooth is staggered at a different depth from the front so that only one of the tabs, on each side, is locked onto the ridges at a time.

Note:

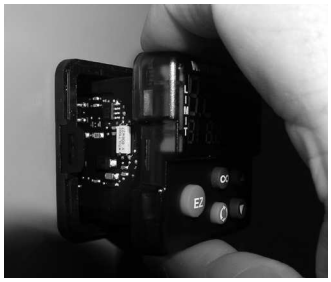
There is a graduated measurement difference between the up per and lower half of the display to the panel. In order to meet the seal requirements mentioned above, ensure that the distance from the front of the top half of the display to the panel is 16 mm (0.630 in.) or less, and the distance from the front of the bottom half and the panel is 13.3 mm (0.525 in.) or less.

Removing the Mounted Controller from Its Case

1. From the controller's face, pull out the tab on each side until you hear it click.



Pull out the tab on each side until you hear it click.



Grab the unit above and below the face and pull forward.

2. Once the sides are released, grab the unit above and below the face with two hands and pull the unit out. On the PM4/8/9 controls slide a screwdriver under the pry tabs and turn.

Returning the Controller to its Case

1. Ensure that the orientation of the controller is correct and slide it back into the housing.

Note: The controller is keyed so if it feels that it will not slide back in do not force it. Check the orientation again and reinsert after correcting.

2. Using your thumbs push on either side of the controller until both latches click.

Chemical Compatibility

This product is compatible with acids, weak alkalis, alcohols, gamma radiation and ultraviolet radiation.

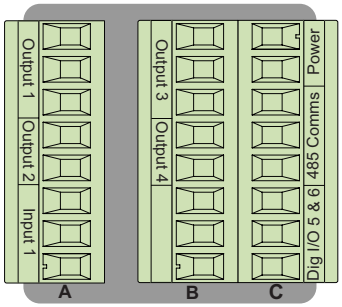
This product is not compatible with strong alkalis, organic solvents, fuels, aromatic hydrocarbons, chlorinated hydrocarbons, esters and keytones.

Slot A		Slot B		Slot E		
Output					Terminal Function	Configuration
1	2	3	4			
X1 W1 Y1		X3 W3 Y3			common (Any switched dc output can use this common.) dc- (open collector) dc+	Switched dc/open collector output 1: PM _ _ _ **[C]** _-_ _ _ _ AAA output 3: PM **[6, 8, 9]** _ _ _ _-_ _ **[C]** _ AAA
			W4 Y4		dc- dc+	Switched dc output 4: PM **[6, 8, 9]** _ _ _ _-_ _ _ **[C]** AAA
		F3 G3 H3			voltage or current - voltage + current +	Universal Process output 3: PM **[6, 8, 9]** _ _ _ _-_ _ **[F]** _ AAA
L1 K1 J1		L3 K3 J3			normally open common normally closed	Mechanical Relay 5 A, Form C output 1: PM _ _ _ **E** _-_ _ _ _ AAA output 3: PM **[6, 8, 9]** _ _ _ _-_ _ **[E]** _ AAA
	L2 K2		L4 K4		normally open common	Mechanical Relay 5 A, Form A output 2: PM _ _ _ _ **J**-_ _ _ _ AAA output 4: PM **[6, 8, 9]** _ _ _ _-_ _ _ **[J]** AAA
		L3 K3	L4 K4		normally open common	Solid-state Relay 0.5 A, Form A output 3: PM **[6, 8, 9]** _ _ _ _-_ _ **[K]** _ AAA output 4: PM **[6, 8, 9]** _ _ _ _-_ _ _ **[K]** AAA
Communications						
		CB CA CC CB CA C5 C3 C2		CB CA CC CB CA C5 C3 C2	Modbus RTU EIA-485 T+/R+ Modbus RTU EIA-485 T-/R- Modbus RTU EIA-485 common Modbus RTU EIA-485 T+/R+ Modbus RTU EIA-485 T-/R- Modbus RTU EIA-232 common Modbus RTU EIA-232 to DB9 pin 2 Modbus RTU EIA-232 to DB9 pin 3	Modbus RTU 232/485 Communications PM **[6, 8, 9]** _ _ _ _-**[2]** A A A AAA
		V+ CH SH CL V-		V+ CH SH CL V-	DeviceNet™ power Positive side of DeviceNet™ bus Shield interconnect Negative side of DeviceNet™ bus DeviceNet™ power return	DeviceNet™ Communications PM **[6, 8, 9]** _ _ _ _-**[5]** A A A AAA
		E8 E7 E6 E5 E4 E3 E2 E1		E8 E7 E6 E5 E4 E3 E2 E1	EtherNet/IP™ and Modbus TCP unused EtherNet/IP™ and Modbus TCP unused EtherNet/IP™ and Modbus TCP receive - EtherNet/IP™ and Modbus TCP unused EtherNet/IP™ and Modbus TCP unused EtherNet/IP™ and Modbus TCP receive + EtherNet/IP™ and Modbus TCP transmit - EtherNet/IP™ and Modbus TCP transmit +	Ethernet 10/100 supporting EtherNet/IP™ and Modbus TCP PM **[6, 8, 9]** _ _ _ _-**[3]** A A A AAA
Inputs						
1						
T1 S1 R1					S2 (RTD) or current + S3 (RTD), thermocouple -, current -, volts - or potentiometer wiper, thermistor S1 (RTD), thermocouple + or volts +, thermistor	Universal Sensor input 1: all configurations
Slot A		Slot B		Slot E		

Terminal Definitions for Slot C.

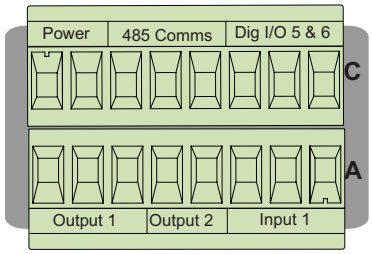
Slot C	Terminal Function	Configuration
98 99	power input: ac or dc+ power input: ac or dc-	all
CC CA CB	Standard Bus or Modbus RTU EIA-485 common Standard Bus or Modbus RTU EIA-485 T-/R- Standard Bus or Modbus RTU EIA-485 T+/R+	Standard Bus or Modbus PM **[6, 8, 9]** _ _ _ _-**[1]** _ _ _ AAA
CF CD CE	Standard Bus EIA-485 common Standard Bus EIA-485 T-/R- Standard Bus EIA-485 T+/R+	PM **[6, 8, 9]** _ _ _ _-**[A, 2 or 3]** _ _ _ AAA
B5 D6 D5	digital input-output common digital input or output 6 digital input or output 5	PM _ _ **[2]** _ _-_ _ _ _ AAA PM _ _ **[4]** _ _-_ _ _ _ AAA

Back View
Slot Orientation
1/16 DIN **PM6**

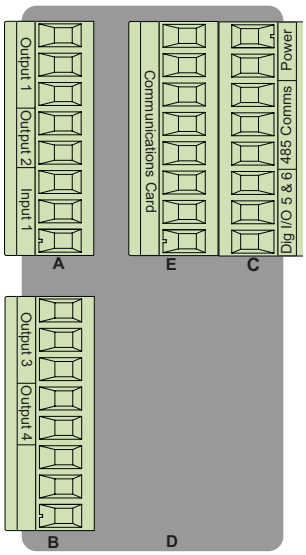


Note:
Slot B above can also be configured with a communications card.

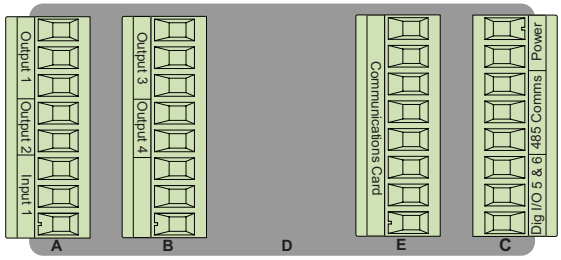
Back View
Slot Orientation
1/32 DIN **PM3**



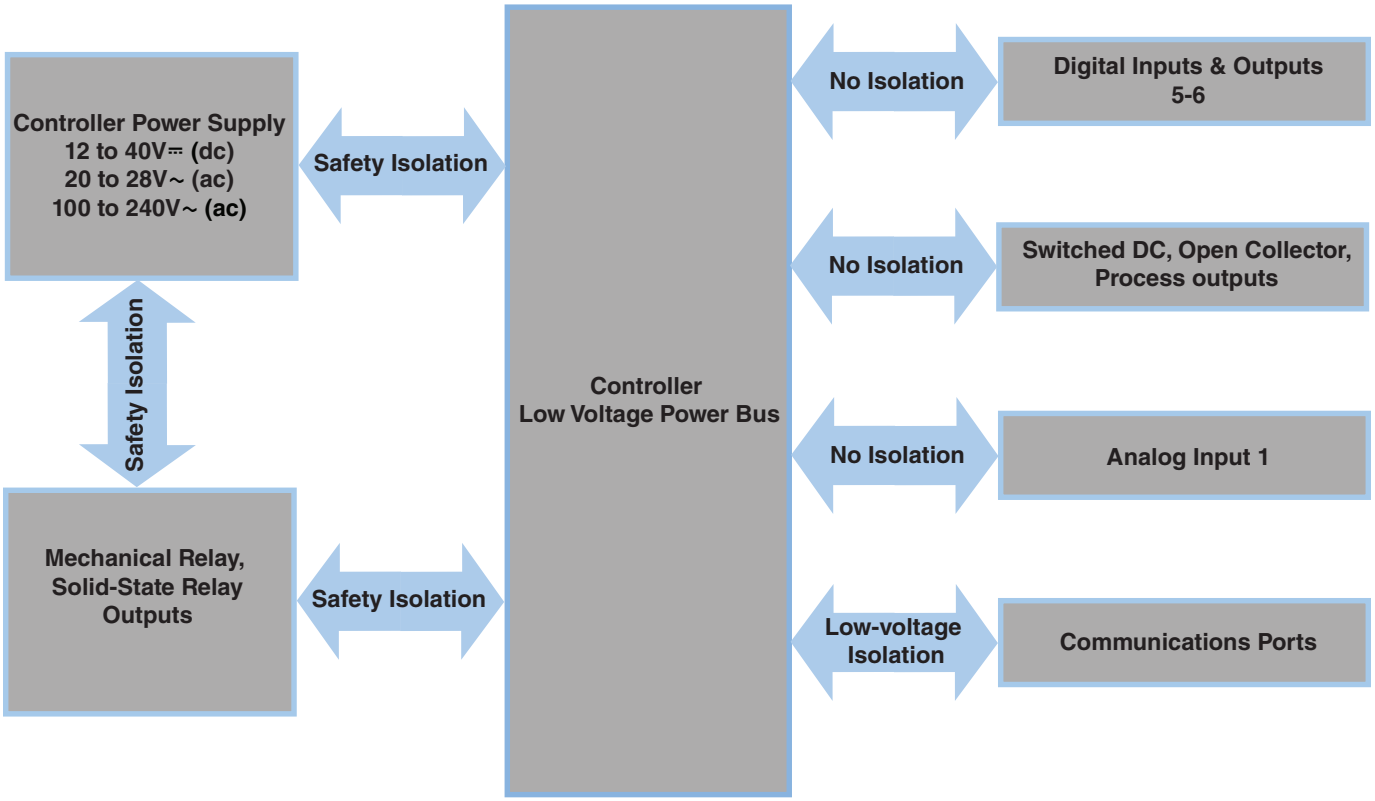
Back View
Slot Orientation 1/8
DIN Vertical **PM8**



Back View
Slot Orientation
1/8 DIN Horizontal **PM9**



EZ-ZONE PM Isolation Blocks.



Low-voltage Isolation: 42V peak
Safety Isolation: 2300V~ (ac)

Warning:
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

Note:
Maximum wire size termination and torque rating:
- **0.0507 to 3.30 mm^2 (30 to 12 AWG) single-wire termination or two 1.31 mm^2 (16 AWG)**
- **0.8 Nm (7.0 lb.-in.) torque**

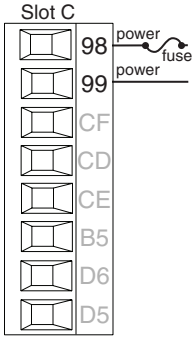
Note:
Adjacent terminals may be labeled differently, depending on the model number.

Note:
To prevent damage to the controller, do not connect wires to unused terminals.

Note:
Maintain electrical isolation between analog input 1, digital input-outputs, switched dc/open collector outputs and process outputs to prevent ground loops.

Note:
The control output common terminal and the digital common terminal are referenced to different voltages and must remain isolated.

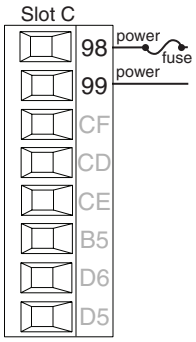
Low Power



- Minimum/Maximum Ratings
- 12 to 40V⎓ (dc)
- 20 to 28V~ (ac) Semi Sig F47
- 47 to 63 Hz
- 14VA maximum power consumption (PM8 & 9)
- 10VA maximum power consumption (PM3 & 6)

PM_ _ **[3, 4]** _ _ - _ _ _ _ _ _ _

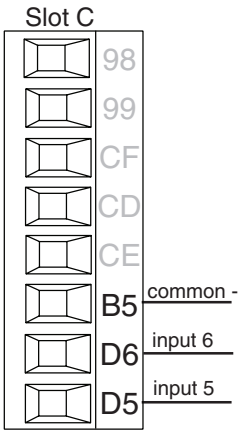
High Power



- Minimum/Maximum Ratings
- 85 to 264V~ (ac)
- 100 to 240V~ (ac) Semi Sig F47
- 47 to 63 Hz
- 14VA maximum power consumption (PM8 & 9)
- 10VA maximum power consumption (PM6)

PM_ _ **[1, 2]** _ _ - _ _ _ _ _ _ _

Digital Input 5, 6



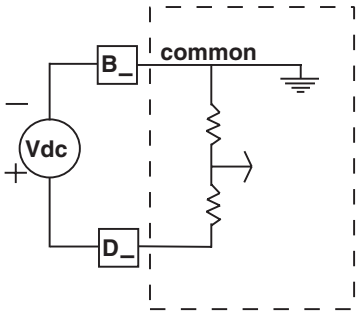
Digital Input
- Update rate 10 Hz
- Dry contact or dc voltage

DC Voltage
- Input not to exceed 36V at 3 mA
- Input active when > 3V @ 0.25 mA
- Input inactive when < 2V

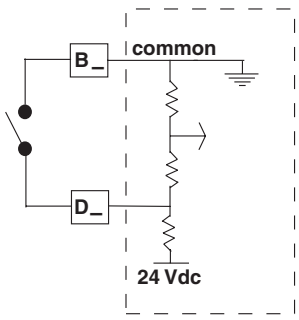
Dry Contact
- Input inactive when > 500 Ω
- Input active when < 100 Ω
- maximum short circuit 13 mA

PM _ _ **[2,4]** _ _-_ _ _ _ _ _ _

Voltage Input



Dry Contact



Warning:
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

Note:
Maximum wire size termination and torque rating:
- **0.0507 to 3.30 mm^2 (30 to 12 AWG) single-wire termination or two 1.31 mm^2 (16 AWG)**
- **0.8 Nm (7.0 lb.-in.) torque**

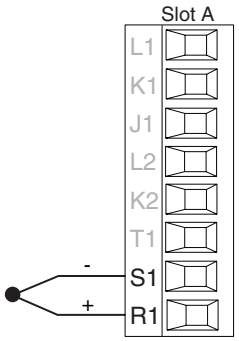
Note:
Adjacent terminals may be labeled differently, depending on the model number.

Note:
To prevent damage to the controller, do not connect wires to unused terminals.

Note:
Maintain electrical isolation between analog input 1, digital input-outputs, switched dc/open collector outputs and process outputs to prevent ground loops.

Note:
The control output common terminal and the digital common terminal are referenced to different voltages and must remain isolated.

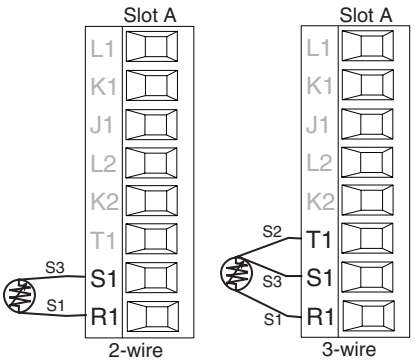
Input 1 Thermocouple



- 2K Ω maximum source resistance
- >20 MΩ input impedance
- 3 microampere open-sensor detection
- Thermocouples are polarity sensitive. The negative lead (usually red) must be connected to S1.
- To reduce errors, the extension wire for thermocouples must be of the same alloy as the thermocouple.

Input 1: PM _ _ _ _ _ - _ _ _ _ _ _ _ (S1/R1)

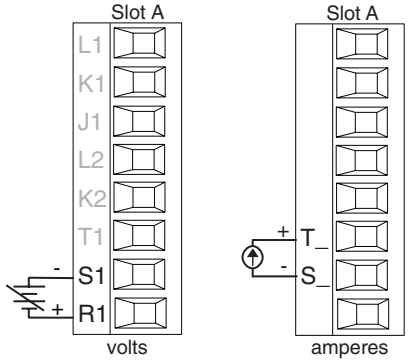
Input 1 RTD



- platinum, 100 and 1,000 Ω @ 0°C
- calibration to DIN curve (0.00385 Ω/Ω/°C)
- 20 Ω total lead resistance
- RTD excitation current of 0.09 mA typical. Each ohm of lead resistance may affect the reading by 0.03°C.
- For 3-wire RTDs, the S1 lead (usually white) must be connected to R1.
- For best accuracy use a 3-wire RTD to compensate for lead-length resistance. All three lead wires must have the same resistance.

PM _ _ _ _ _-_ _ _ _ AAA (all)

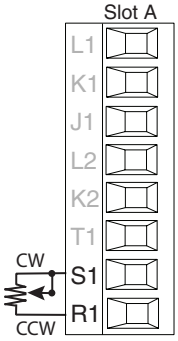
Input 1 Process



- 0 to 20 mA @ 100 Ω input impedance
- 0 to 10V⎓ (dc) @ 20 kΩ input impedance
- 0 to 50 mV⎓ (dc) @ 20 kΩ input impedance
- scalable

PM _ _ _ _ _-_ _ _ _ AAA (all)

Input 1 Potentiometer



- Use a 1 kΩ potentiometer.

PM _ _ _ _ _-_ _ _ _ AAA (all)

Warning:
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

Note:
Maximum wire size termination and torque rating:
- **0.0507 to 3.30 mm^2 (30 to 12 AWG) single-wire termination or two 1.31 mm^2 (16 AWG)**
- **0.8 Nm (7.0 lb.-in.) torque**

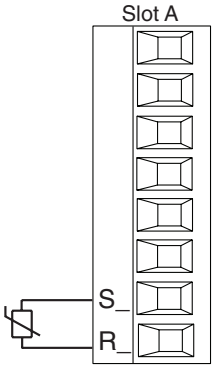
Note:
Adjacent terminals may be labeled differently, depending on the model number.

Note:
To prevent damage to the controller, do not connect wires to unused terminals.

Note:
Maintain electrical isolation between analog input 1, digital input-outputs, switched dc/open collector outputs and process outputs to prevent ground loops.

Note:
The control output common terminal and the digital common terminal are referenced to different voltages and must remain isolated.

Input 1 Thermistor



- 20 Ω maximum source resistance
- >20 MΩ input impedance
- 3 microampere open-sensor detection

Input 1: PM _ **[M]**_ _ _ _-_ _ _ _ _ _ _ (S1/R1)

Warning:
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Note:
Maximum wire size termination and torque rating:
- **0.0507 to 3.30 mm^2 (30 to 12 AWG) single-wire termination or two 1.31 mm^2 (16 AWG)**
- **0.8 Nm (7.0 lb.-in.) torque**

Note:
Adjacent terminals may be labeled differently, depending on the model number.

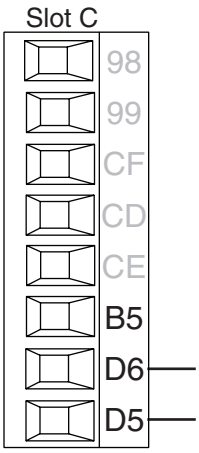
Note:
To prevent damage to the controller, do not connect wires to unused terminals.

Note:
Maintain electrical isolation between analog input 1, digital input-outputs, switched dc/open collector outputs and process outputs to prevent ground loops.

Note:
The control output common terminal and the digital common terminal are referenced to different voltages and must remain isolated.

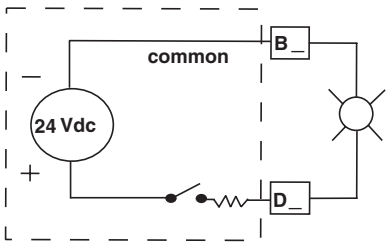
Quencharc Note:
Switching pilot duty inductive loads (relay coils, solenoids, etc.) with the mechanical relay, solid state relay or open collector output options requires use of an R.C. suppressor.

Digital Output 5, 6

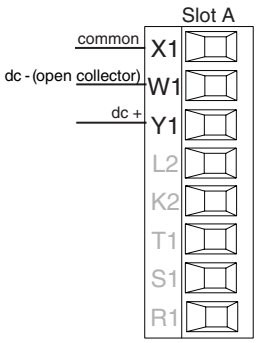


Digital Output
- Update rate 10 Hz
- Output voltage 24V
- Current limit, Output 5, 24 mA maximum
- Current limit, Output 6, 10 mA maximum driving single pole DIN-A-MITE
- Capable of driving a 3-pole DIN-A-MITE
- Open-circuit voltage 22 to 32V⎓ (dc)

PM _ _ **[2, 4]** _ _-_ _ _ _ _ _ _



Output 1 Switched DC/Open Collector

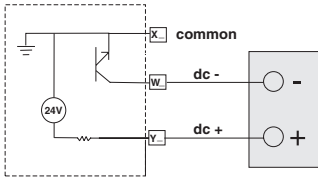


Switched DC
- 30 mA dc maximum supply current
- Short circuit limited to <50 mA
- 22 to 32V⎓ (dc) open circuit voltage
- Use dc- and dc+ to drive external solid-state relay.
- DIN-A-MITE compatible
- Single-pole: up to 4 in parallel or 4 in series
- 2-pole: up to 2 in parallel or 2 in series
- 3-pole: up to 2 in series

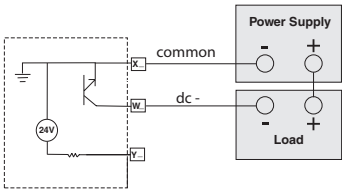
Open Collector
- 100 mA maximum output current sink
- 30V⎓ (dc) maximum supply voltage
- Any switched dc output can use the common terminal.
- Use an external power supply to control a dc load, with the load positive to the positive of the power supply, the load negative to the open collector and common to the power supply negative.

PM _ _ _ **[C]** _-_ _ _ _ AAA

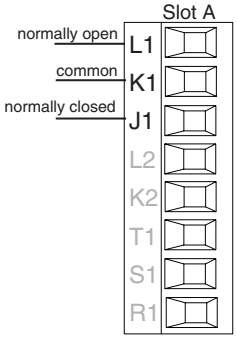
Switched DC



Open Collector



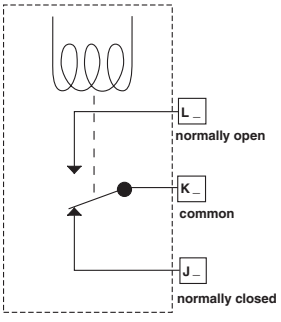
Output 1 Mechanical Relay, Form C



- 5 A at 240V~ (ac) or 30V⎓ (dc) maximum resistive load
- 20 mA at 24V minimum load
- 125 VA pilot duty at 120/240V~ (ac), 25 VA at 24V~ (ac)
- 100,000 cycles at rated load
- Output does not supply power.
- for use with ac or dc

See Quencharc note.

PM _ _ _ **[E]** _-_ _ _ _ AAA



Warning:
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Note:
Maximum wire size termination and torque rating:
- **0.0507 to 3.30 mm^2 (30 to 12 AWG) single-wire termination or two 1.31 mm^2 (16 AWG)**
- **0.8 Nm (7.0 lb.-in.) torque**

Note:
Adjacent terminals may be labeled differently, depending on the model number.

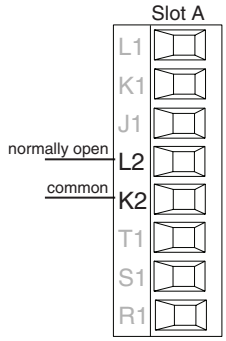
Note:
To prevent damage to the controller, do not connect wires to unused terminals.

Note:
Maintain electrical isolation between analog input 1, digital input-outputs, switched dc/open collector outputs and process outputs to prevent ground loops.

Note:
The control output common terminal and the digital common terminal are referenced to different voltages and must remain isolated.

Quencharc Note:
Switching pilot duty inductive loads (relay coils, solenoids, etc.) with the mechanical relay, solid state relay or open collector output options requires use of an R.C. suppressor.

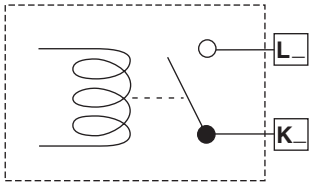
Output 2 Mechanical Relay, Form A



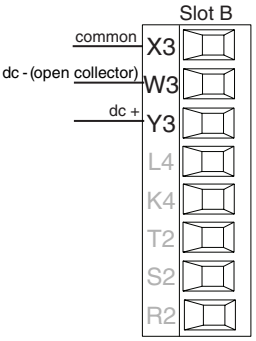
- 5 A at 240V~ (ac) or 30V⎓ (dc) maximum resistive load
- 20 mV at 24V minimum load
- 125 VA pilot duty @ 120/240V~ (ac), 25 VA at 24V~ (ac)
- 100,000 cycles at rated load
- Output does not supply power.
- for use with ac or dc

See Quencharc note.

PM _ _ _ _ **[J]**-_ _ _ _ AAA



Output 3 Switched DC/Open Collector



Switched DC

- 30 mA dc maximum supply current
- short circuit limited to <50 mA
- 22 to 32V⎓ (dc) open circuit voltage
- Use dc- and dc+ to drive external solid-state relay.
- DIN-A-MITE compatible
- Single-pole: up to 4 in parallel or 4 in series
- 2-pole: up to 2 in parallel or 2 in series
- 3-pole: up to 2 in parallel

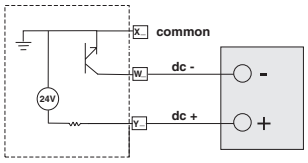
Open Collector

- 100 mA maximum output current sink
- 30V⎓ (dc) maximum supply voltage
- Any switched dc output can use the common terminal.
- Use an external power supply to control a dc load, with the load positive to the positive of the power supply, the load negative to the open collector and common to the power supply negative.

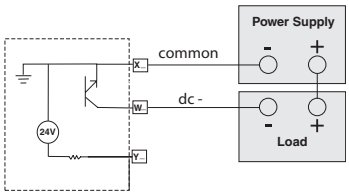
See Quencharc note.

PM _ _ _ _ _-_ _ **[C]** _ AAA

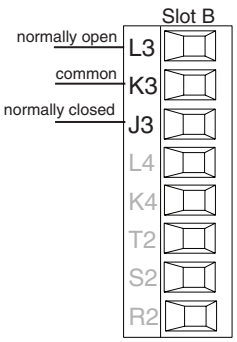
Switched DC



Open Collector



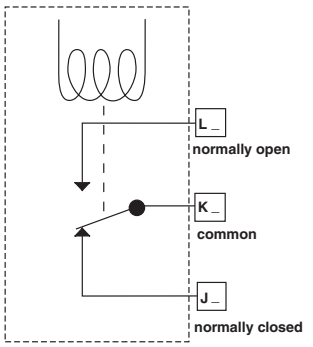
Output 3 Mechanical Relay, Form C



- 5 A at 240V~ (ac) or 30V⎓ (dc) maximum resistive load
- 20 mA at 24V minimum load
- 125 VA pilot duty at 120/240V~ (ac), 25 VA at 24V~ (ac)
- 100,000 cycles at rated load
- Output does not supply power.
- for use with ac or dc

See Quencharc note.

PM _ _ _ _ _-_ _ **[E]** _ AAA



Warning:
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

Note:
Maximum wire size termination and torque rating:
- **0.0507 to 3.30 mm^2 (30 to 12 AWG) single-wire termination or two 1.31 mm^2 (16 AWG)**
- **0.8 Nm (7.0 lb.-in.) torque**

Note:
Adjacent terminals may be labeled differently, depending on the model number.

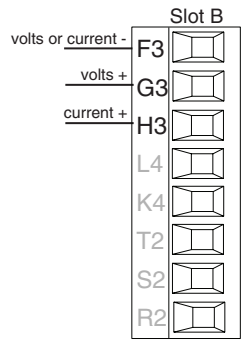
Note:
To prevent damage to the controller, do not connect wires to unused terminals.

Note:
Maintain electrical isolation between analog input 1, digital input-outputs, switched dc/open collector outputs and process outputs to prevent ground loops.

Note:
The control output common terminal and the digital common terminal are referenced to different voltages and must remain isolated.

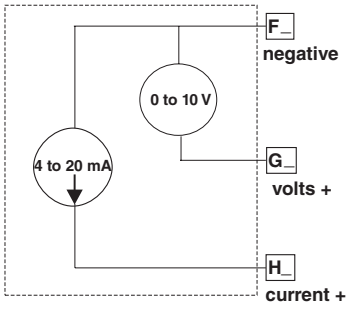
Quencharc Note:
Switching pilot duty inductive loads (relay coils, solenoids, etc.) with the mechanical relay, solid state relay or open collector output options requires use of an R.C. suppressor.

Output 3 Universal Process

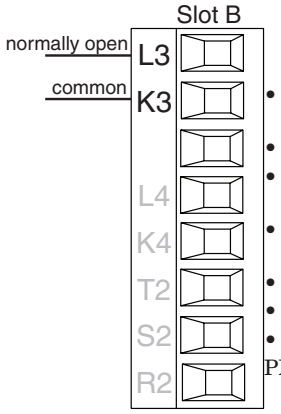


- 0 to 20 mA into 800 Ω maximum load
- 0 to 10V⎓ (dc) into 1 kΩ minimum load
- scalable
- output supplies power
- cannot use voltage and current outputs at same time
- Output may be used as retransmit or control.

PM _ _ _ _ _-_ _ **[F]** _ AAA

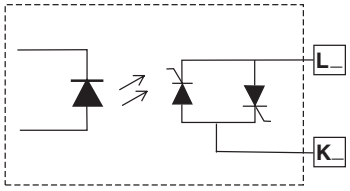


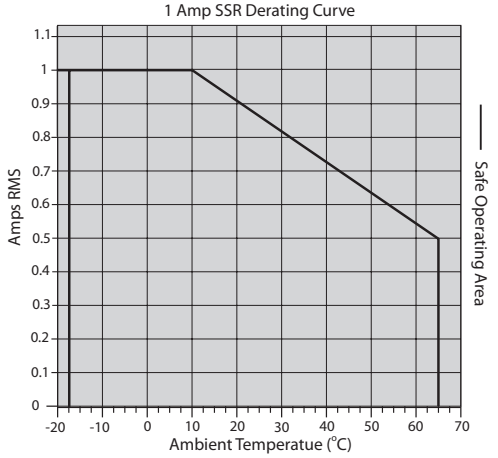
Output 3 Solid-State Relay, Form A



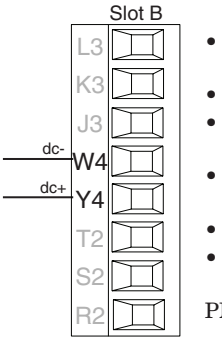
- 0.5 A at 20 to 264V~ (ac) maximum resistive load
- 20 VA 120/240V~ (ac) pilot duty
- opto-isolated, without contact suppression
- maximum off state leakage of 105 microamperes
- output does not supply power
- Do not use on dc loads.
- See Quencharc note.

PM _ _ _ _ _-_ _ **[K]** _ AAA



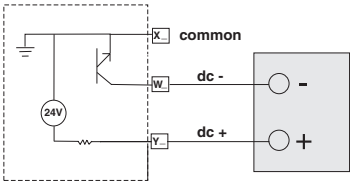


Output 4 Switched DC



- 10 mA DC maximum supply current
- Short circuit limited to <50 mA
- 22 to 32V⎓ (dc) open circuit voltage
- Use dc- and dc+ to drive external solid-state relay.
- DIN-A-MITE compatible
- Single-pole: up to 2 in series, none in parallel

PM _ _ _ _ _-_ _ _ **[C]** AAA



Warning:
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Note:
Maximum wire size termination and torque rating:
- **0.0507 to 3.30 mm^2 (30 to 12 AWG) single-wire termination or two 1.31 mm^2 (16 AWG)**
- **0.8 Nm (7.0 lb.-in.) torque**

Note:
Adjacent terminals may be labeled differently, depending on the model number.

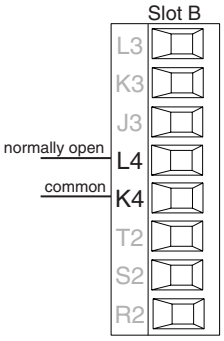
Note:
To prevent damage to the controller, do not connect wires to unused terminals.

Note:
Maintain electrical isolation between analog input 1, digital input-outputs, switched dc/open collector outputs and process outputs to prevent ground loops.

Note:
The control output common terminal and the digital common terminal are referenced to different voltages and must remain isolated.

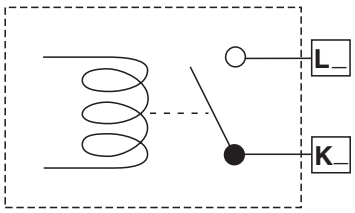
Quencharc Note:
Switching pilot duty inductive loads (relay coils, solenoids, etc.) with the mechanical relay, solid state relay or open collector output options requires use of an R.C. suppressor.

Output 4 Mechanical Relay, Form A

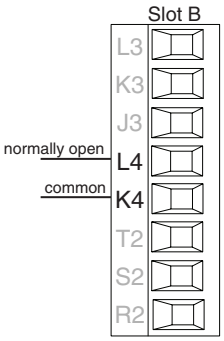


- 0.5 A at 20 to 264V~ (ac) maximum resistive load
- 20 VA 120/240V~ (ac) pilot duty
- opto-isolated, without contact suppression
- maximum off state leakage of 105 microamperes
- output does not supply power
- Do not use on dc loads.
- See Quencharc note

PM _ _ _ _ _-_ _ _ **[J]** AAA



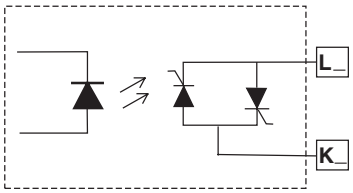
Output 4 Solid-State Relay, Form A

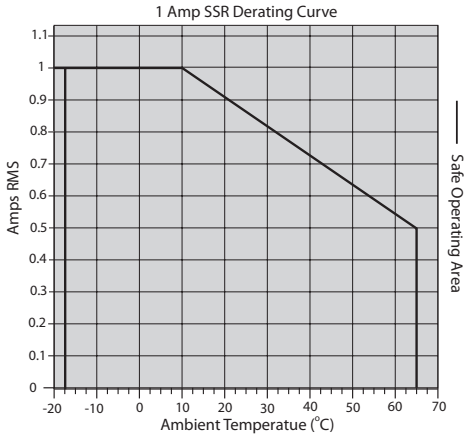


- 0.5 A at 20 to 264V~ (ac) maximum resistive load
- 20 VA 120/240V~ (ac) pilot duty
- opto-isolated, without contact suppression
- maximum off state leakage of 105 microamperes
- Output does not supply power.
- Do not use on dc loads.

See Quencharc note.

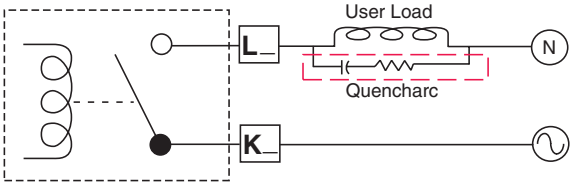
PM _ _ _ _ _-_ _ _ **[K]** AAA





Quencharc Wiring Example

In this example the Quencharc circuit (Watlow part# 0804-0147-0000) is used to protect PM internal circuitry from the counter electromagnetic force from the inductive user load when de-engergized. It is recommended that this or an equivalent Quencharc be used when connecting inductive loads to PM outputs.



Warning:
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

Note:
Maximum wire size termination and torque rating:
- **0.0507 to 3.30 mm^2 (30 to 12 AWG) single-wire termination or two 1.31 mm^2 (16 AWG)**
- **0.8 Nm (7.0 lb.-in.) torque**

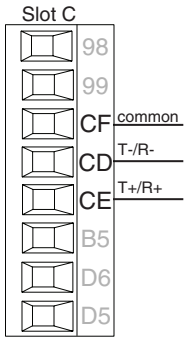
Note:
Adjacent terminals may be labeled differently, depending on the model number.

Note:
To prevent damage to the controller, do not connect wires to unused terminals.

Note:
Maintain electrical isolation between analog input 1, digital input-outputs, switched dc/open collector outputs and process outputs to prevent ground loops.

Note:
The control output common terminal and the digital common terminal are referenced to different voltages and must remain isolated.

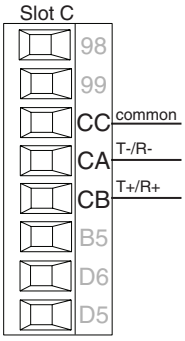
Standard Bus EIA-485 Communications



- Wire T-/R- to the A terminal of the EIA-485 port.
- Wire T+/R+ to the B terminal of the EIA-485 port.
- Wire common to the common terminal of the EIA-485 port.
- Do not route network wires with power wires. Connect network wires in daisy-chain fashion when connecting multiple devices in a network.
- A 120 Ω termination resistor may be required across T+/R+ and T-/R-, placed on the last controller on the network.
- Do not connect more than 16 EZ-ZONE PM controllers on a network.
- Maximum network length: 1,200 meters (4,000 feet)
- 1/8th unit load on EIA-485 bus

PM _ _ _ _ _-**[A, 2 or 3]** _ _ _ AAA

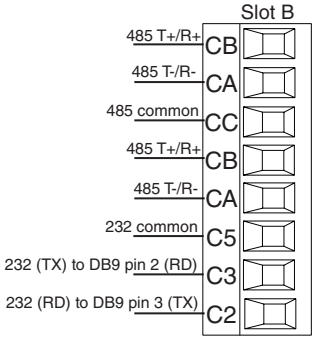
Modbus RTU or Standard Bus EIA-485 Communications



- Wire T-/R- to the A terminal of the EIA-485 port.
- Wire T+/R+ to the B terminal of the EIA-485 port.
- Wire common to the common terminal of the EIA-485 port.
- Do not route network wires with power wires. Connect network wires in daisy-chain fashion when connecting multiple devices in a network.
- A termination resistor may be required. Place a 120 Ω resistor across T+/R+ and T-/R- of last controller on network.
- Only one protocol per port is available at a time: either Modbus RTU or Standard Bus.
- Do not connect more than 16 EZ-ZONE PM controllers on a Standard Bus network.
- Maximum number of EZ-ZONE controllers on a Modbus RTU network is 247.
- Maximum network length: 1,200 meters (4,000 feet)
- 1/8th unit load on EIA-485 bus.

PM _ _ _ _ _-**[1]** _ _ _ AAA

EIA-232/485 Modbus RTU Communications



- Wire T-/R- to the A terminal of the EIA-485 port.
- Wire T+/R+ to the B terminal of the EIA-485 port.
- Wire common to the common terminal of the EIA-485 port.
- Do not route network wires with power wires. Connect network wires in daisy-chain fashion when connecting multiple devices in a network.
- A termination resistor may be required. Place a 120 Ω resistor across T+/R+ and T-/R- of last controller on network.
- Do not wire to both the EIA-485 and the EIA-232 pins at the same time.
- Two EIA-485 terminals of T/R are provided to assist in daisy-chain wiring.
- Do not connect more than one EZ-ZONE PM controller on an EIA-232 network.
- Do not connect more than 16 EZ-ZONE PM controllers on a Standard Bus EIA-485 network.
- Do not connect more than 247 EZ-ZONE PM controllers on a Modbus RTU EIA-485 network.
- maximum EIA-232 network length: 15 meters (50 feet)
- maximum EIA-485 network length: 1,200 meters (4,000 feet)
- 1/8th unit load on EIA-485 bus.

PM **[6, 8, 9]** _ _ _ _-**[2]** AAA AAA

Modbus-IDA Terminal	EIA/TIA-485 Name	Watlow Terminal Label	Function
DO	A	CA or CD	T-/R-
D1	B	CB or CE	T+/R+
common	common	CC or CF	common

Warning:
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

Note:
Maximum wire size termination and torque rating:
- **0.0507 to 3.30 mm^2 (30 to 12 AWG) single-wire termination or two 1.31 mm^2 (16 AWG)**
- **0.8 Nm (7.0 lb.-in.) torque**

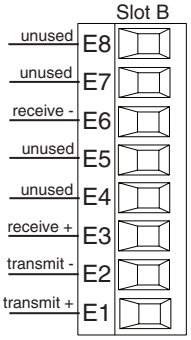
Note:
Adjacent terminals may be labeled differently, depending on the model number.

Note:
To prevent damage to the controller, do not connect wires to unused terminals.

Note:
Maintain electrical isolation between analog input 1, digital input-outputs, switched dc/open collector outputs and process outputs to prevent ground loops.

Note:
The control output common terminal and the digital common terminal are referenced to different voltages and must remain isolated.

EtherNet/IP™ and Modbus TCP Communications



RJ-45 pin	T568B wire color	Signal	Slot B
8	brown	unused	E8
7	brown & white	unused	E7
6	green	receive -	E6
5	white & blue	unused	E5
4	blue	unused	E4
3	white & green	receive +	E3
2	orange	transmit -	E2
1	white & orange	transmit +	E1

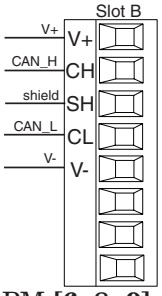
EtherNet/IP™ and Modbus TCP communications to connect with a 10/100 switch.

- Do not route network wires with power wires.
- Connect one Ethernet cable per controller to a 10/100 mbps ethernet switch. Both Modbus TCP and EtherNet/IP™ are available on the network.
- A RUI may be connected at the same time using Slot C.

PM **[6, 8, 9]**_ _ _ _ _**-[3]** _ _ _ AAA

Note:
When changing the fixed IP address cycle module power for new address to take effect.

DeviceNet™ Communications



Terminal	Signal	Function
V+	V+	DeviceNet™ power
CH	CAN_H	positive side of DeviceNet™ bus
SH	shield	shield interconnect
CL	CAN_L	negative side of DeviceNet™ bus
V-	V-	DeviceNet™ power return

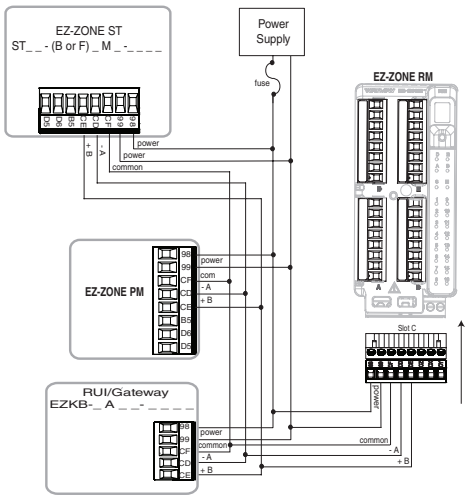
PM **[6, 8, 9]** _ _ _ _ **- 5** _ _ _ _ _ _

Wiring a Serial EIA-485 Network

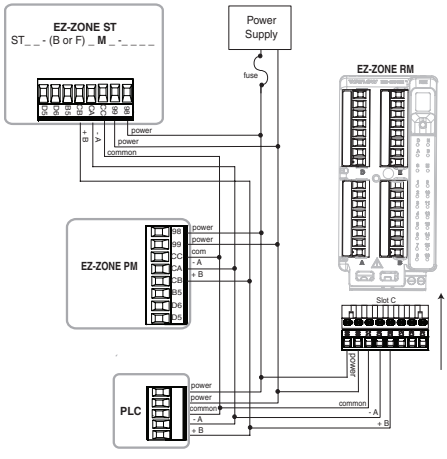
Do not route network wires with power wires. Connect network wires in daisy-chain fashion when connecting multiple devices in a network.

A termination resistor may be required. Place a 120 Ω resistor across T+/R+ and T-/R- of the last controller on a network.

Only one protocol per port is available at a time: either Modbus RTU or Standard Bus.



A network using Watlow's Standard Bus and an RUI/Gateway.



A network using Modbus RTU.

3 Chapter 3: Keys and Displays

Upper (Left, 32nd DIN) Display:

In the Home Page, displays the process value, otherwise displays the value of the parameter in the lower display.

Zone Display:

Indicates the controller zone.

1 to 9 = zones 1 to 9

A = zone 10
b = zone 11
C = zone 12
d = zone 13
E = zone 14
F = zone 15
h = zone 16

EZ Key/s:

This key can be programmed to do various tasks, such as locking the keyboard, restoring user settings, etc...

Channel Display:

Indicates the channel for any given EZ-ZONE module.

- Available with the PM8 and PM9 only.

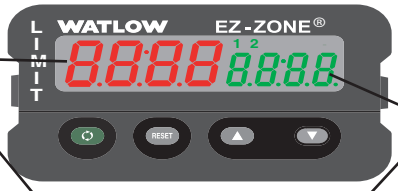
Reset Key

Press to back up one level, or press and hold for two seconds to return to the Home Page. From the Home Page will reset the limit and clear alarms and errors if clearable.

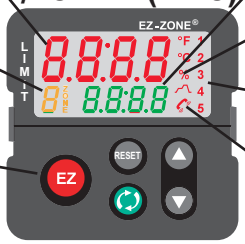
Advance Key

Advances through parameter prompts.

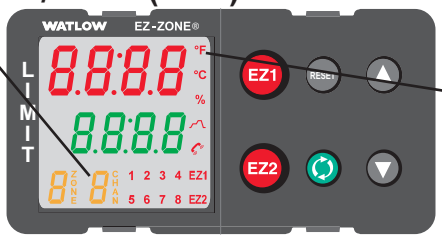
1/32 DIN (PM3)



1/16 DIN (PM6)



1/8 DIN (PM8) Horizontal



1/8 DIN (PM8) Vertical

Lower (Right, 32nd DIN) Display:

Indicates the set point or output power value during operation, or the parameter whose value appears in the upper display.

Percent Units:

Lights when the controller is displaying values as a percentage or when the open-loop set point is displayed.

Output Activity:

Number LEDs indicate activity of outputs. A flashing light indicates output activity.

Communications Activity

Flashes when another device is communicating with this controller.

Temperature Units:

Indicates whether the temperature is displayed in Fahrenheit or Celsius.

Up and Down Keys

In the Home Page, adjusts the set point in the lower (right) display. In other pages, changes the upper (left) display to a higher or lower value, or changes a parameter selection.

Responding to a Displayed Message

An active message will cause the display to toggle between the normal settings and the active message in the upper display and [AtEn] in the lower display.

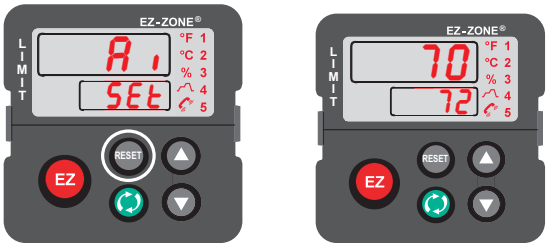
Your response will depend on the message and the controller settings. If the message was generated by a latched alarm or limit condition, the message can be cleared when the condition no longer exists by simply pushing the Reset key or alternatively by following the steps below.

Push the Advance Key to display [iSnr] in the upper display and the message source (such as [L.hI]) in the lower display.

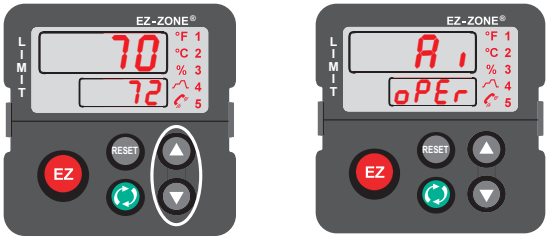
Use the Up or Down keys to scroll through possible responses, such as Clear [CLr] or Silence [SiL]. Then push the Advance or Reset key to execute the action.

Navigating the EZ-ZONE PM Limit Controller

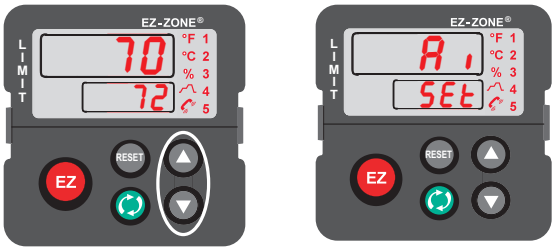
All Models



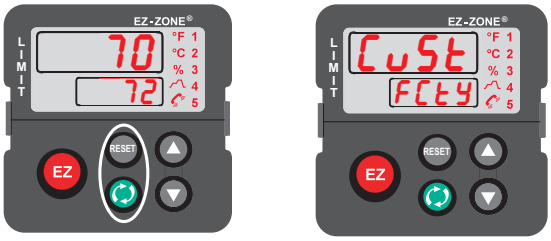
Home Page from anywhere: Press the Reset key for two seconds to return to the Home Page.



Operations Page from Home Page: Press both the Up and Down keys for three seconds.



Setup Page from Home Page: Press both the Up and Down keys for six seconds.



Factory Page from Home Page: Press both the Advance and Reset keys for six seconds.

4 Chapter 4: Home Page

Default Home Page Parameters

Watlow's patented user-defined menu system improves operational efficiency. The user-defined Home Page provides you with a shortcut to monitor or change the parameter values that you use most often. The default Home Page is shown on the following page. When a parameter normally located in the Setup Page or Operations Page is placed in the Home Page, it is accessible through both. If you change a parameter in the Home Page, it is automatically changed in its original page. If you change a parameter in its original page it is automatically changed in the Home Page.

The Attention [AtEn] parameter appears only if there is an active message. An example of an active message could be that Alarm 1 High occurred where the display would flash [AtEn] on the bottom display and [AL.h 1] on top.

Use the Advance key to step through the other parameters. When not in pairs the parameter prompt will appear in the lower display, and the parameter value will appear in the upper display. You can use the Up or Down keys to change the value of writable parameters, just as you would in any other menu.

If a sensor failure has occurred, dashed lines [- - - -] will appear in the upper display and [FA iL] in the lower display. This would also cause the limit to trip as well.

Changing the Set Point

From the default Home Page the Limit set points (high and or low) can be changed. If the Limit is set up for high and low limits push the Advance key one time and the Limit Low Set Point [LL.S 1] prompt will appear in the lower display while the current set point will be displayed above. Pushing the Up or Down keys will change the set point. Once done, simply push the Advance key to display the Limit High Set Point [Lh.S 1] will appear below and the current high set point will be displayed above. Again, to change simply push the Up and Down arrow keys.

Modifying the Home Page

To modify the Home Page proceed to the Factory Menu by pushing and holding the Advance key and the Reset key for approximately six seconds. Upon entering the Factory Page the first menu will be the Custom Menu [CuSt]. Once there push the Advance key where the lower display will show [CuSt] and the upper display will show [1]. Again, push the Advance button where the prompt for the Process Value [Pro] will be displayed on top and Parameter [PAr] in the bottom. Using the Up or Down arrow keys will allow for a customized selection of choice. There are twenty positions available that can be customized.

Modifying the Display Pairs

The Home Page, being a customized list of as many as 20 parameters can be configured in pairs of up to 10 via the Display Pairs [d.Pr5] prompt found in the Diagnostic Menu [d iAG] (Factory Page). The listing in the table that follows represents the Limit default Home Page. It is important to note that some of the prompts shown may not appear simply because the feature is not being used or is turned off. As an example, the prompt shown in position 3 (Limit Low Set Point) will not appear unless the Limit is set up for limit low found on the Set Page under the Limit Menu.

As stated above, the user can define ten pairs of prompts to appear on the display every time the Advance key is pushed. In a default state the Display Pairs [d.Pr5] prompt is equal to one with the first pair displayed as is defined in the Home Page table that follows. If the Display Pairs prompt were to be changed to two pushing the Advance key one time would cause the display to show the Limit low Set Point on the top and the Limit High Set point on the bottom reflecting position 3 and 4 respectively. Note that both of these parameters are writable however being paired in this manner only Limit High Set Point can be changed. Pairing two writable prompts will only allow for the bottom one to be changed.

The display can be configured to scroll by going to the Factory Page under the Diagnostic Menu and changing the Display Time [d.t i] prompt to something greater than 0. If set to 2, the display will scroll every 2 seconds from Custom Menu Pair 1 to 2, etc...

Custom Menu Number	Home Page Display (defaults)	Parameter Name	Settings	Custom Menu Display (defaults)	Parameter Page and Menu
1 (Upper or left display)	Numerical value	Active Process Value		Pro	
2 (Lower or right display)	SAFE or FAIL	Limit Status		LSt	
3	Numerical value	Limit Low Set Point		LLS1	Operations Page, Limit Menu
4	Numerical value	Limit High Set Point		LHS1	Operations Page, Limit Menu
5 to 20	(skipped)			none	(Add parameters to the Home Page in the Custom Menu, Factory Page.)

Default Home Page

When the Limit is in a default state (as shipped from factory), the display will flash where the top display will show the Process Value and L1H1 and the bottom will display Atto and FAIL.

Attention Codes

Display	Parameter Name Description	Setting	Range	De-fault	Appears If
Atto	**Attention** An active message will cause the display to toggle between the normal settings and the active message in the upper display and Atto in the lower display. Your response will depend on the message and the controller settings. If the message was generated by a latched alarm or limit condition, the message can be cleared when the condition no longer exists. As with the above conditions if an alarm has silencing enabled, it can be silenced by simply pushing the Reset Key or alternatively by following the steps below. Push the Advance key to display 1Snr in the upper display and the message source (such as L1H1) in the lower display. Use the Up or Down keys to scroll through possible responses, such as Clear Clr or Silence S1L. Then push the Advance or Reset key to execute the action.		AL1 1 AL12 AL13 AL14 Alarm Low 1 to 4 AL1H 1 AL1H2 AL1H3 AL1H4 Alarm High 1 to 4 AL1E 1 AL1E2 AL1E3 AL1E4 Alarm Error 1 to 4 Er1 1 Error Input 1 L1L 1 Limit Low 1 L1H 1 Limit High 1 L1E 1 Limit Error 1		an alarm or error message is active.

Parameters that appear only in the Home Page

Conventions Used in the Menu Pages

To better understand the menu pages that follow review the naming conventions used. When encountered throughout this document, the word "default" implies as shipped from the factory. Each page (Operations, Setup, Profile and Factory) and their associated menus have identical headers defined below:

Header Name	Definition
Display	Visually displayed information from the control.
Parameter Name	Describes the function of the given parameter.
Range	Defines options available for this prompt, i.e., min/max values (numerical), yes/no, etc... (further explanation below).
Default	Values as delivered from the factory.
Parameter Appears in Menu When	Conditions required for parameter to appear in menu.
Modbus Relative Address	Identifies unique parameters using either the Modbus RTU or Modbus TCP protocols (further explanation below).
CIP (Common Industrial Protocol)	Identifies unique parameters using either the DeviceNet or EtherNet/IP protocol (further explanation below).
Data Type R/W	uint = Unsigned 16 bit integer dint = long, 32-bit string = ASCII (8 bits per character) float = IEEE 754 32-bit RWES = **R**ead only **W**ritable **E**EPROM (saved) User **S**et (saved)

Display

Visual information from the control is displayed to the observer using a fairly standard 7 segment display. Due to the use of this technology, several characters displayed need some interpretation, see the list below:

1 = 1	0 = 0	i = i	r = r
2 = 2	A = A	J = J	S = S
3 = 3	b = b	K = K	t = t
4 = 4	c, C = c	L = L	u = u
5 = 5	d = d	M = M	v = v
6 = 6	E = E	n = n	W = W
7 = 7	F = F	o = o	y = y
8 = 8	g = g	P = P	Z = Z
9 = 9	h = h	q = q	

Range

Within this column notice that on occasion there will be numbers found within parenthesis. This number represents the enumerated value for that particular selection. Range selections can be made simply by writing the enumerated value of choice using any of the available communications protocols. As an example, turn to the Setup Page and look at the Analog Input [AI] menu and then the Sensor Type [SEn] prompt. To turn the sensor off simply write the value of 62 (off) to Modbus register 400369 and send that value to the control.

Modbus RTU & TCP Protocols

All Modbus registers are 16-bits and as displayed in this manual are relative addresses (actual). Some legacy software packages limit available Modbus registers to 40001 to 49999 (5 digits). Many applications today require access to all available Modbus registers which range from 400001 to 465535 (6 digits). Watlow controls support 6 digit Modbus registers. For parameters listed as float notice that only one (low order) of the two registers is listed, this is true throughout this document. By default the low order word contains the two low bytes of the 32-bit parameter. As an example, look in the Operations Page for the Process Value. Find the column identified in the header as Modbus and notice that it lists register 360. Because this parameter is a float it is actually represented by registers 360 (low order bytes) and 361 (high order bytes). Because the Modbus specification does not dictate which register should be high or low order Watlow provides the user the ability to swap this order (Setup Page, [CoMM] Menu) from the default low/high [Loh1] to high/low [h1Lo].

Note:

With the release of firmware revision 7.00 and above new functions where introduced into the EZ-ZONE PM product line. With the introduction of these new functions there was a reorganization of Modbus registers. Notice in the column identified as Modbus the reference to Map 1 and Map 2 registers for each of the various parameters.

To be backwards compatible in your programming use Map 1 registers. To be able to implement new functions in the Limit when and if they become available use Map 2 registers. The Data Map [MAP] for Modbus registers can be changed in the

Setup Page under the [CoM] Menu. This setting will apply across the control.

It should also be noted that some of the cells in the Modbus column contain wording pertaining to an offset. Several parameters in the control contain more than one instance; such as, profiles (4), alarms (4), analog inputs (2), etc... The Modbus register shown always represents instance one. Take for an example the Alarm Silence parameter found in the Setup Page under the Alarm menu. Instance one of Map 1 is shown as address 1490 and +50 is identified as the offset to the next instance. If there was a desire to read or write to instance 3 simply add 100 to 1490 to find its address, in this case, the instance 3 address for Alarm Silence is 1590.

To learn more about the Modbus protocol point your browser to http://www.modbus.org.

Common Industrial Protocol (CIP) DeviceNet & Ethernet/IP

Both DeviceNet and EtherNet/IP use open object based programming tools and use the same addressing scheme. In the following menu pages notice the column header identified as CIP. There you will find the Class, Instance and Attribute in hexadecimal, (decimal in parenthesis) which makes up the addressing for both protocols.

Data Types Used with CIP

uint	= Unsigned 16 bit integer
int	= Signed 16-bit
dint	= Signed 32-bits, long
real	= Float, IEEE 754 32-bit
string	= ASCII, 8 bits per character
sint	= Signed 8 bits, byte

To learn more about the DeviceNet and EtherNet/IP protocol point your browser to http://www.odva.org.

5 Chapter 5: Operations Page

Navigating the Operations Page

To go to the Operations Page from the Home Page, press both the Up ▲ and Down ▼ keys for three seconds. [A1] will appear in the upper display and [oPEr] will appear in the lower display.

- Press the Up ▲ or Down ▼ key to view available menus. On the following pages top level menus are identified with a yellow background color.
- Press the Advance key ◯ to enter and view available prompts within a menu.
- Press the Up ▲ or Down ▼ key to move through available menu prompts.
- Press the Infinity Key ∞ to move backwards through the levels: parameter to submenu; submenu to menu; menu to Home Page.
- Press and hold the Infinity Key ∞ for two seconds to return to the Home Page.

Note:
Some of these menus and parameters may not appear, depending on the controller's options. See model number information in the Appendix for more information. If there is only one instance of a menu, no submenus will appear.

Operations Page

[A1]
[oPEr] **Analog Input Menu**
  [1]
  [A1] **Analog Input**
    [A1n] **Process Value**
    [nEr] **Error Status**
    [nCA] **Calibration Offset**

[d1o]
[oPEr] **Digital Input/Output Menu**
  [5] to [6]
  [d1o] **Digital Input/Output**
    [do.5] **Output State**
    [E1.5] **Event State**
    [d1.5] **Input State**

[L1M]
[oPEr] **Limit Menu**
  [1]
  [L1M] **Limit**
    [LLS] **Low Set Point**
    [LhS] **High Set Point**

[ALM]
[oPEr] **Alarm Menu**
  [1] to [4]
  [ALM] **Alarm**
    [ALo] **Low Set Point**
    [Ah1] **High Set Point**

Operations Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
A i oPEr **Analog Input Menu**							
A in [Ain]	*Analog Input (1)* **Process Value** View the process value.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C		Always	***Instance 1*** *Map 1* *Map 2* 360 360 ***Instance 2*** *Map 1* *Map 2* 440 450	0x68 (104) 1 1	float R
i.Er [i.Er]	*Analog Input (1)* **Error Status** View the cause of the most recent error. If the AtEn message is Er.1, this parameter will display the cause of the input error.	nonE None (61) OPEn Open (65) FAiL Fail (32) Shrt Shorted (127) E.rn Measurement Error (140) E.CAL Bad Calibration Data (139) Er.Ab Ambient Error (9) E.rtd RTD Error (141)	None	Always	***Instance 1*** *Map 1* *Map 2* 362 362 ***Instance 2*** *Map 1* *Map 2* 442 452	0x68 (104) 1 2	uint R
i.CA [i.CA]	*Analog Input (1)* **Calibration Offset** Offset the input reading to compensate for lead wire resistance or other factors that cause the input reading to vary from the actual process value.	-1,999.000 to 9,999.000°F or units -1,110.555 to 5,555.000°C	0.0	Always	***Instance 1*** *Map 1* *Map 2* 382 382 ***Instance 2*** *Map 1* *Map 2* 462 472	0x68 (104) 1 0xC (12)	float RWES
d io oPEr **Digital Input/ Output Menu**							
do.S [do.S]	*Digital Output (5 to 6)* **Output State** View the state of this output.	oFF Off (62) on On (63)		Direction (Setup Page, Digital Input/ Output Menu) is set to Output.	***Instance 1*** *Map 1* *Map 2* 892 1012 Offset to next instance equals +30	0x6A (106) 1 to 2 7	uint R
Ei.S [Ei.S]	*Digital Input (5 to 6)* **Event Status** View this event input state.	oFF Off (62) on On (63)		Direction (Setup Page, Digital Input/ Output Menu) is set to Input Voltage or Input Dry Contact.	***Instance 1*** *Map 1* *Map 2* 1328 1568 Offset to next instance equals +20	0x6E (110) 1 to 2 5	uint R
	EZ-Key/s (1 to 2) **Event Status** View this event input state.	oFF Off (62) on On (63)			***Instance 1*** *Map 1* *Map 2* 1368 1608 ***Instance 2*** *Map 1* *Map 2* - - - - 1628	0x6E (110) 3 to 4 5	
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read** **W: Write** **E: EEPROM** **S: User Set**

Operations Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
LiM oPEr **Limit Menu**							
LLS [LL.S]	*Limit (1)* **Low Set Point** Set the low process value that will trigger the limit.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	0.0°F or units -18.0°C	Limit Sides (Setup Page) is not set to High.	***Instance 1*** *Map 1* 684 *Map 2* 724	0x70 (112) 1 3	float RWES
LhS [Lh.S]	*Limit (1)* **High Set Point** Set the high process value that will trigger the limit.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	0.0°F or units -18.0°C	Limit Sides (Setup Page) is not set to Low.	***Instance 1*** *Map 1* 686 *Map 2* 726	0x70 (112) 1 4	float RWES
ALM oPEr **Alarm Menu**							
A.Lo [A.Lo]	*Alarm (1 to 4)* **Low Set Point** If Alarm Type (Setup Page, Alarm Menu) is set to: **process** - set the process value that will trigger a low alarm.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	32.0°F or units 0.0°C	Alarm Sides (Setup Page) is not set to High.	***Instance 1*** *Map 1* 1482 *Map 2* 1882 Offset to next instance (*Map 1*) equals +50 Offset to next instance (*Map 2*) equals +60	0x6D (109) 1 to 4 2	float RWES
A.hi [A.hi]	*Alarm (1 to 4)* **High Set Point** If Alarm Type (Setup Page, Alarm Menu) is set to: **process** - set the process value that will trigger a high alarm.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	300.0°F or units 150.0°C	Alarm Sides (Setup Page) is not set to Low.	***Instance 1*** *Map 1* 1480 *Map 2* 1880 Offset to next instance (*Map 1*) equals +50 Offset to next instance (*Map 2*) equals +60	0x6D (109) 1 to 4 1	float RWES
	Alarm (1 to 4) **Alarm State** Current state of alarm	Startup (88) None (61) Blocked (12) Alarm low (8) Alarm high (7) Error (28)	None	No parameter	***Instance 1*** *Map 1* 1496 *Map 2* 1896 Offset to next instance (Map1 1 equals +50, *Map 2* equals +60)	0x6D (109) 1 to 4 9	uint R
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read** **W: Write** **E: EEPROM** **S: User Set**

Operations Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
	Alarm (1 to 4) **Alarm Clearable** Current state of alarm	no No (59) YES Yes (106)		No parameter	***Instance 1*** *Map 1* 1502 *Map 2* 1902 Offset to next instance (Map1 1 equals +50, *Map 2* equals +60)	0x6D (109) 1 to 4 0xC (12)	uint R
	Alarm (1 to 4) **Alarm Clear Request** Write to this register to clear an alarm	0		No parameter	***Instance 1*** *Map 1* 1504 *Map 2* 1904 Offset to next instance (Map1 1 equals +50, *Map 2* equals +60)	0x6D (109) 1 to 4 0xD (13)	uint W
	Alarm (1 to 4) **Alarm Silence Request** Write to this register to silence an alarm	0		No parameter	***Instance 1*** *Map 1* 1506 *Map 2* 1906 Offset to next instance (Map1 1 equals +50, *Map 2* equals +60)	0x6D (109) 1 to 4 0xE (14)	uint W
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read** **W: Write** **E: EEPROM** **S: User Set**

6 Chapter 6: Setup Page

Navigating the Setup Page

To go to the Setup Page from the Home Page, press both the Up ▲ and Down ▼ keys for six seconds. A1 will appear in the upper display and SEt will appear in the lower display.

- Press the Up ▲ or Down ▼ key to view available menus. On the following pages top level menus are identified with a yellow background color.
- Press the Advance Key to enter and view available prompts within a menu.
- Press the Up ▲ or Down ▼ key to move through available menu prompts.
- Press the Infinity Key to move backwards through the levels: parameter to submenu; submenu to menu; menu to Home Page.
- Press and hold the Infinity Key for two seconds to return to the Home Page.

Note:
Some of these menus and parameters may not appear, depending on the controller's options. See model number information in the Appendix for more information. If there is only one instance of a menu, no submenus will appear.

A1
SEt **Analog Input Menu**
1
A1 **Analog Input**
SEn **Sensor Type**
Lin **Linearization**
rtL **RTD Leads**
Unit **Units**
SLo **Scale Low**
Sh1 **Scale High**
rLo **Range Low**
rh1 **Range High**
PEE **Process Error Enable**
PEL **Process Error Low**
tC **Thermistor Curve**
rr **Resistance Range**
Fil **Filter**
1Er **Error Latching**
dEC **Display Precision**

dio
SEt **Digital Input/Output Menu**
5 to 6
dio **Digital Input/Output**
dir **Direction**
Fn **Function**
F1 **Function Instance**
oCt **Control**
otb **Time Base**
oLo **Low Power Scale**
oh1 **High Power Scale**

LIM
SEt **Limit Menu**
1
L1M **Limit**
LSd **Sides**
LHy **Hysteresis**
SPLh **Set Point Limit High**
SPLL **Set Point Limit Low**

otPt
SEt **Output Menu**
1 to 4
otPt **Output**
Fn **Function**
F1 **Function Instance**
oCt **Control**
otb **Time Base**
oLo **Low Power Scale**
oh1 **High Power Scale**
otPt **Output 3 process**
oty **Type**
Fn **Function**
F1 **Function Instance**
SLo **Scale Low**
Sh1 **Scale High**
rLo **Range Low**
rh1 **Range High**
oCA **Calibration Offset**

ALM
SEt **Alarm Menu**
1 to 4
ALM **Alarm**
Aty **Type**
Sr.A **Source Function A**
1SA **Source Instance A**
AHy **Hysteresis**
ALg **Logic**
ASd **Sides**
ALA **Latching**
Abl **Blocking**
AS1 **Silencing**
AdSP **Display**
AdL **Delay**

FUn
SEt **Function Key Menu**
1 to 2
FUn **Function Key**
LEu **Level**
Fn **Digital Input Function**
F1 **Instance**

GLbL
SEt **Global Menu**
1
GLbL **Global**
C_F **Display Units**

COM
SEt **Communications Menu**
1 to 2
COM **Communications**
PCoL **Protocol**
Ad5 **Standard Bus Address**
bAUd **Baud Rate**
PAr **Parity**
MWhL **Modbus Word Order**
1PM **IP Address Mode**
1PF1 **IP Fixed Address (Part 1)**
1PF2 **IP Fixed Address (Part 2)**
1PF3 **IP Fixed Address (Part 3)**
1PF4 **IP Fixed Address (Part 4)**
1PS1 **IP Fixed Subnet (Part 1)**
1PS2 **IP Fixed Subnet (Part 2)**
1PS3 **IP Fixed Subnet (Part 3)**
1PS4 **IP Fixed Subnet (Part 4)**
1PG1 **IP Fixed Gateway (Part 1)**
1PG2 **IP Fixed Gateway (Part 2)**
1PG3 **IP Fixed Gateway (Part 3)**
1PG4 **IP Fixed Gateway (Part 4)**
MbE **Modbus TCP Enable**
E1PE **EtherNet/IP Enable**
Aonb **Output Assembly Size**
A1nb **Input Assembly Size**
C_F **Display Units**
MMAP **Data Map**
nvS **Non-volatile Save**

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
A1 SEt **Analog Input Menu**							
SEn [SEn]	*Input (1)* **Sensor Type** Set the analog sensor type to match the device wired to this input. **Note:** There is no open-sensor detection for process inputs.	oFF Off (62) tC Thermocouple (95) mV Millivolts (56) volt Volts dc (104) mA Milliamps dc (112) rtd.H RTD 100 Ω (113) r1.0H RTD 1,000 Ω (114) Pot Potentiometer 1 kΩ (155) thEr Thermistor (229)		Always	***Instance 1*** *Map 1* *Map 2* 368 368	0x68 (104) 1 5	uint RWES
L in [Lin]	*Input (1)* **Linearization** Set the linearization to match the thermocouple wired to this input.	b B (11) C (15) d D (23) E E (26) F F (30) J J (46) H K (48) n N (58) r R (80) S S (84) t T (93)	J	Sensor Type is set to Thermocouple.	***Instance 1*** *Map 1* *Map 2* 370 370	0x68 (104) 1 6	uint RWES
rtL [rt.L]	*Input (1)* **RTD Leads** Set to match the number of leads on the RTD wired to this input.	2 2 (1) 3 3 (2)	2	Sensor Type is set to RTD 100 Ω or RTD 1,000 Ω.	***Instance 1*** *Map 1* *Map 2* 372 368	0x68 (104) 1 7	uint RWES
Unit [Unit]	*Input (1)* **Units** Set the type of units the sensor will measure.	AtP Absolute Temperature (1540) rh Relative Humidity (1538) Pro Process (75) PWJr Power (73)	Process	Sensor Type is set to Millivolts, Volts, Milliamps or Potentiometer 1 kΩ.	***Instance 1*** *Map 1* *Map 2* - - - - 442	0x68 (104) 1 0x2A (42)	uint RWES
S.Lo [S.Lo]	*Input (1)* **Scale Low** Set the low scale for process inputs. This value, in millivolts, volts or milliamps, will correspond to the Range Low output of this function block.	-100.0 to 1,000.0	0.0	Sensor Type is set to Millivolts, Volts, Milliamps or Potentiometer 1 kΩ.	***Instance 1*** *Map 1* *Map 2* 388 388	0x68 (104) 1 0xF (15)	float RWES
S.hi [S.hi]	*Input (1)* **Scale High** Set the high scale for process inputs. This value, in millivolts, volts or milliamps, will correspond to the Range High output of this function block.	-100.0 to 1,000.0	20.0	Sensor Type is set to Millivolts, Volts, Milliamps or Potentiometer 1 kΩ.	***Instance 1*** *Map 1* *Map 2* 390 390	0x68 (104) 1 to 4 0x10 (16)	float RWES
r.Lo [r.Lo]	*Input (1)* **Range Low** Set the low range for this function block's output.	-1,999.000 to 9,999.000	0.0	Sensor Type is set to Millivolts, Volts, Milliamps or Potentiometer 1 kΩ.	***Instance 1*** *Map 1* *Map 2* 392 392	0x68 (104) 1 0x11 (17)	float RWES
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R:** Read **W:** Write **E:** EEPROM **S:** User Set

Setup Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
r.hi [r.hi]	*Input (1)* **Range High** Set the high range for this function block's output.	-1,999.000 to 9,999.000	9,999	Sensor Type is set to Millivolts, Volts, Milliamps or Potentiometer 1 kΩ.	***Instance 1*** *Map 1* 394 *Map 2* 394	0x68 (104) 1 0x12 (18)	float RWES
P.EE [P.EE]	*Input (1)* **Process Error Enable** Turn the Process Error Low feature on or off.	oFF Off (62) Lo.J Low (53)	Off	Sensor Type is set to Millivolts, Volts, Milliamps or Potentiometer 1 kΩ.	***Instance 1*** *Map 1* 418 *Map 2* 388	0x68 (104) 1 0x1E (30)	uint RWES
t.C [t.C]	*Input (1)* **Thermistor Curve** Select a curve to apply to the thermistor input.	A Curve A (1451) b Curve B (1452) C Curve C (1453) CUSt Custom (180)	Curve A	Sensor Type is set to Thermistor.	***Instance 1*** *Map 1* 434 *Map 2* 434	0x68 (104) 1 20x6 (38)	uint RWES
r.r [r.r]	*Input (1)* **Resistance Range** Set the maximum resistance of the thermistor input.	5 5K (1448) 10 10K (1360) 20 20K (1361) 40 40K (1449)	40K	Sensor Type is set to Thermistor.	***Instance 1*** *Map 1* 432 *Map 2* 432	0x68 (104) 1 0x25 (37)	uint RWES
F.iL [FiL]	*Input (1)* **Filter** Filtering smooths out the process signal to both the display and the input. Increase the time to increase filtering.	0.0 to 60.0 seconds	0.5	Always	***Instance 1*** *Map 1* 386 *Map 2* 386	0x68 (104) 1 0xE (14)	float RWES
.Er [i.Er]	*Input (1)* **Error Latching** Turn input error latching on or off. If latching is on, errors must be manually cleared.	oFF Off (62) on On (63)	Off	Always	***Instance 1*** *Map 1* 414 *Map 2* 414	0x68 (104) 1 to 2 0x1C (28)	uint RWES
dEC [dEC]	*Input (1)* **Display Precision** Set the precision of the displayed value.	0 Whole (105) 0.0 Tenths (94) 0.00 Hundredths (40) 0.000 Thousandths (96)	Whole	Always	***Instance 1*** *Map 1* 398 *Map 2* 398	0x68 (104) 1 0x14 (20)	uint RWES
d.io SEt **Digital Input/ Output Menu**							
dir [dir]	*Digital Input/Output (5 to 6)* **Direction** Set this function to operate as an input or output.	oUtP Output (68) .Con Input Dry Contact (44) in Input Voltage (193)	Output	Always	***Instance 1*** *Map 1* 1000 *Map 2* 1120 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 5 to 6 1	uint RWES
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read** **W: Write** **E: EEPROM** **S: User Set**

Setup Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
Fn [Fn]	*Digital Output (5 to 6)* **Function** Select what function will drive this output.	oFF Off (62) ALrM Alarm (6)	Off	Direction is set to Output.	***Instance 1*** *Map 1* 1008 *Map 2* 1128 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 5 to 6 5	uint RWES
F, [Fi]	*Digital Output (5 to 6)* **Function Instance** Set the instance of the function selected above.	1 to 4	1	Direction is set to Output.	***Instance 1*** *Map 1* 1010 *Map 2* 1130 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 5 to 6 6	uint RWES
LEv [LEv]	*Digital Input (5 to 6)* Select which action will be interpreted as a true state.	h,Gh High (37) Lolo Low (53)	High	Direction is set to input	***Instance 1*** *Map 1* 1320 *Map 2* 1560 Offset to next instance (*Map 1 & Map 2*) equals +20	0x6E (110) 1 to 2 1	uint RW
Fn [Fn]	*Digital Input (5 to 6)* **Function** Select the function that will be triggered by a true state.	nonE None (61) LrMr Limit Reset (82) F.AL Force Alarm to Occur (218) AoF Control Loops Off and Alarms to Non-alarm State (220) S,L Silence Alarms (108) ALrM Alarm (6) PLoc Keyboard lockout (217) USr.r User Settings Restore (227)		Direction is set to Output.	***Instance 1*** *Map 1* 1324 *Map 2* 1564 Offset to next instance (*Map 1 & Map 2*) equals +20	0x6E (110) 5 to 6 3	uint RWES
F, [Fi]	*Digital Input (5 to 6)* **Function Instance** Select which instance of the Event Function that will be triggered by a true state.	0 to 4	0	Direction is set to Output.	***Instance 1*** *Map 1* 1326 *Map 2* - Offset to next instance (*Map 1*) equals +20	0x6E (110) 5 to 6 4	uint RWES
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read W: Write E: EEPROM S: User Set**

Setup Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
LIM SET **Limit Menu**							
L.Sd [L.Sd]	*Limit (1)* **Sides** Select which side or sides of the process value will be monitored.	both Both (13) high High (37) Low Low (53)	Both	Always	***Instance 1*** *Map 1* *Map 2* 688 728	0x70 (112) 1 5	uint RWES
L.hy [L.hy]	*Limit (1)* **Hysteresis** Set the hysteresis for the limit function. This determines how far into the safe range the process value must move before the limit can be cleared.	0.001 to 9,999.000°F or units 0.001 to 5,555.000°C	3.0°F or units 2.0°C	Always	***Instance 1*** *Map 1* *Map 2* 682 722	0x70 (112) 1 2	float RWES
SP.Lh [SP.Lh]	*Limit (1)* **Set Point Limit High** Set the high end of the limit set point range.	-1,999.000 to 9,999.000	9,999.000	Always	***Instance 1*** *Map 1* *Map 2* - - - - - - - -		float RWES
SP.LL [SP.LL]	*Limit (1)* **Set Point Limit Low** Set the low end of the limit set point range.	-1,999.000 to 9,999.000	-1,999.000	Always	***Instance 1*** *Map 1* *Map 2* - - - - - - - -		float RWES
OUTP SET **Output Menu**							
Fn [Fn]	*Output Digital (1 to 4)* **Function** Select what function will drive this output.	oFF Off (62) LIM Limit (126) ALM Alarm (6)	Output 1 - Alarm Output 2 - Limit Output 3 - Off Output 4 - Off	Always	***Instance 1*** *Map 1* *Map 2* 888 1008	0x6A (106) 1 to 4 5	uint RWES
Fi [Fi]	*Output (1 to 4)* **Function Instance** Set the instance of the function selected above.	1 to 4	1	Always	***Instance 1*** *Map 1* *Map 2* 890 1010 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 1 to 4 6	uint RWES
o.ty [o.ty]	*Output (3 process)* **Type** Select whether the process output will operate in volts or milliamps.	volt Volts (104) mA Milliamps (112)	Volts	Always	***Instance 1*** *Map 1* *Map 2* 720 840	0x76 (118) 3 1	uint RWES
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read** **W: Write** **E: EEPROM** **S: User Set**

Setup Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
Fn [Fn]	*Output Process (3)* **Function** Set the type of function that will drive this output.	oFF Off (62) rPnt Retransmit (213) Ent.b Event Out B (234) Ent.A Event Out A (233) ALPn Alarm (6)	Off	Always if digit 10 of part number is an "F".	***Instance 1*** *Map 1* 722 *Map 2* 842	0x76 (118) 3 2	uint RWES
r.Sr [r.Sr]	*Output (3 process)* **Retransmit Source** Select the value that will be retransmitted.	AI Analog Input (142)	Analog Input	Always if digit 10 of part number is an "F".	***Instance 1*** *Map 1* 724 *Map 2* 844	0x76 (118) 3 3	uint RWES
Fi [Fi]	*Output (3 process)* **Function Instance** Set the instance of the function selected above.	1 to 4	1	Always if digit 10 of part number is an "F	***Instance 1*** *Map 1* 726 *Map 2* 846	0x76 (118) 3 4	uint RWES
S.Lo [S.Lo]	*Output (3 process)* **Scale Low** Set the minimum value of the output range.	-100.0 to 100.0	0.00	Always if digit 10 of part number is an "F	***Instance 1*** *Map 1* 736 *Map 2* 856	0x76 (118) 3 9	float RWES
S.hi [S.hi]	*Output (3 process)* **Scale High** Set the maximum value of the output range.	-100.0 to 100.0	10.00	Always if digit 10 of part number is an "F	***Instance 1*** *Map 1* 738 *Map 2* 858	0x76 (118) 3 0xA (10)	float RWES
r.Lo [r.Lo]	*Output (3 process)* **Range Low** Set the minimum value of the retransmit value range in process units. When the retransmit source is at this value, the retransmit output will be at its Scale Low value.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	0.0°F or units -18°C	Always if digit 10 of part number is an "F	***Instance 1*** *Map 1* 740 *Map 2* 860	0x76 (118) 3 0xB (11)	float RWES
r.hi [r.hi]	*Output (3 process)* **Range High** Set the maximum value of the retransmit value range in process units. When the retransmit source is at this value, the retransmit output will be at its Scale High value.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	9,999.0°F or units 5,537.0°C	Always if digit 10 of part number is an "F	***Instance 1*** *Map 1* 742 *Map 2* 862	0x76 (118) 3 0xC (12)	float RWES
o.CA [o.CA]	*Output (3 process)* **Calibration Offset** Set an offset value for a process output.	-1,999.000 to 9,999.000°F or units -1,110.555 to 5,555.000°C	0.0°F or units 0.0°C	Always if digit 10 of part number is an "F	***Instance 1*** *Map 1* 732 *Map 2* 852	0x76 (118) 3 7	float RWES
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Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
ALM1 SEt **Alarm Menu**							
AtY [A.ty]	*Alarm (1 to 4)* **Type** Select whether the alarm trigger is a fixed value or will track the set point.	oFF Off (62) Pr.AL Process Alarm (76)	Off	Always	***Instance 1*** *Map 1* *Map 2* 1508 1908 Offset to next instance (*Map 1 & Map 2*) equals +60	0x6D (109) 1 to 4 0xF (15)	uint RWES
Sr.A [Sr.A]	*Alarm (1 to 4)* **Source Function A** Select what will trigger this alarm.	A1 Analog Input (142)		Type is not set to Off.	***Instance 1*** *Map 1* *Map 2* 1512 1912 Offset to next instance (*Map 1 & Map 2*) equals +60	0x6D (109) 1 to 4 0x11 (17)	uint RWES
AhY [A.hy]	*Alarm (1 to 4)* **Hysteresis** Set the hysteresis for an alarm. This determines how far into the safe region the process value needs to move before the alarm can be cleared.	0.001 to 9,999.000°F or units 0.001 to 5,555.000°C	1.0°F or units 1.0°C	Type is not set to Off.	***Instance 1*** *Map 1* *Map 2* 1484 1884 Offset to next instance (*Map 1 equals +50, for Map 2* equals +60)	0x6D (109) 1 to 4 3	float RWES
ALG [A.Lg]	*Alarm (1 to 4)* **Logic** Select what the output condition will be during the alarm state.	ALC Close On Alarm (17) ALo Open On Alarm (66)	Close On Alarm	Type is not set to Off.	***Instance 1*** *Map 1* *Map 2* 1488 1888 Offset to next instance (*Map 1 equals +50, for Map 2* equals +60)	0x6D (109) 1 to 4 5	uint RWES
ASd [A.Sd]	*Alarm (1 to 4)* **Sides** Select which side or sides will trigger this alarm.	both Both (13) hIGh High (37) Lolo Low (53)	Both	Type is not set to Off.	***Instance 1*** *Map 1* *Map 2* 1486 1886 Offset to next instance (*Map 1 equals +50, for Map 2* equals +60)	0x6D (109) 1 to 4 4	uint RWES
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read** **W: Write** **E: EEPROM** **S: User Set**

Setup Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
AL A [A.LA]	*Alarm (1 to 4)* **Latching** Turn alarm latching on or off. A latched alarm has to be turned off by the user.	nLAt Non-Latching (60) LAt Latching (49)	Non-Latching	Type is not set to Off.	***Instance 1*** *Map 1* 1492 *Map 2* 1892 Offset to next instance (*Map 1 equals +50, for Map 2* equals +60)	0x6D (109) 1 to 4 7	uint RWES
A.bL [A.bL]	*Alarm (1 to 4)* **Blocking** Select when an alarm will be blocked. After startup and/or after the set point changes, the alarm will be blocked until the process value enters the normal range.	oFF Off (62) Str Startup (88) StPt Set Point (85) both Both (13)	Off	Type is not set to Off.	***Instance 1*** *Map 1* 1494 *Map 2* 1894 Offset to next instance (*Map 1 equals +50, for Map 2* equals +60)	0x6D (109) 1 to 4 8	uint RWES
A.Si [A.Si]	*Alarm (1 to 4)* **Silencing** Turn alarm silencing on to allow the user to disable this alarm.	oFF Off (62) on On (63)	Off	Type is not set to Off.	***Instance 1*** *Map 1* 1490 *Map 2* 1890 Offset to next instance (*Map 1 equals +50, for Map 2* equals +60)	0x6D (109) 1 to 4 6	uint RWES
A.dSP [A.dSP]	*Alarm (1 to 4)* **Display** Display an alarm message when an alarm is active.	oFF Off (62) on On (63)	On	Type is not set to Off.	***Instance 1*** *Map 1* 1510 *Map 2* 1910 Offset to next instance (*Map 1 equals +50, for Map 2* equals +60)	0x6D (109) 1 to 4 0x10 (16)	uint RWES
A.dL [A.dL]	*Alarm (1 to 4)* **Delay** Set the span of time that the alarm will be delayed after the process value exceeds the alarm set point.	0 to 9,999 seconds	0	Type is not set to Off.	***Instance 1*** *Map 1* 1520 *Map 2* 1920 Offset to next instance (*Map 1 equals +50, for Map 2* equals +60)	0x6D (109) 1 to 4 0x15 (21)	uint RWES
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read** **W: Write** **E: EEPROM** **S: User Set**

Setup Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
FUn SEt							
LEu [LEv]	*Function Key (1 to 2)* **Level** Select what state the Function Key will be in at startup. Pressing the Function Key will toggle the selected action.	hiGh High (37) LoUJ Low (53)	High	Always	***Instance 1*** *Map 1* 1320 *Map 2* 1560 ***Instance 2*** *Map 1* 1340 *Map 2* 1580	0x6E (110) 1 to 2 1	uint RWES
Fn [Fn]	*Function Key (1 to 2)* **Digital Input Function** Program the EZ Key to trigger an action. Functions respond to a level state change or an edge level change.	nonE None LPMr Limit Reset, edge triggered (82) F.AL Force Alarm, level triggered (218) AoF Alarm Outputs & Control Loop Off, level triggered (220) S iL Silence Alarms, edge triggered (108) ALMM Alarm Reset, edge triggered (6) PLoC Lock Keypad, level triggered (217) uSrr Restore User Settings, edge triggered (227)	None	Always	***Instance 1*** *Map 1* 1324 *Map 2* 1564 ***Instance 2*** *Map 1* 1344 *Map 2* 1584	0x6E (110) 1 to 2 3	uint RWES
F i [Fi]	*Function Key (1 to 2)* **Instance** Select which instance the EZ Key will affect. If only one instance is available, any selection will affect it.	1 to 4	0	Always	***Instance 1*** *Map 1* 1326 *Map 2* 1566 ***Instance 2*** *Map 1* 1346 *Map 2* 1586	0x96 (110) 1 to 2 4	
GLbL SEt **Global Menu**							
C_F [C_F]	*Global* **Display Units** Select which scale to use for temperature.	F °F (30) C °C (15)	°F	Always			
CoMM SEt **Communications Menu**							
PCoL [PCoL]	*Communications 1* **Protocol** Set the protocol of this controller to the protocol that this network is using.	Std Standard Bus (1286) MMod Modbus RTU (1057)	Modbus	Always if digit 8 is a "1".	***Instance 1*** *Map 1* 2492 *Map 2* 2972	0x96 (150) 1 7	uint RWE
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read** **W: Write** **E: EEPROM** **S: User Set**

Setup Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
Ad.S [Ad.S]	*Communications 1* **Address Standard Bus** Set the network address of this controller. Each device on the network must have a unique address. The Zone Display on the front panel will display this number.	1 to 16	1	Protocol is set to Standard-bus.	***Instance 1*** *Map 1* 2480 *Map 2* 2960	0x96 (150) 1 1	uint RWE
Ad.M [Ad.M]	*Communications (1 or 2)* **Address Modbus** Set the network address of this controller. Each device on the network must have a unique address.	1 to 247	1	Protocol is set to Modbus.	***Instance 1*** *Map 1* 2482 *Map 2* 2962	0x96 (150) 1 2	uint RWE
bAUd [bAUd]	*Communications (1 or 2)* **Baud Rate Modbus** Set the speed of this controller's communications to match the speed of the serial network.	9,600 (188) 19,200 (189) 38,400 (190)	9,600	Protocol is set to Modbus.	***Instance 1*** *Map 1* 2484 *Map 2* 2964	0x96 (150) 1 3	uint RWE
PAr [PAr]	*Communications* **Parity Modbus** *(1 or 2)* Set the parity of this controller to match the parity of the serial network.	nonE None EuEn Even odd Odd	None	Protocol is set to Modbus.	***Instance 1*** *Map 1* 2486 *Map 2* 2966	0x96 (150) 1 4	uint RWE
M.hL [M.hL]	*Communications (1 or 2)* **Modbus Word Order** Select the word order of the two 16-bit words in the floating-point values.	Loh, Low-High h,Lo High-Low	Low-High	Protocol is set to Modbus.	***Instance 1*** *Map 1* 2488 *Map 2* 2968	0x96 (150) 1 5	uint RWE
MAP [Map]	*Communications (1)* **Data Map** If set to 1 the control will use PM legacy mapping. If set to 2 the control will use new mapping to accommodate new functions.	1 to 2	1	Always			
nV.S [nV.S]	*Communications (1)* **Non-volatile Save** If set to Yes all values written to the control will be saved in EEPROM.	YES Yes (106) no No (59)	Yes	Always	***Instance 1*** *Map 1* 2494 *Map 2* 2974	0x96 (150) 1 8	uint RWE
Ad.d [Ad.d]	*Communications (2)* **DeviceNet™ Node Address** Set the DeviceNet™ address for this gateway.	0 to 63	63	Always if digit 8 is a "5".			
bAUd [bAUd]	*Communications (2)* **Baud Rate DeviceNet™** Set the speed of this gateway's communications to match the speed of the serial network.	125 125 kb 250 250 kb 500 500 kb	125	Always if digit 8 is a "5".			
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read** **W: Write** **E: EEPROM** **S: User Set**

Setup Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
FC.E [FC.E]	*Communications (2)* **DeviceNet™ Quick Connect Enable** Allows for immediate communication with the scanner upon power up.	no No YES Yes	No	Always if digit 8 is a "5".			
iP.M [iP.M]	*Communications (2)* **IP Address Mode** Select DHCP to let a DHCP server assign an address to this module.	dhCP DHCP (1281) F.Add Fixed Address (1284)	DHCP	Always if digit 8 is a "3".			
ip.F1 [ip.F1]	*Communications (2)* **IP Fixed Address Part 1** Set the IP address of this module. Each device on the network must have a unique address.	0 to 255	169	If address mode is set to fixed.			
ip.F2 [ip.F2]	*Communications (2)* **IP Fixed Address Part 2** Set the IP address of this module. Each device on the network must have a unique address.	0 to 255	254	If address mode is set to fixed.			
ip.F3 [ip.F3]	*Communications (2)* **IP Fixed Address Part 3** Set the IP address of this module. Each device on the network must have a unique address.	0 to 255	1	If address mode is set to fixed.			
ip.F4 [ip.F4]	*Communications (2)* **IP Fixed Address Part 4** Set the IP address of this module. Each device on the network must have a unique address.	0 to 255	1	If address mode is set to fixed.			
ip.F5 [ip.F5]	*Communications (2)* **IP Fixed Address Part 5** Set the IP address of this module. Each device on the network must have a unique address.	0 to 255	0	If address mode is set to fixed.			
ip.F6 [ip.F6]	*Communications (2)* **IP Fixed Address Part 6** Set the IP address of this module. Each device on the network must have a unique address.	0 to 255	0	If address mode is set to fixed.			
ip.S1 [ip.S1]	*Communications (2)* **IP Fixed Subnet Part 1** Set the IP subnet mask for this module.	0 to 255	255	If address mode is set to fixed.			
ip.S2 [ip.S2]	*Communications (2)* **IP Fixed Subnet Part 2** Set the IP subnet mask for this module.	0 to 255	255	If address mode is set to fixed.			
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read W: Write E: EEPROM S: User Set**

Setup Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
iP.S3 [ip.S3]	*Communications (2)* **IP Fixed Subnet Part 3** Set the IP subnet mask for this module.	0 to 255	0	If address mode is set to fixed.			
iP.S4 [ip.S4]	*Communications (2)* **IP Fixed Subnet Part 4** Set the IP subnet mask for this module.	0 to 255	0	If address mode is set to fixed.			
iP.S5 [ip.S5]	*Communications (2)* **IP Fixed Subnet Part 5** Set the IP subnet mask for this module	0 to 255	0	If address mode is set to fixed.			
iP.S6 [ip.S6]	*Communications (2)* **IP Fixed Subnet Part 6** Set the IP subnet mask for this module.	0 to 255	0	If address mode is set to fixed.			
iP.g1 [ip.g1]	*Communications (2)* **Fixed IP Gateway Part 1**	0 to 255	0	If address mode is set to fixed.			
iP.g2 [ip.g2]	*Communications (2)* **Fixed IP Gateway Part 2**	0 to 255	0	If address mode is set to fixed.			
iP.g3 [ip.g3]	*Communications (2)* **Fixed IP Gateway Part 3**	0 to 255	0	If address mode is set to fixed.			
iP.g4 [ip.g4]	*Communications (2)* **Fixed IP Gateway Part 4**	0 to 255	0	If address mode is set to fixed.			
iP.g5 [ip.g5]	*Communications (2)* **Fixed IP Gateway Part 5**	0 to 255	0	If address mode is set to fixed.			
iP.g6 [ip.g6]	*Communications (2)* **Fixed IP Gateway Part 6**	0 to 255	0	If address mode is set to fixed.			
Mb.E [Mb.E]	*Communications (2)* **Modbus TCP Enable** Activate Modbus TCP.	YES Yes no No	Yes	Always if digit 8 is a "3".			
EiP.E [EiP.E]	*Communications (2)* **EtherNet/IP™ Enable** Activate Ethernet/IP™.	YES Yes no No	Yes	Always if digit 8 is a "3".			
Ao.nb [Ao.nb]	*Communications (2)* **Implicit Output Assembly Size**	1 to 20	20	Always if digit 8 is a "3" or "5".			
Ai.nb [Ai.nb]	*Communications (2)* **Implicit Input Assembly Size**	1 to 20	20	Always if digit 8 is a "3" or "5".			
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read W: Write E: EEPROM S: User Set**

Setup Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
C_F [C_F]	*Communications (2)* **Display Units** Select which scale to use for temperature passed over communications port 2.	F °F (30) C °C (15)	°F	Always	***Instance 1*** *Map 1* *Map 2* 2490 2970	0x96 (150) 1 6	uint RWE
MAP [Map]	*Communications (2)* **Data Map** If set to 1 the control will use PM legacy mapping. If set to 2 the control will use new mapping to accommodate new functions.	1 to 2	1	Always			
nUS [nU.S]	*Communications (2)* **Non-volatile Save** If set to Yes all values written to the control will be saved in EEPROM.	YES Yes no No	Yes	Always if digit 8 of the part number is 2, 3 or 5.	***Instance 1*** *Map 1* *Map 2* - - ***Instance 2*** *Map 1* *Map 2* - -	96 (150) 2 8	uint RWE
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read** **W: Write** **E: EEPROM** **S: User Set**

8 Chapter 8: Factory Page

Navigating the Factory Page

To go to the Factory Page from the Home Page, press and hold both the Advance and Reset keys for six seconds.

- Press the Advance Key to move through the parameter prompts.
- Press the Up or Down keys to change the parameter value.
- Press the Reset key to return to the Home Page.

Note:

Some of these menus and parameters may not appear, depending on the controller's options. See model number information in the Appendix for more information. If there is only one instance of a menu, no submenus will appear.

CUSt
FCty **Custom Setup Menu**
  1 to 20
  CUSt **Custom Setup**
    PAr Parameter
    Ins Instance ID

LoC
FCty **Security Setting Menu**
  LoC **Security Setting**
    LoC.o **Operations Page**
    PASS **Password**
    rLoC **Read Lock**
    SLoC **Write Security**
    LoC.L **Locked Access Level**
    roLL **Rolling Password**
    PAS.u **User Password**
    PAS.A **Administrator Password**

diAG
FCty **Diagnostics Menu**
  diAG **Diagnostics**
    Pn **Part Number**
    rEv **Software Revision**
    S.bld **Software Build Number**
    Sn **Serial Number**
    dAtE **Date of Manufacture**
    USr.r **User Restore Settings**
    USr.S **User Settings Save**
    IP.AC **IP Actual Address Mode**
    IP.A1 **IP Fixed Address Part 1**
    IP.A2 **IP Fixed Address Part 2**
    IP.A3 **IP Fixed Address Part 3**
    IP.A4 **IP Fixed Address Part 4**
    C.LEd **Communications LED Action**
    Zone **Zone Action**
    Chan **Channel Action**
    d.Prs **Display Pairs**
    dt **Menu Display Timer**

CAL
FCty **Calibration Menu**
  1 or 3
  CAL **Calibration**

Pnu **Electrical Measurement**
EL.o **Electrical Input Offset**
EL.S **Electrical Input Slope**
ELo.o **Electrical Output Offset**
EL.S **Electrical Output Slope**

Factory Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
CUSt FCtY **Custom Menu**							
PAr [Par]	*Custom Menu* **Parameter 1 to 20** Select the parameters that will appear in the Home Page. The Parameter 1 value will appear in the upper display of the Home Page. It cannot be changed with the Up and Down Keys in the Home Page. The Parameter 2 value will appear in the lower display in the Home Page. It can be changed with the Up and Down Keys, if the parameter is a writable one. Scroll through the other Home Page parameters with the Advance Key .	nonE None LSt Limit State LHY Limit Hysteresis LHS Limit High Set Point LLS Limit Low Set Point CUSt Custom Menu AHY Alarm Hysteresis AHI Alarm High Set Point ALO Alarm Low Set Point USrr User Restore Set C_F Display Units iCA Input Calibration Offset Pro Process	See: Home Page	Always			
iid [iid]	*Custom Setup (1 to 20)* **Instance ID** Select which instance of the parameter will be selected.	1 to 4		If there is only one valid instance for corresponding class member then not active, otherwise active.			
LoC FCtY **Security Setting Menu**							
LoCo [LoC.o]	*Security Setting* **Operations Page** Change the security level of the Operations Page.	1 to 3	2	Password security off or appropriate security access			
PASE [LoC.P]	*Security Setting* **Password Enable** Turn security features on or off.	oFF Off on On	Off	Password security off or appropriate security access			
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read** **W: Write** **E: EEPROM** **S: User Set**

Factory Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
rLoC [rLoC]	*Security Setting* **Read Lock** Set the read security clearance level. The user can access the selected level and all lower levels. If the Set Lockout Security level is higher than the Read Lockout Security, the Read Lockout Security level takes priority.	1 to 5	5	Password security off or appropriate security access			
SLoC [SLoC]	*Security Setting* **Write Security** Set the write security clearance level. The user can access the selected level and all lower levels. If the Set Lockout Security level is higher than the Read Lockout Security, the Read Lockout Security level takes priority.	0 to 5	5	Password security off or appropriate security access			
LoC.L [LoC.L]	*Security Setting* **Locked Access Level** Determines user level menu visibility when security is enabled. See Features section under Password Security.	1 to 5	5	Password security off or appropriate security access			
roLL [roLL]	*Security Setting* **Rolling Password** When on every time power is cycled a new Public Key will be displayed.	oFF Off on On	Off	Password security off or appropriate security access			
PAS.u [PAS.u]	*Security Setting* **User Password** Used to acquire access to menus made available through Password Security..	10 to 999	63	Password security off or appropriate security access			
PAS.A [PAS.A]	*Security Setting* **Administrator Password** Used to acquire full access to all menus.	10 to 999	156	Password security off or appropriate security access			
ULoC FCty **Security Setting Menu**							
CodE [CodE]	*Security Setting* **Public Key** If Rolling Password turned on, generates a random number when power is cycled. If Rolling Password is off fixed number will be displayed.	Customer Specific	0	Password security on			
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read** **W: Write** **E: EEPROM** **S: User Set**

Factory Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
PASS [PASS]	*Security Setting* **Password** Number used to acquire access to available Pages and Menus (see Password Security in the Features Section).	-1999 to 9999	0	Password security on			
diAG FCty **Security Setting Menu**							
Pn [Pn]	*Diagnostics Menu* **Part Number** Display this controller's part number.	15 characters		Instance 1 only		0x65 (101) 1 9	string RWE
rEu [rEu]	*Diagnostics Menu* **Software Revision** Display this controller's firmware revision number.	1 to 10		Always		0x65 (101) 1 0x11 (17)	string R
S.bLd [S.bLd]	*Diagnostics Menu* **Software Build Number** Display the firmware build number.	0 to 2,147,483,647		Always	***Instance 1*** *Map 1* 8 *Map 2* 8	0x65 (101) 1 5	dint R
Sn [Sn]	*Diagnostics Menu* **Serial Number** Display the serial number.	0 to 2,147,483,647				0x65 (101) 1 0x20 (32)	string RWE
dAtE [dAtE]	*Diagnostics Menu* **Date of Manufacture** Display the date code.	0 to 2,147,483,647			***Instance 1*** *Map 1* 14 *Map 2* 14	0x65 (101) 1 8	dint RWE
USr.r [USr.r]	*Diagnostics Menu* **User Restore Settings** Replace all of this controller's settings with another set.	FCty Factory (31) nonE None (61) SEt 1 User Set 1 (101) SEt2 User Set 2 (102)	None		***Instance 1*** *Map 1* 24 *Map 2* 24	0x65 (101) 1 0xD (13)	uint RWE
USr.S [USr.S]	*Diagnostics Menu* **User Settings Save** Save all of this controller's settings to the selected set.	SEt 1 User Set 1 (101) SEt2 User Set 2 (102) nonE None (61)	None	Always	***Instance 1*** *Map 1* 26 *Map 2* 26	0x(101) 1 0xE (14)	uint RWE
iP.AC [iP.AC]	*Diagnostics Menu* **IP Address Mode** Actual address mode (DHCP or Fixed).	dhCP DHCP (1281) F.Add Fixed Address (1284)	DHCP	If Ethernet card present (see part number).			
iPA 1 [ip.F1]	*Diagnostics Menu* **IP Actual Address Part 1** Actual IP address of this module. Each device on the network must have a unique address.	0 to 255	169	If address mode is set to fixed.			
iPA2 [ip.F2]	*Diagnostics Menu* **IP Actual Address Part 2** Actual IP address of this module. Each device on the network must have a unique address.	0 to 255	254	If address mode is set to fixed.			
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read W: Write E: EEPROM S: User Set**

Factory Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
iP.A3 [ip.F3]	*Diagnostics Menu* **IP Actual Address Part 3** Actual IP address of this module. Each device on the network must have a unique address.	0 to 255	1	If address mode is set to fixed.			
iP.A4 [ip.F4]	*Diagnostics Menu* **IP Actual Address Part 4** Actual IP address of this module. Each device on the network must have a unique address.	0 to 255	1	If address mode is set to fixed.			
iP.A5 [ip.F5]	*Diagnostics Menu* **IP Actual Address Part 4** Actual IP address of this module. Each device on the network must have a unique address.	0 to 255	1	If address mode is set to fixed.			
iP.A5 [ip.F4]	*Diagnostics Menu* **IP Actual Address Part 5** Actual IP address of this module. Each device on the network must have a unique address.	0 to 255	1	If address mode is set to fixed.			
C.LEd [C.LEd]	*Diagnostics Menu* **Communications LED Action** Turns comms LED on or off for selected comms ports.	Con1 Comm port 2 Con2 Comm port 1 both Comm port 1 and 2 oFF Off	both	Always			
Zone [Zone]	*Diagnostics Menu* **Zone** Turns Zone LED on or off based on selection.	oFF Off on On	On	Always			
Chan [Chan]	*Diagnostics Menu* **Channel** Turns Channel LED on or off based on selection.	oFF Off on On	On	Always			
dPrS [dPrS]	*Diagnostics Menu* **Display Pairs** Defines the number of Display Pairs.	1 to 10	2	Always			
d.ti [d.ti]	*Diagnostics Menu* **Display Time** Time delay in toggling between channel 1 and channel 2.	0 to 60	0	Always			
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read W: Write E: EEPROM S: User Set**

Factory Page

Display	Parameter name Description	Range	Default	Parameter Appears in Menu When	Modbus Relative Address	CIP Class Instance Attribute hex (dec)	Data Type & Read/ Write
CAL FCty **Calibration Menu**							
Pnu [Mv]	*Calibration Menu (1)* **Electrical Measurement** Read the raw electrical value for this input in the units corresponding to the Sensor Type (Setup Page, Analog Input Menu) setting.	-3.4e38 to 3.4e38		Always	***Instance 1*** *Map 1* 400 *Map 2* 400	0x68 (104) 1 0x15 (21)	float R
EL.o [ELi.o]	*Calibration Menu (1)* **Electrical Input Offset** Change this value to calibrate the low end of the input range.	-1,999.000 to 9,999.000	0.0	Always	***Instance 1*** *Map 1* 378 *Map 2* 378	0x68 (104) 1 0xA (10)	float RWES
EL.S [ELi.S]	*Calibration Menu (1)* **Electrical Input Slope** Adjust this value to calibrate the slope of the input value.	-1,999.000 to 9,999.000	1.0	Always	***Instance 1*** *Map 1* 380 *Map 2* 380	0x68 (104) 1 0xB (11)	float RWES
ELo.o [ELo.o]	*Calibration Menu (3)* **Electrical Output Offset** Change this value to calibrate the low end of the output range. Menu 2 calibrates output 3.	-1,999.000 to 9,999.000	0.0	the controller has process output: 3	***Instance 1*** *Map 1* 808 *Map 2* 928	0x76 (118) 3 5	float RWES
ELo.S [ELo.S]	*Calibration Menu (3)* **Electrical Output Slope** Adjust this value to calibrate the slope of the output value. Menu 2 calibrates output 3.	-1,999.000 to 9,999.000	1.0	the controller has process outputs: 3	***Instance 1*** *Map 1* 730 *Map 2* 850	0x76 (118) 3 6	float RWES
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.							**R: Read** **W: Write** **E: EEPROM** **S: User Set**

8 Chapter 8: Features

Saving and Restoring User Settings

Recording setup and operations parameter settings for future reference is very important. If you unintentionally change these, you will need to program the correct settings back into the controller to return the equipment to operational condition.

After you program the controller and verify proper operation, use User Save Set [USr.S] (Factory Page, Diagnostics Menu) to save the settings into either of two files in a special section of memory. If the settings in the controller are altered and you want to return the controller to the saved values, use User Restore Set [USr.r] (Factory Page, Diagnostics Menu) to recall one of the saved settings.

A digital input or the Function Key can also be configured to restore user settings.

Note: Only perform the above procedure when you are sure that all the correct settings are programmed into the controller. Saving the settings overwrites any previously saved collection of settings. Be sure to document all the controller settings.

Programming the Home Page

Watlow's patented user-defined menu system improves operational efficiency. The user-defined Home Page provides you with a shortcut to monitor or change the parameter values that you use most often.

You can create your own Home Page with as many as 20 of the active parameters. When a parameter normally located in the Setup Page or Operations Page is placed in the Home Page, it is accessible through both. If you change a parameter in the Home Page, it is automatically changed in its original page. If you change a parameter in its original page it is automatically changed in the Home Page.

The default parameters will automatically appear in the Home Page.

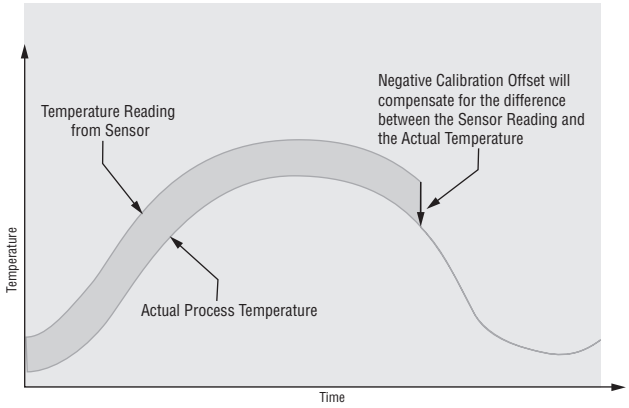
Change the list of parameters in the Home Page from the Custom Menu [CUSt] (Factory Page).

Inputs

Calibration Offset

Calibration offset allows a device to compensate for an inaccurate sensor, lead resistance or other factors that affect the input value. A positive offset increases the input value, and a negative offset decreases the input value.

The input offset value can be viewed or changed with Calibration Offset [InCA] (Operations Page, Analog Input Menu).



Calibration

To calibrate an analog input, you will need to provide two electrical signals or resistance loads near the extremes of the range that the application is likely to utilize. See recommended values below:

Sensor Type	Low Source	High Source
thermocouple	0.000 mV	50.000 mV
millivolts	0.000 mV	50.000 mV
volts	0.000V	10.000V
milliamps	0.000 mA	20.000 mA
100 Ω RTD	50.00 Ω	350.00 Ω
1,000 Ω RTD	500.00 Ω	3,500.00 Ω

Follow these steps for a thermocouple or process input:

1. Apply the low source signal to the input you are calibrating. Measure the signal to ensure it is accurate.
2. Read the value of Electrical Measurement [InU] (Factory Page, Calibration Menu) for that input.
3. Calculate the offset value by subtracting this value from the low source signal.
4. Set Electrical Offset [InLo] (Factory Page, Calibration Menu) for this input to the offset value.
5. Check the Electrical Measurement to see whether it now matches the signal. If it doesn't match, adjust Electrical Offset again.
6. Apply the high source signal to the input. Measure the signal to ensure it is accurate.
7. Read the value of Electrical Measurement for that input.
8. Calculate the gain value by dividing the low source signal by this value.
9. Set Electrical Slope [InLS] (Factory Page, Calibration Menu) for this input to the calculated gain value.
10. Check the Electrical Measurement to see whether it now matches the signal. If it doesn't match, adjust Electrical Slope again.

Set Electrical Offset to 0 and Electrical Slope to 1 to restore factory calibration.

Follow these steps for an RTD input:

1. Measure the low source resistance to ensure it is accurate. Connect the low source resistance to the input you are calibrating.
2. Read the value of Electrical Measurement [rnu] (Factory Page, Calibration Menu) for that input.
3. Calculate the offset value by subtracting this value from the low source resistance.
4. Set Electrical Offset [E.o] (Factory Page, Calibration Menu) for this input to the offset value.
5. Check the Electrical Measurement to see whether it now matches the resistance. If it doesn't match, adjust Electrical Offset again.
6. Measure the high source resistance to ensure it is accurate. Connect the high source resistance to the input.
7. Read the value of Electrical Measurement for that input.
8. Calculate the gain value by dividing the low source signal by this value.
9. Set Electrical Slope [EL.S] (Factory Page, Calibration Menu) for this input to the calculated gain value.
10. Check the Electrical Measurement to see whether it now matches the signal. If it doesn't match, adjust Electrical Slope again.

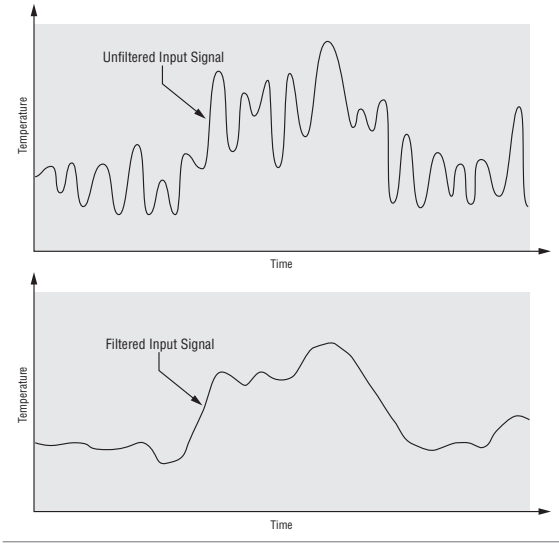
Set Electrical Offset to 0 and Electrical Slope to 1 to restore factory calibration.

Filter Time Constant

Filtering smoothes an input signal by applying a first-order filter time constant to the signal. Filtering the displayed value makes it easier to monitor. Filtering the signal may improve the performance of PID control in a noisy or very dynamic system.

Adjust the filter time interval with Filter Time [F.iL] (Setup Page, Analog Input Menu).

Example: With a filter value of 0.5 seconds, if the process input value instantly changes from 0 to 100 and remained at 100, the display will indicate 100 after five time constants of the filter value or 2.5 seconds.



Sensor Selection

You need to configure the controller to match the input device, which is normally a thermocouple, RTD or process transmitter. When you select an input device, the controller automatically sets the input linearization to match the sensor. It also sets high and low limits, which in turn limit the set point range-high and range-low values.

Select the sensor type with Sensor Type [SEn] (Setup Page, Analog Input Menu).

Note:
The EZ-ZONE® PM does not have an open-sensor detection feature for process inputs.

Set Point Low Limit and High Limit

The controller constrains the set point to a value between a set point low limit and a set point high limit.

Set the set point range with Low Set Point [SPLL] and High Set Point [SPLh] (Setup Page, Loop Menu).

Scale High and Scale Low

When an analog input is selected as process voltage or process current input, you must choose the value of voltage or current to be the low and high ends. For example, when using a 4 to 20 mA input, the scale low value would be 4.00 mA and the scale high value would be 20.00 mA. Commonly used scale ranges are: 0 to 20 mA, 4 to 20 mA, 0 to 5V, 1 to 5V and 0 to 10V.

You can create a scale range representing other units for special applications. You can reverse scales from high values to low values for analog input signals that have a reversed action. For example, if 50 psi causes a 4 mA signal and 10 psi causes a 20 mA signal.

Scale low and high low values do not have to match the bounds of the measurement range. These along with range low and high provide for process scaling and can include values not measureable by the controller. Regardless of scaling values, the measured value will be constrained by the electrical measurements of the hardware.

Select the low and high values with Scale Low [S.Lo] and Scale High [S.hi]. Select the displayed range with Range Low [r.Lo] and Range High [r.hi] (Setup Page, Analog Input Menu).

Range High and Range Low

With a process input, you must choose a value to represent the low and high ends of the current or voltage range. Choosing these values allows the controller's display to be scaled into the actual working units of measurement. For example, the analog input from a humidity transmitter could represent 0 to 100 percent relative humidity as a process signal of 4 to 20 mA. Low scale would be set to 0 to represent 4 mA and high scale set to 100 to represent 20 mA. The indication on the display would then represent percent humidity and range from 0 to 100 percent with an input of 4 to 20 mA.

Select the low and high values with Range Low [r.Lo] and Range High [r.hi] (Setup Page, Analog Input Menu).

Outputs

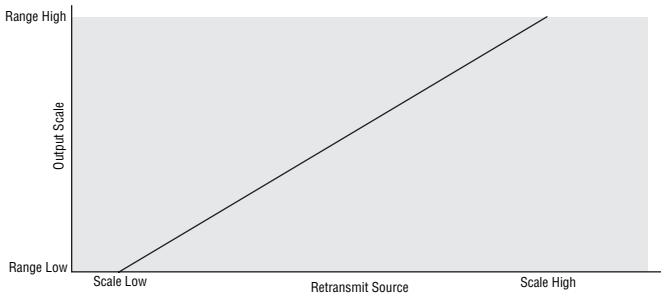
Retransmitting a Process Value or Set Point

The retransmit feature allows a process output to provide an analog signal that represents the set point or process value. The signal may serve as a remote set point for another controller or as an input for a chart recorder documenting system performance over time.

In choosing the type of retransmit signal the operator must take into account the input impedance of the device to be retransmitted to and the required signal type, either voltage or milliamps.

Typically applications might use the retransmit option to record one of the variables with a chart recorder or to generate a set point for other controls in a multi-zone application.

Outputs 1 and 3 can be ordered as process outputs and used to retransmit. Select retransmit [rTNt] as the Output Function [Fn] (Setup Page, Output Menu). Set the output to volts [volt] or milliamps [mA] with Output Type [o.ty]. Select the signal to retransmit with Retransmit Source [r.Sr].



Set the range of the process output with Scale Low [S.Lo] and Scale High [S.hi]. Scale the retransmit source to the process output with Range Low [r.Lo] and Range High [r.hi].

When the retransmit source is at the Range Low value, the retransmit output will be at its Scale Low value. When the retransmit source is at the Range High value, the retransmit output will be at its Scale High value.

Alarms

Alarms are activated when the output level, process value or temperature leaves a defined range. A user can configure how and when an alarm is triggered, what action it takes and whether it turns off automatically when the alarm condition is over.

Configure alarm outputs in the Setup Page before setting alarm set points.

Alarms do not have to be assigned to an output. Alarms can be monitored and controlled through the front panel or by using software.

Process Alarms

A process alarm uses one or two absolute set points to define an alarm condition.

Select the alarm type with Type [A.tY] (Setup Page, Alarm Menu).

Alarm Set Points

The alarm high set point defines the process value or temperature that will trigger a high side alarm. It must be higher than the alarm low set point and lower than the high limit of the sensor range.

The alarm low set point defines the temperature that will trigger a low side alarm. It must be lower than the alarm high set point and higher than the low limit of the sensor range.

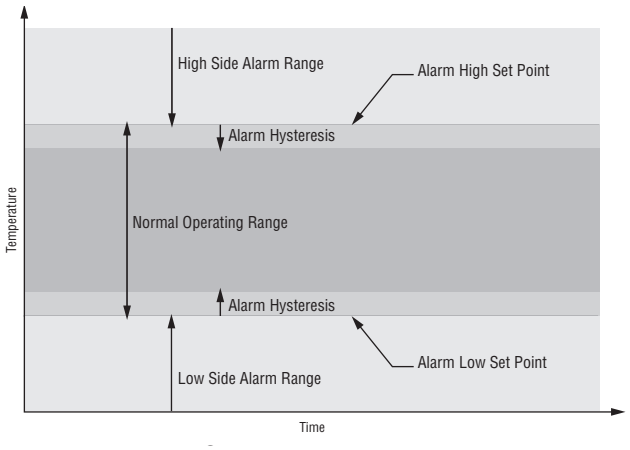
View or change alarm set points with Low Set Point [A.Lo] and High Set Point [A.hi] (Operations Page, Alarm Menu).

Alarm Hysteresis

An alarm state is triggered when the process value reaches the alarm high or alarm low set point. Alarm hysteresis defines how far the process must return into the normal operating range before the alarm can be cleared.

Alarm hysteresis is a zone inside each alarm set point. This zone is defined by adding the hysteresis value to the alarm low set point or subtracting the hysteresis value from the alarm high set point.

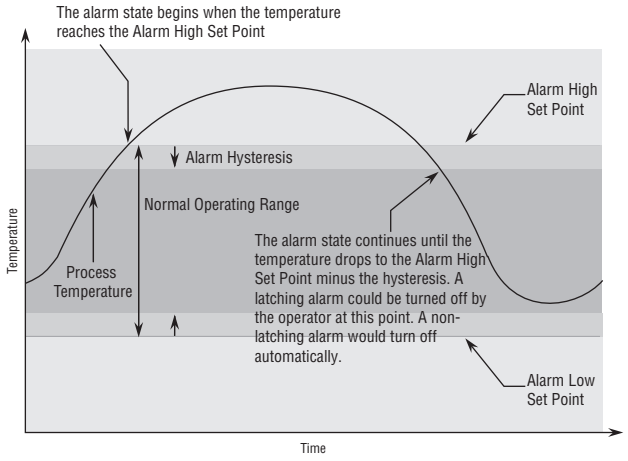
View or change alarm hysteresis with Hysteresis [A.hY] (Setup Page, Alarm Menu).



Alarm Latching

A latched alarm will remain active after the alarm condition has passed. To clear a latched alarm, press the Reset key. It can only be deactivated by the user. An alarm that is not latched (self-clearing) will deactivate automatically when the alarm condition has passed.

Turn alarm latching on or off with Latching [A.LA] (Setup Page, Alarm Menu).



Alarm Silencing

Alarm silencing allows the operator to disable the alarm output while the controller is in an alarm state. The process value or temperature has to enter the normal operating range beyond the hysteresis zone to activate the alarm output function again.

Turn alarm silencing on or off with Silencing [A.SI] (Setup Page, Alarm Menu).

Alarm Blocking

Alarm blocking allows a system to warm up after it has been started up. With alarm blocking on, an alarm is not triggered when the process temperature is initially lower than the alarm low set point. The process temperature has to enter the normal operating range beyond the hysteresis zone to activate the alarm function.

Turn alarm blocking on or off with Blocking [A.bL] (Setup Page, Alarm Menu).

Using Lockout to Hide Pages and Menus

If unintentional changes to parameter settings might raise safety concerns or lead to downtime, your can use the lockout feature to make them more secure.

Each of the menus in the Factory Page and each of the pages, except the Factory Page, has a security level assigned to it. You can change the read and write access to these menus and pages by using the parameters in the Lockout Menu (Factory Page).

Lockout Menu

There are four parameters in the Lockout Menu (Factory Page):

- Lock Operations Page [LoC.o] sets the security level for the Operations Page. (default: 2)

  Note:

  The Home and Setup Page lockout levels are fixed and cannot be changed.
- Password Security Enable [PAS.E] will turn on or off the Password security feature. (default: off)
- Read Lockout Security [rLoC] determines which pages can be accessed. The user can access the selected level and all lower levels. (default: 5)
- Set Lockout Security [SLoC] determines which parameters within accessible pages can be written to. The user can write to the selected level and all lower levels. (default: 5)

The table below represents the various levels of lockout for the Set Lockout Security prompt and the Read Lockout Security prompt. The Set Lockout has 6 levels (0-5) of security where the Read Lockout has 5 (1-5). Therefore, level "0" applies to Set Lockout only. "Y" equates to yes (can write/read) where "N" equates to no (cannot write/read). The colored cells differentiate one level from the next.

Lockout Security SLoC & rLoC						
Lockout Level	0	1	2	3	4	5
Home Page	Y	Y	Y	Y	Y	Y
Operations Page	N	N	Y	Y	Y	Y
Setup Page	N	N	N	N	Y	Y
Factory Page						
Custom Menu	N	N	N	N	N	Y
Diagnostic Menu	N	Y	Y	Y	Y	Y
Calibration Menu	N	N	N	N	N	Y
Lockout Menu						
LoC.0	N	Y	Y	Y	Y	Y
PAS.E	N	Y	Y	Y	Y	Y
rLoC	Y	Y	Y	Y	Y	Y
SLoC	Y	Y	Y	Y	Y	Y

The following examples show how the Lockout Menu parameters may be used in applications:

1. You can lock out access to the Operations Page but allow an operator access to the Profile Menu, by changing the default Profile Page and Operations Page security levels. Change Lock Operations Page LoC.o to 3 and Lock Profiling Page LoC.P to 2. If Set Lockout Security SLoC is set to 2 or higher and the Read Lockout Security rLoC is set to 2, the Profiling Page and Home Pages can be accessed, and all writable parameters can be written to. Pages with security levels greater than 2 will be locked out (unaccessible).
2. If Set Lockout Security SLoC is set to 0 and Read Lockout Security rLoC is set to 5, all pages will be accessible, however, changes will not be allowed on any pages or menus, with one exception: Set Lockout Security SLoC can be changed to a higher level.
3. The operator wants to read all the menus and not allow any parameters to be changed.

   In the Factory Page, Lockout Menu, set Read Lockout Security rLoC to 5 and Set Lockout Security SLoC to 0.
4. The operator wants to read and write to the Home Page and Profiling Page, and lock all other pages and menus.

   In the Factory Page, Lockout Menu, set Read Lockout Security rLoC to 2 and Set Lockout Security SLoC to 2.

   In the Factory Page, Lockout Menu, set Lock Operations Page LoC.0 to 3 and Lock Profiling Page LoC.P to 2.
5. The operator wants to read the Operations Page, Setup Page, Profiling Page, Diagnostics Menu, Lock Menu, Calibration Menu and Custom Menus. The operator also wants to read and write to the Home Page.

   In the Factory Page, Lockout Menu, set Read Lockout Security rLoC to 1 and Set Lockout Security SLoC to 5.

   In the Factory Page, Lockout Menu, set Lock Operations Page LoC.0 to 2 and Lock Profiling Page LoC.P to 3.

Using Password Security

It is sometimes desirable to apply a higher level of security to the control where a limited number of menus are visible and not providing access to others without a security password. Without the appropriate password those menus will remain inaccessible. If Password Enabled PAS.E in the Factory Page under the LoC Menu is set to on, an overriding Password Security will be in effect. When in effect, the only Pages that a User without a password has visibility to are defined in the Locked Access Level LoC.L prompt. On the other hand, a User with a password would have visibility restricted by the Read Lockout Security rLoC. As an example, with Password Enabled and the Locked Access Level LoC.L set to 1 and rLoC is set to 3, the available Pages for a User without a password would be limited to the Home and Factory Pages (locked level 1). If the User password is entered all pages would be accessible with the exception of the Setup Page as defined by level 3 access.

How to Enable Password Security

Go to the Factory Page by holding down the Reset key and the Advance key for approximately six seconds. Once there push the Down key one time to get to the LoC menu. Again push the Advance key until the Password Enabled PAS.E prompt is visible. Lastly, push either the up or down key to turn it on. Once on, 4 new prompts will appear:

1. LoC.L Locked Access Level (1 to 5) corresponding to the lockout table above.
2. roLL Rolling Password will change the Customer Code every time power is cycled.
3. PAS.U User Password which is needed for a User to acquire access to the control.
4. PAS.A, Administrator Password which is needed to acquire administrative access to the control.

The Administrator can either change the User and or the Administrator password or leave them in the default state. Once Password Security is enabled they will no longer be visible to anyone other than the Administrator. As can be seen in the formula that follows either the User or Administrator will need to know what those passwords are to acquire a higher level of access to the control. Back out of this menu by pushing the Reset key. Once out of the menu, the Password Security will be enabled.

How to Acquire Access to the Control

To acquire access to any inaccessible Pages or Menus, go to the Factory Page and enter the ULoC menu. Once there follow the steps below:

Note:

If Password Security (Password Enabled [PAS.E]) is enabled the two prompts mentioned below in the first step will not be visible. If unknown, call the individual or company that originally setup the control.

1. Acquire either the User Password [PAS.u] or the Administrator Password [PAS.A].

2. Push the Advance key one time where the Code [CodE] prompt will be visible.

Note:

a. If the the Rolling Password is off push the Advance key one more time where the Password [PASS] prompt will be displayed. Proceed to either step 7a or 8a. Pushing the Up or Down arrow keys enter either the User or Administrator Password. Once entered, push and hold the Reset key for two seconds to return to the Home Page.

b. If the Rolling Password [roLL] was turned on proceed on through steps 3 - 9.

3. Assuming the Code [CodE] prompt (Public Key) is still visible on the face of the control simply push the Advance key to proceed to the Password [PASS] prompt. If not find your way back to the Factory Page as described above.

4. Execute the calculation defined below (7b or 8b) for either the User or Administrator.

5. Enter the result of the calculation in the upper display by using the Up and Down arrow keys or use EZ-ZONE Confgurator Software.

6. Exit the Factory Page by pushing and holding the Reset key for two seconds.

Formulas used by the User and the Administrator to calculate the Password follows:

Passwords equal:

7. **User**

a. If Rolling Password [roLL] is Off, Password [PASS] equals User Password [PAS.u].

b. If Rolling Password [roLL] is On, Password [PASS] equals:
([PAS.u] x code) Mod 929 + 70

8. **Administrator**

a. If Rolling Password [roLL] is Off, Password [PASS] equals User Password [PAS.A].

b. If Rolling Password [roLL] is On, Password [PASS] equals:
([PAS.A] x code) Mod 997 + 1000

Differences Between a User Without Password, User With Password and Administrator

Without Password Security [PAS.E] being enabled restrictions are applied via Read [rLoC] and Write [SLoC] Lockout exclusively. As discussed in the first paragraph of this section when Password Security is enabled restrictions are applied with the Locked Access Level [LoC.L], [rLoC] and [SLoC] with the Locked Access Level taking precedence.

- User **without** a password has Page visibility restricted by the Locked Access Level [LoC.L].
- A User **with** a password has Page visibility restricted by the Read Lockout Security [rLoC], never having access to the Lock [LoC] Menu.
- An Administrator is restricted according to the Read Lockout Security [rLoC] however, the Administrator has access to the Lock Menu where the Read Lockout can be changed.

Chapter 9: Appendix

Troubleshooting Alarms, Errors and Control Issues

Indication	Description	Possible Cause(s)	Corrective Action
Alarm won't clear or Reset	Alarm will not clear or Reset with keypad or digital input	• Alarm latching is active • Alarm set to incorrect output • Alarm is set to incorrect source • Sensor input is out of alarm set point range • Alarm set point is incorrect • Alarm is set to incorrect type • Digital input function is incorrect	• Reset alarm when process is within range or disable latching • Set output to correct alarm source instance • Set alarm source to correct input instance • Correct cause of sensor input out of alarm range • Set alarm set point to correct trip point • Set digital input function and source instance
Alarm won't occur	Alarm will not activate output	• Alarm silencing is active • Alarm blocking is active • Alarm is set to incorrect output • Alarm is set to incorrect source • Alarm set point is incorrect • Alarm is set to incorrect type	• Disable alarm silencing, if required • Disable alarm blocking, if required • Set output to correct alarm source instance • Set alarm source to correct input instance • Set alarm set point to correct trip point
AL.E1 Alarm Error AL.E2 AL.E3 AL.E4	Alarm state cannot be determined due to lack of sensor input	• Sensor improperly wired or open • Incorrect setting of sensor type • Calibration corrupt	• Correct wiring or replace sensor • Match setting to sensor used • Check calibration of controller
AL.L1 Alarm Low AL.L2 AL.L3 AL.L4	Sensor input below low alarm set point	• Temperature is less than alarm set point • Alarm is set to latching and an alarm occurred in the past • Incorrect alarm set point • Incorrect alarm source	• Check cause of under temperature • Clear latched alarm • Establish correct alarm set point • Set alarm source to proper setting
AL.h1 Alarm High AL.h2 AL.h3 AL.h4	Sensor input above high alarm set point	• Temperature is greater than alarm set point • Alarm is set to latching and an alarm occurred in the past • Incorrect alarm set point • Incorrect alarm source	• Check cause of over temperature • Clear latched alarm • Establish correct alarm set point • Set alarm source to proper setting
Er.i1 Error Input	Sensor does not provide a valid signal to controller	• Sensor improperly wired or open • Incorrect setting of sensor type • Calibration corrupt	• Correct wiring or replace sensor • Match setting to sensor used • Check calibration of controller
Limit won't clear or Reset	Limit will not clear or Reset with keypad or digital input	• Sensor input is out of limit set point range • Limit set point is incorrect • Digital input function is incorrect	• Correct cause of sensor input out of limit range • Set limit set point to correct trip point • Set digital input function and source instance
L.E1 Limit Error	Limit state cannot be determined due to lack of sensor input, limit will trip	• Sensor improperly wired or open • Incorrect setting of sensor type • Calibration corrupt	• Correct wiring or replace sensor • Match setting to sensor used • Check calibration of controller
L.L1 Limit Low	Sensor input below low limit set point	• Temperature is less than limit set point • Limit outputs latch and require Reset • Incorrect alarm set point	• Check cause of under temperature • Clear limit • Establish correct limit set point

Indication	Description	Possible Cause(s)	Corrective Action
LHI Limit High	Sensor input above high limit set point	• Temperature is greater than limit set point • Limit outputs latch and require Reset • Incorrect alarm set point	• Check cause of over temperature • Clear limit • Establish correct limit set point
No Display	No display indication or LED illumination	• Power to controller is off • Fuse open • Breaker tripped • Safety interlock switch open • Separate system limit control activated • Wiring error • Incorrect voltage to controller	• Turn on power • Replace fuse • Reset breaker • Close interlock switch • Reset limit • Correct wiring issue • Apply correct voltage, check part number
No Serial Communication	Cannot establish serial communications with the controller	• Address parameter incorrect • Incorrect protocol selected • Baud rate incorrect • Parity incorrect • Wiring error • EIA-485 converter issue • Incorrect computer or PLC communications port • Incorrect software setup • Termination resistor may be required	• Set unique addresses on network • Match protocol between devices • Match baud rate between devices • Match parity between devices • Correct wiring issue • Check settings or replace converter • Set correct communication port • Correct software setup to match controller • Place 120 Ω resistor across EIA-485 on last controller
Temperature runway	Process value continues to increase or decrease past set point.	• Controller output incorrectly programmed • Thermocouple reverse wired • Controller output wired incorrectly • Short in heater • Power controller connection to controller defective • Controller output defective	• Verify output function is correct (heat or cool) • Correct sensor wiring (red wire negative) • Verify and correct wiring • Replace heater • Replace or repair power controller • Replace or repair controller
100 Device Error rEtn	Controller displays internal malfunction message at power up.	• Controller defective	• Replace or repair controller
Menus inaccessible	Unable to access SEt, OPEr, FCtY or ProF menus or particular prompts in Home Page	• Lockout or Security set to incorrect level • Digital input set to lockout keypad • Custom parameters incorrect	• Check lockout setting in Factory Page • Change state of digital input • Change custom parameters in Factory Page
EZ-Key/s doesn't work	EZ-Key does not activate required function	• EZ-Key function incorrect • EZ-Key function instance not incorrect • Keypad malfunction	• Verify EZ-Key function in Setup Menu • Check that the function instance is correct • Replace or repair controller

Specifications

LineVoltage/Power (Minimum/Maximum Ratings)

- 85 to 264V~ (ac), 47 to 63Hz
- 20 to 28V~ (ac), 47 to 63Hz
- 12 to 40V⎓ (dc)
- 14VA maximum power consumption (PM8 & 9)
- 10VA maximum power consumption (PM3 & 6)
- Data retention upon power failure via non-volatile memory
- Compliant with SEMIF47-0200, FigureR1-1 voltage sag requirements @24V ~ (ac) or higher

Environment

- 0 to 149°F (-18 to 65°C) operating temperature
- -40 to 185°F (-40to85°C) storage temperature
- 0 to 90%RH, non-condensing

Accuracy

- Calibration accuracy and sensor conformity: ±0.1% of span, ±1°C @ the calibrated ambient temperature and rated line voltage
- Types R, S, B; 0.2%
- Type T below -50°C; 0.2%
- Calibration ambient temperature @ 77 ±5°F (25±3°C)
- Accuracy span :1000 °F (540°C) min.
- Temperature stability: ±0.1 °F/°F (±0.1°C/°C) rise in ambient max.

Agency Approvals

- UL® Listed to UL® 61010-1 File E185611
- UL® Reviewed to CSA C22.2 No.61010-1-04
- UL® 50Type 4X, NEMA 4X indoor locations, IP66 front panel seal
- FM Class 3545 File 3029084 temperature limit switches
- CE-See Declaration of Conformity RoHS and W.E.E.E. complaint
- ODVA-EtherNet/IP™ and DeviceNet Compliance
- PM3/6 CSA C22. No. 24 File 158031 Class 4813-02

Isolated Serial Communications

- EIA 232/485, Modbus® RTU
- EtherNet/IP™, DeviceNet™ (ODVA certified)
- Modbus® TCP

Wiring Termination—Touch-Safe Terminals

- Input, power and controller output terminals are touch safe removable 12 to 22 AWG

Universal Input

- Thermocouple, grounded or ungrounded sensors
- >20MΩ input impedance
- 3µA open sensor detection
- Max. of 20KΩ source resistance
- RTD 2 or 3 wire, platinum, 100Ω and 1000Ω @ 0°C calibration to DIN curve (0.00385Ω/Ω/°C)
- Process, 0-20mA @ 100Ω ,or 0-10V ⎓(dc) @ 20kΩ input impedance; scalable, 0-50mV, 0-1000Ω
- Potentiometer: 0 to 1,200Ω
- Inverse scaling

Input Type	Max Error @ 25 Deg C	Accuracy Range Low	Accuracy Range High	Units
J	±1.75	0	750	Deg C
K	±2.45	-200	1250	Deg C
T (0 to 350)	±1.55	0	350	Deg C
T (-200 to 0)	±1.55	-200	0	Deg C
N	±2.25	0	1250	Deg C
E	±2.10	-200	900	Deg C
R	±3.9	0	1450	Deg C
S	±3.9	0	1450	Deg C
B	±2.66	870	1700	Deg C
C	±3.32	0	2315	Deg C
D	±3.32	0	2315	Deg C
F (PTII)	±2.34	0	1343	Deg C
RTD, 100 ohm	±2.00	-200	800	Deg C
RTD, 1000 ohm	±2.00	-200	800	DegC
mV	±0.05	-50	50	mV
Volts	±0.01	0	10	Volts
mA dc	±0.02	0	20	mAmps DC
mA ac	±5	-50	50	mAmps AC
Potentiometer, 1K range	±1	0	1000	Ohms

Operating Range

Input Type	Range Low	Range High
J	-210	1200
K	-270	1371
T	-270	400
N	-270	1300
E	-270	1000
R	-50	1767
S	-50	1767
B	-50	1816
C	0	2315
D	0	2315
F (PTII)	0	1343
RTD (100 ohm)	-200	800
RTD (1000 ohm)	-200	800
mV	-50	50
Volts	0	10
mAdc	0	20
mAac	-50	50
Potentiometer, 1K range	0	1200

Operating Range		
Resistance, 5K range	0	5000
Resistance, 10K range	0	10000
Resistance, 20K range	0	20000
Resistance, 40K range	0	40000

Thermistor Input

Input Type	Max Error @ 25 Deg C	Accuracy Range Low	Accuracy Range High	Units
Thermistor, 5K range	±5	0	5000	Ohms
Thermistor, 10K range	±10	0	10000	Ohms
Thermistor, 20K range	±20	0	20000	Ohms
Thermistor, 40K range	±40	0	40000	Ohms

- 0 to 40 KΩ, 0 to 20 KΩ, 0 to 10 KΩ, 0 to 5 KΩ
- 2.252 KΩ and 10 KΩ base at 77°F (25°C)
- Linearization curves built in
- Third party Thermistor compatibility requirements

Base R @ 25C	Alpha Techniques	Beta THERM	YSI	Prompt
2.252K	Curve A	2.2K3A	004	A
10K	Curve A	10K3A	016	B
10K	Curve C	10K4A	006	C

2 Digital Input/Output Option - 2 DIO

- Digital input update rate 10Hz
  - DC voltage
    - Max. input 36V⎓ @ 3 mA
    - Min. high state 3 V at 0.25 mA
    - Max. low state 2 V
  - Dry contact
    - Min. open resistance 10 KΩ
    - Max. closed resistance 50 Ω
    - Max. short circuit 20 mA
- Digital output update rate 10 Hz
  - Output voltage 24 V, current limit, Output 6 = 10mA max., Output 5 = 3 pole DIN-A-MITE ® or 24mA max.

Output Hardware

- Switched dc = 22 to 32V⎓ (dc) @ 30mA output 1 and 3, 10mA output 4
- Switched dc/open collector = 30V⎓ (dc) max. @ 100mA max. current sink
- Solid-State Relay (SSR), Form A, 0.5A @ 24V~ (ac) min., 264V ~ (ac) max., opto-isolated, without contact suppression, 20 VA 120/240V~ (ac) pilot duty
- Electromechanical relay, Form C, 5A, 24 to 240V~ (ac) or 30V⎓ (dc)max., resistive load, 100,000 cycles at rated load, 125 VA pilot duty at 120/240V~ (ac), 25 VA at 24V~ (ac)
- Electromechanical relay, Form A, 5A, 24 to 240V~ (ac) or 30V⎓ (dc) max., resistive load, 100,000 cycles at rated load, 125 VA pilot duty at 120/240V~ (ac), 25 VA at 24V~ (ac)
- Universal process/retransmit, Output range selectable:
  - 0 to 10V ⎓(dc) into a min. 1,000Ω load
  - 0 to 20mA into max. 800Ω load

Operator Interface

- Dual 4 digit, 7 segment LED displays
- Advance, Reset, up and down keys, plus optional programmable EZ-KEY(s) depending on model size
- Typical display update rate 1Hz
- RESET key substituted for infinity on all models including the limit control

Dimensions

DIN Size	Behind Panel (max.)	Width	Height	Display Character Height
1/32 (PM3)	101.6 mm (4.00 in)	53.3 mm (2.10 in)	30.9 mm (1.22 in)	left: 7.59 mm (0.299 in) right: 5.90 mm (0.220 in)
1/16 (PM6)	101.6 mm (4.00 in)	53.3 mm (2.10 in)	53.3 mm (2.10 in)	up: 10.80 mm (0.425 in) low: 6.98 mm (0.275 in)
1/8 (PM9)	101.6 mm (4.00 in)	100.3 mm (2.10 in)	53.9 mm (1.22 in)	top: 11.4 mm (0.450 in) middle: 9.53 mm (0.375 in) bottom: 7.62 mm (0.300 in)
1/8 (PM8)	101.6 mm (4.00 in)	53.3 mm (2.10 in)	100.3 mm (3.95 in)	top: 11.4 mm (0.450 in) middle: 9.53 mm (0.375 in) bottom: 7.62 mm (0.300 in)

Weight

1/32 DIN (PM3)

- Controller: 127 g (4.5 oz.)

1/16 DIN (PM6)

- Controller: 186 g (6.6 oz.)

1/8 DIN (PM8 & 9)

- Controller: 284 g (10 oz.)

User Manual

- User manual: 172.82 g (6.11 oz)

Note:
These specifications are subject to change without prior notice.

Ordering Information for Enhanced Limit Controller Models

Enhanced Limit Controller
EZ-ZONE® Enhanced Limit Models
TRU-TUNE+® Adaptive Tune, red-green 7-segment displays

P M _ _ _ _ _ - _ A _ _ A A A

Package Size

6	Panel Mount 1/16 DIN
8	Panel Mount 1/8 DIN Vertical
9	Panel Mount 1/8 DIN Horizontal

Primary Function

L	Limit Controller with Universal Input
M	Limit Controller with Thermistor
D	Custom Firmware

Power Supply, Digital Input/Output

1	100 to 240V~ (ac)
2	100 to 240V~ (ac) plus 2 Digital I/O points
3	20 to 28V~ (ac) and 12 to 40V⎓ (dc)
4	20 to 28V~ (ac) and 12 to 40V⎓ (dc), plus 2 Digital I/O points

Output 1 and 2 Hardware Options

	Output 1	Output 2
AJ	None	Mechanical relay 5 A, form A
CJ	Switched dc/open collector	Mechanical relay 5 A, form A
EJ	Mechanical relay 5 A, form C	Mechanical relay 5 A, form A

Communications Options

A	None
1	EIA 485 Modbus RTU®
2	Modbus RTU 232/485
3	EtherNet/IP™, Modbus TCP
5	DeviceNet

- Standard Bus EIA-485 always included - all models

Future Options

A	None

Output 3 and 4 Hardware Options

	Output 3	Output 4
AA	None	None
AJ	None	Mechanical relay 5 A, form A
AK	None	Solid-State Relay 0.5 A, form A
CA	Switched dc/open collector	None
CC	Switched dc/open collector	Switched dc
CJ	Switched dc/open collector	Mechanical relay 5 A, form A
CK	Switched dc/open collector	Solid-State Relay 0.5 A, form A
EA	Mechanical relay 5 A, form C	None
EC	Mechanical relay 5 A, form C	Switched dc
EJ	Mechanical relay 5 A, form C	Mechanical relay 5 A, form A
EK	Mechanical relay 5 A, form C	Solid-State Relay 0.5 A, form A
FA	Universal Process	None
FC	Universal Process	Switched dc
FJ	Universal Process	Mechanical relay 5 A, form A
FK	Universal Process	Solid-State Relay 0.5 A, form A
KK	Solid-State Relay 0.5 A, form A	Solid-State Relay 0.5 A, form A

- PM6 only, if communications options 2 - 6 are ordered, option AA must be selected here.

Future Options

A	None

Custom Options

AA	Standard EZ-ZONE face plate

Note:
The model of controller that you have is one of many possible models in the EZ-ZONE PM family of controllers. To view the others, visit our website (http://www.watlow.com/literature/pti search.cfm) and type EZ-ZONE into the Keyword field.

Ordering Information for Limit Controller Models

Limit Controller
EZ-ZONE® Limit Models
TRU-TUNE+® Adaptive Tune, red-green 7-segment displays

P M _ _ _ _ _ - _ A A A A A A

Package Size

3	Panel Mount 1/32 DIN
6	Panel Mount 1/16 DIN
8	Panel Mount 1/8 DIN Vertical
9	Panel Mount 1/8 DIN Horizontal

Primary Function

L	Limit Controller with Universal Input
M	Limit Controller with Thermistor
D	Custom Firmware

Power Supply, Digital Input/Output

1	100 to 240V~ (ac)
2	100 to 240V~ (ac) plus 2 Digital I/O points
3	20 to 28V~ (ac) and 12 to 40V⎓ (dc)
4	20 to 28V~ (ac) and 12 to 40V⎓ (dc), plus 2 Digital I/O points

Output 1 and 2 Hardware Options

	Output 1	Output 2
AJ	None	Mechanical relay 5 A, form A
CJ	Switched dc/open collector	Mechanical relay 5 A, form A
EJ	Mechanical relay 5 A, form C	Mechanical relay 5 A, form A

Communications Options

A	None
1	EIA 485 Modbus RTU®

- Standard Bus EIA-485 always included - all models

Future Option

AAAA None

Custom Options

AA Standard EZ-ZONE face plate

Note:
The model of controller that you have is one of many possible models in the EZ-ZONE PM family of controllers. To view the others, visit our website (http://www.watlow.com/literature/pti search.cfm) and type EZ-ZONE into the Keyword field.

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Declaration of Conformity

Series EZ-ZONE® PM

CE

WATLOW
1241 Bundy Blvd.
Winona, MN 55987 USA

an ISO 9001 approved facility since 1996.

Declares that the following product:

Designation:	**Series EZ-ZONE® PM (Panel Mount)**
Model Numbers:	PM (3, 6, 8, 9 or 4)(Any Letter or number) – (1, 2, 3 or 4)(A, C, E, F or K) (A, C, H, J or K)(Any letter or number) – (Any letter or number)(A, C, E, F or K)(A, C, H, J or K) (Any three letters or numbers)
Classification:	Temperature control, Installation Category II, Pollution degree 2, IP66
Rated Voltage and Frequency:	100 to 240 V~ (ac 50/60 Hz) **or** 15 to 36 V⎓ dc/ 24 V~ac 50/60 Hz
Rated Power Consumption:	10 VA maximum PM3, PM6 Models. 14 VA maximum PM8, PM9, PM4 Models

Meets the essential requirements of the following European Union Directives by using the relevant standards show below to indicate compliance.

2004/108/EC Electromagnetic Compatibility Directive

EN 61326-1	**2006**	**Electrical equipment for measurement, control and laboratory use – EMC requirements (Industrial Immunity, Class B Emissions).**
EN 61000-4-2	1996 +A1,A2	Electrostatic Discharge Immunity
EN 61000-4-3	2006	Radiated Field Immunity 10V/M 80–1000 MHz, 3 V/M 1.4–2.7 GHz
EN 61000-4-4	2004	Electrical Fast-Transient / Burst Immunity
EN 61000-4-5	2006	Surge Immunity
EN 61000-4-6	1996 +A1,A2,A3	Conducted Immunity
EN 61000-4-11	2004	Voltage Dips, Short Interruptions and Voltage Variations Immunity
EN 61000-3-2	2006	Harmonic Current Emissions
EN 61000-3-3[1]	2005	Voltage Fluctuations and Flicker
SEMI F47	2000	Specification for Semiconductor Sag Immunity Figure R1-1

[1]For mechanical relay loads, cycle time may need to be extended up to 160 seconds to meet flicker requirements depending on load switched and source impedance.

2006/95/EC Low-Voltage Directive

EN 61010-1	**2001**	**Safety Requirements of electrical equipment for measurement, control and laboratory use. Part 1: General requirements**

Compliant with 2002/95/EC RoHS Directive

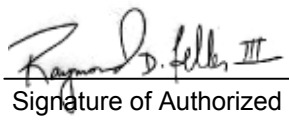
Per 2002/96/EC W.E.E.E Directive  ***Please Recycle Properly.***

Raymond D. Feller III
Name of Authorized Representative

Winona, Minnesota, USA
Place of Issue

General Manager
Title of Authorized Representative

June 2009
Date of Issue


Signature of Authorized Representative

CE DOC EZ-ZONE PM-06-09

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