EZ-ZONE® PM

User's Guide

PID Controller Models

TOTAL CUSTOMER SATISFACTION
3 Year Warranty

ISO 9001
Registered Company
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Made in the U.S.A.

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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 User's Guide 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 a Listed device per Underwriters Laboratories®. It has been evaluated to United States and Canadian requirements for Hazardous Locations Class 1 Division II Groups A, B, C and D. ANSI/ISA 12.12.01-2007. File E184390 QUZW, QUZW7. 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 Guide
- Factory Page

Return Material Authorization (RMA)

1. Call Watlow Customer Service, (507) 454-5300, for a Return Material Authorization (RMA) number before returning any item for repair. If 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 misuse, 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 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 not repairable, 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.

TC Table of Contents

TC

Table of Contents (cont.)

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 order the EZ-ZONE PM as a PID controller or an over-under limit controller, or you can combine both functions in the PM Integrated Limit Controller. You now have the option to integrate a high-amperage power controller output, an over-under limit controller and a high-performance PID controller all in space-saving, panel-mount packages. You can also select from a number of serial communications options to help you manage system performance.

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 PID controller, an over-under limit controller or an integrated controller, the EZ-ZONE PM is the answer.

Standard Features and Benefits

Advanced PID Control Algorithm

- TRU-TUNE+® Adaptive tune provides tighter control for demanding applications.
- Auto Tune for fast, efficient start ups

High-amperage Power Control Output

- Drives 15 amp resistive loads directly
- Reduces component count
- Saves panel space and simplifies wiring
- Reduces the cost of ownership

EZ-ZONE configuration communications and software

- Saves time and improves the reliability of controller set up

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
- Semi F47-0200

P3T Armor Sealing System

- NEMA 4X and IP65 offers water and dust resistance, can be cleaned and washed down (indoor use only)
- 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

Programmable Menu System

- Reduces set up time and increases operator efficiency

Full-featured Alarms

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

Heat-Cool Operation

- Provides application flexibility with accurate temperature and process control

Profile Capability

- Preprogrammed process control
- Ramp and soak programming with four files and 40 total steps

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 controller's 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 single PM controller can carry out several procedures at the same time, for instance closed-loop control, monitoring for several different alarm situations and operating switched devices, such as lights and motors. 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. In a simple form, this information may come from an operator pushing a button or as part of a more complex procedure it may represent a remote set point being received from another controller.

Each analog input typically uses a thermocouple or RTD to read the temperature of something. 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 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 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, it could compare the temperature of a process to the set point and calculate the optimal power for a heater.

To set up a function, it's important to tell it what source, or instance, to use. For example, an alarm may be set to respond to either analog input 1 or 2 (instance 1 or 2, respectively).

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 operating a heater; 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, you might assign an output to respond to alarm 4 (instance 4) or to retransmit the value of analog input 2 (instance 2).

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 and output events are internal states that are used exclusively by profiles. The source of an event input can come from a real-world digital input or an output from another function. Likewise, event outputs may control a physical output such as an output function block or be used as an input to another function.

Getting Started Quickly

The PM control has a page and menu structure that is listed below along with a brief description of its purpose.

Setup Page Push and hold the up and down keys (▲ ▼) for 6 seconds to enter. (See the Setup Page for further information)	Once received, a user would want to setup their control prior to operation. As an example, define the input type and set the output cycle time.
Operations Page Push and hold the up and down keys (▲ ▼) for 3 seconds to enter. (See the Operations Page for further information)	After setting up the control to reflect your equipment, the Operations Page would be used to monitor or change run-time settings. As an example, the user may want to see how much time is left in a profile step or perhaps change the autotune set point.
Factory Page Push and hold the Infinity and the green Advance keys (∞ ◉) for 6 seconds to enter. (See the Factory Page for further information)	For the most part the Factory Page has no bearing on the control when running. A user may want to enable password protection, view the control part number or perhaps create a custom Home Page.
Home Page The control is at the Home Page when initially powered up.	Pushing the green Advance key ◉ will allow the user to see and change such parameters as the control mode, enable autotune and idle set point to name a few.
Profile Page Push and hold the the green Advance key ◉ for 6 seconds to enter. (See the Profile Page for further information)	If equipped with this feature a user would want to go here to configure a profile.

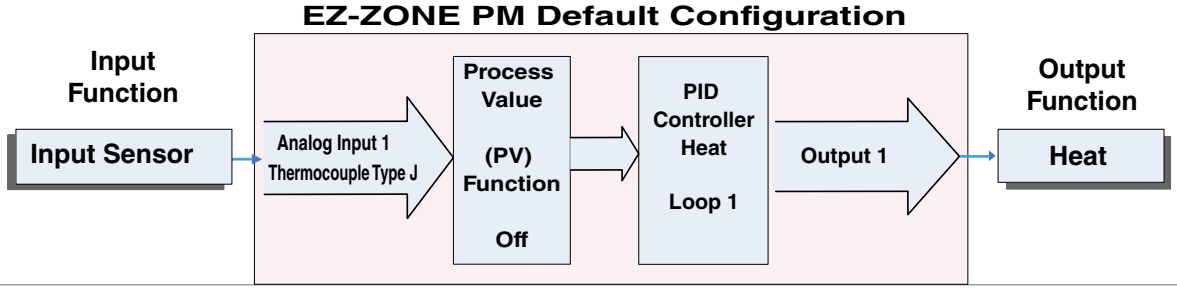
The default PM loop configuration out of the box is shown below:

- Analog Input functions set to thermocouple, type J
- Heat algorithm set for PID, Cool set to off
- Output 1 set to Heat
- Control mode set to Auto
- Set point set to 75 °F

If you are using the input type shown above, simply connect your input and output devices to the control. Power up the control and push the up arrow ▲ on the face of the control to change the set point from the default value of 75 °F to the desired value. As the Set Point increases above the Process Value, output 1 will come on and it will now begin driving your output device. The PV function as shown in the graphic below is only available with PM4/8/9 models.

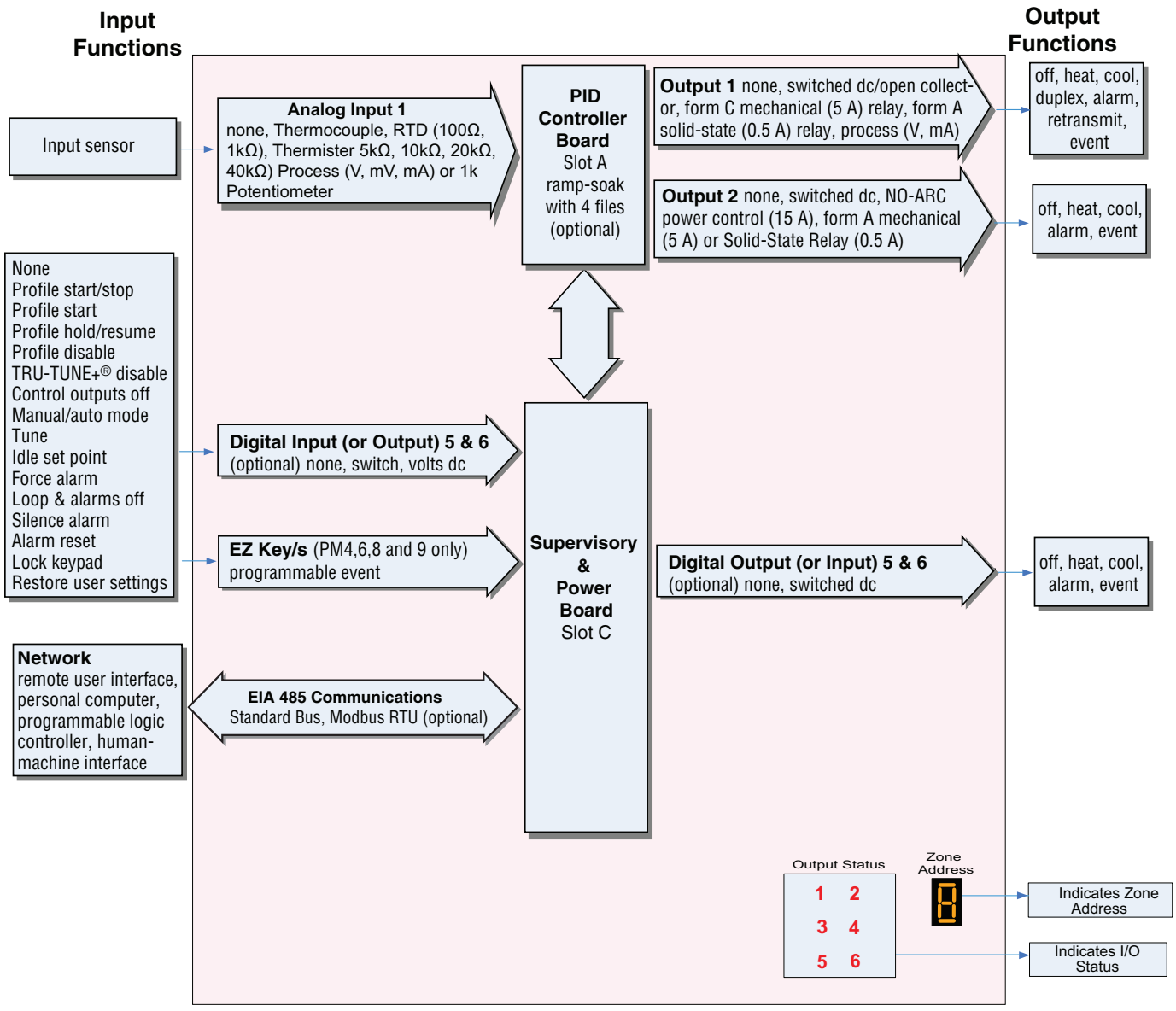
Note:

The output cycle time will have a bearing on the life of mechanical relay outputs and can be different based on the type of output ordered. The output cycle time can be changed in the Setup Page under the Output Menu.



EZ-ZONE® PM PID Model System Diagram

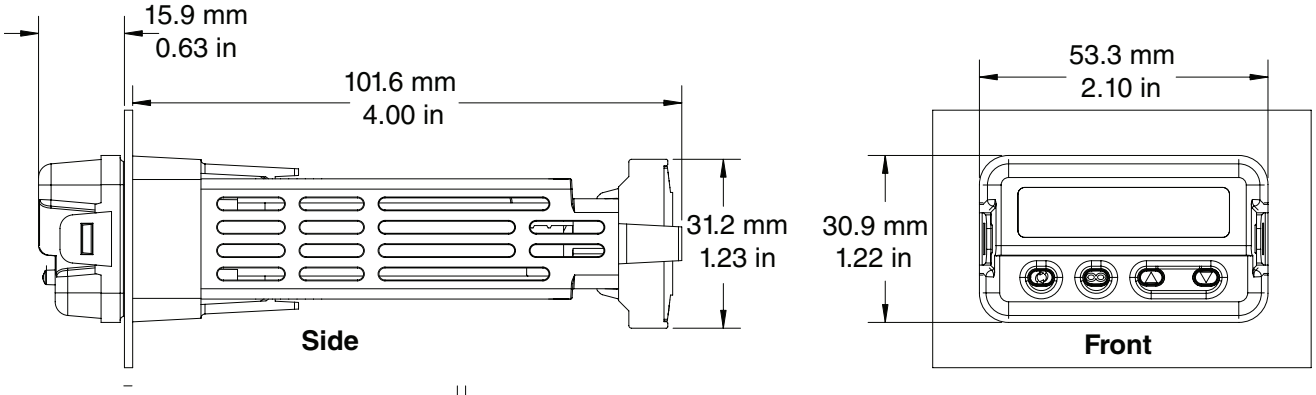
Universal Sensor Input, Configuration Communications,
Red/Green 7-Segment Display

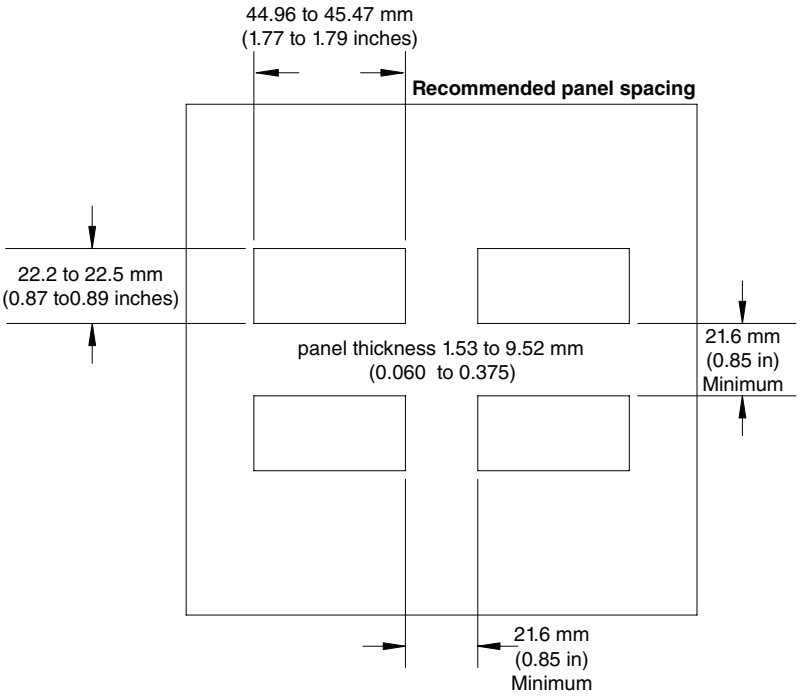


2 Chapter 2: Install and Wire

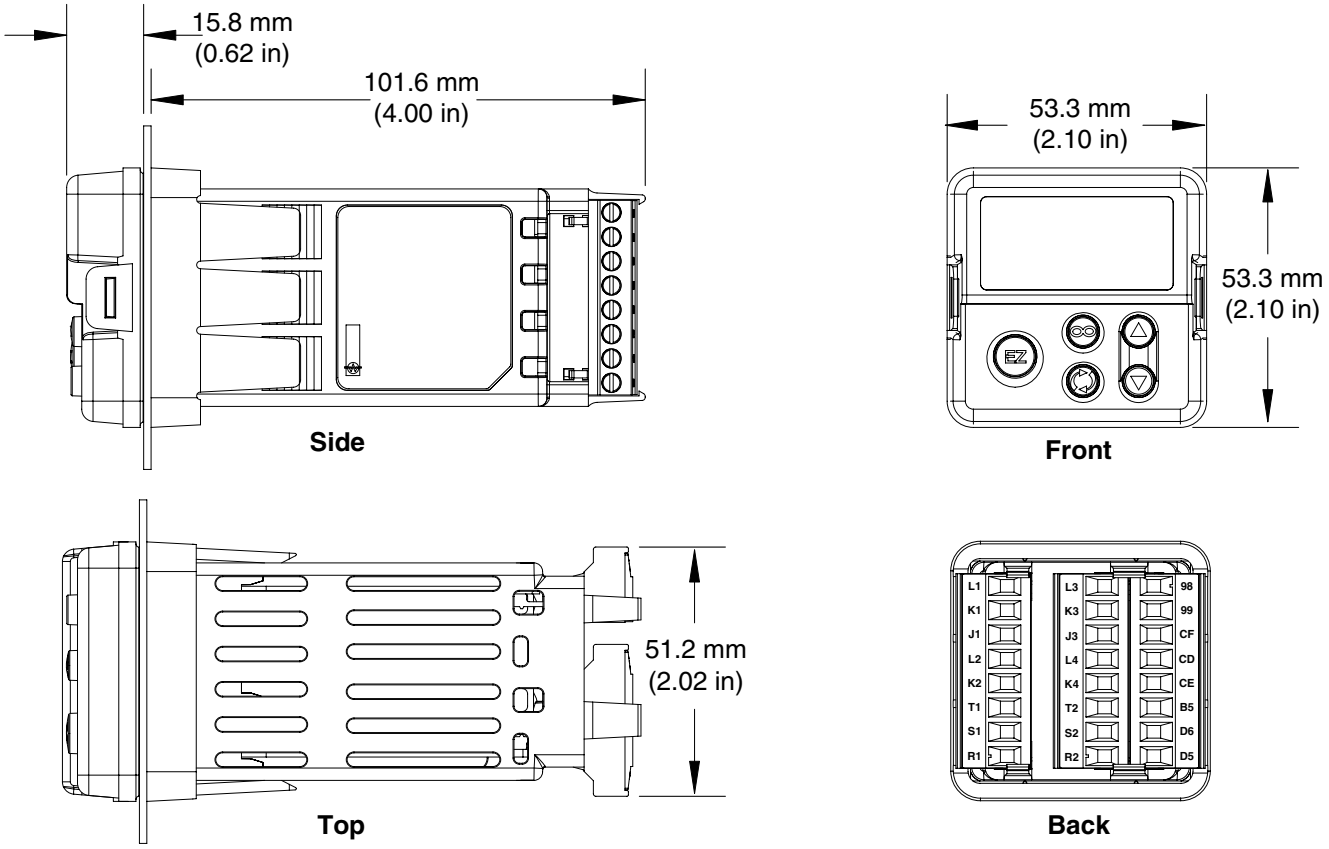
Dimensions

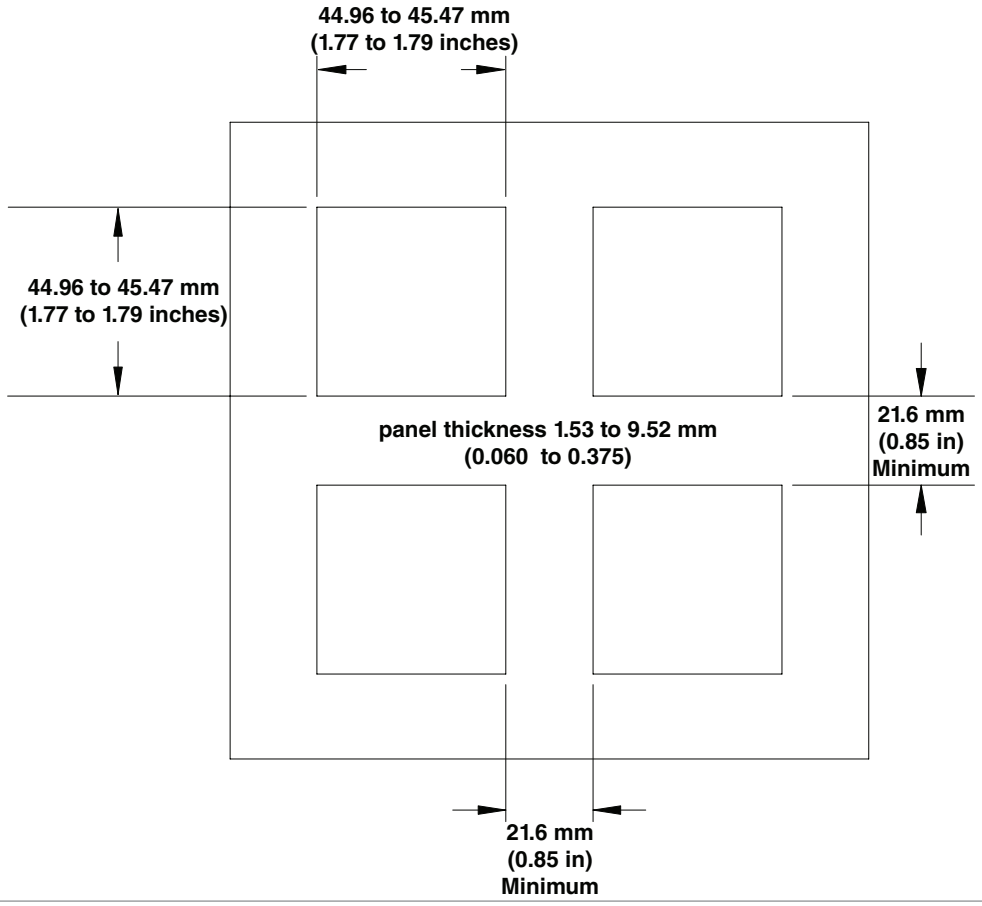
1/32 DIN



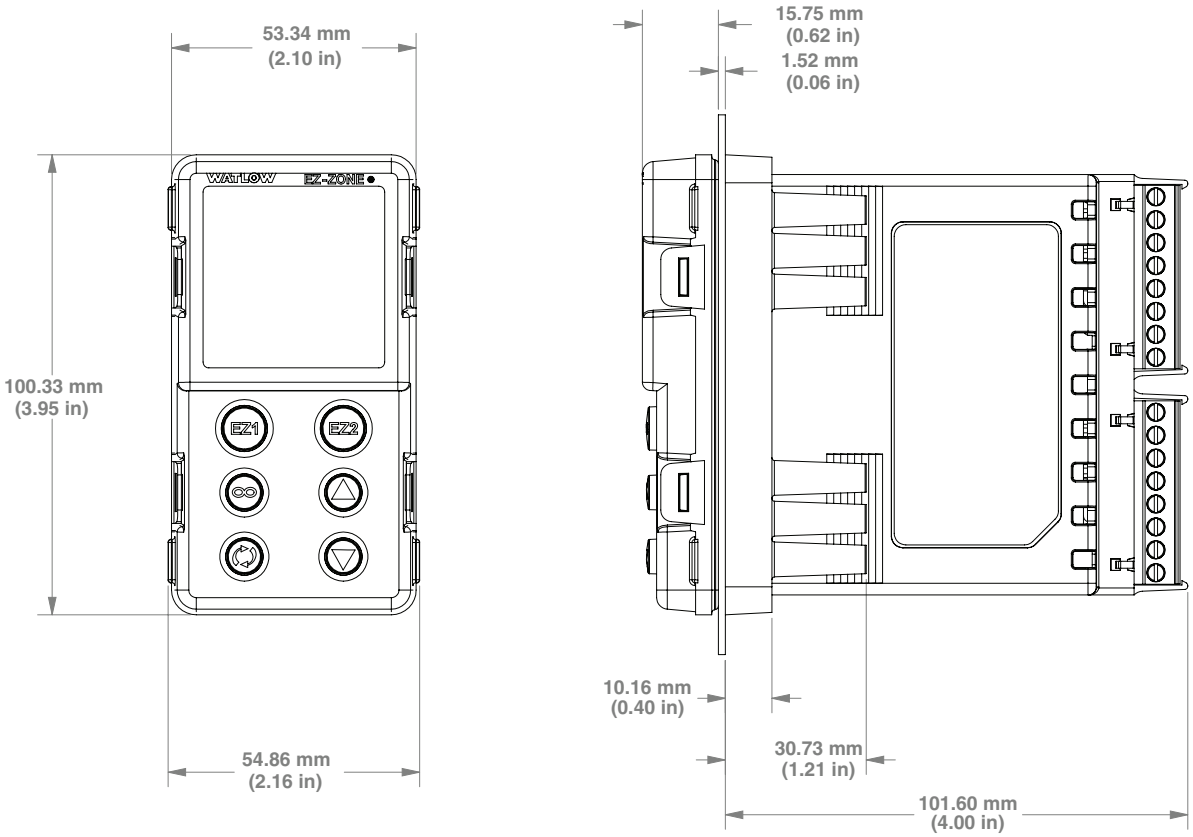


1/16 DIN

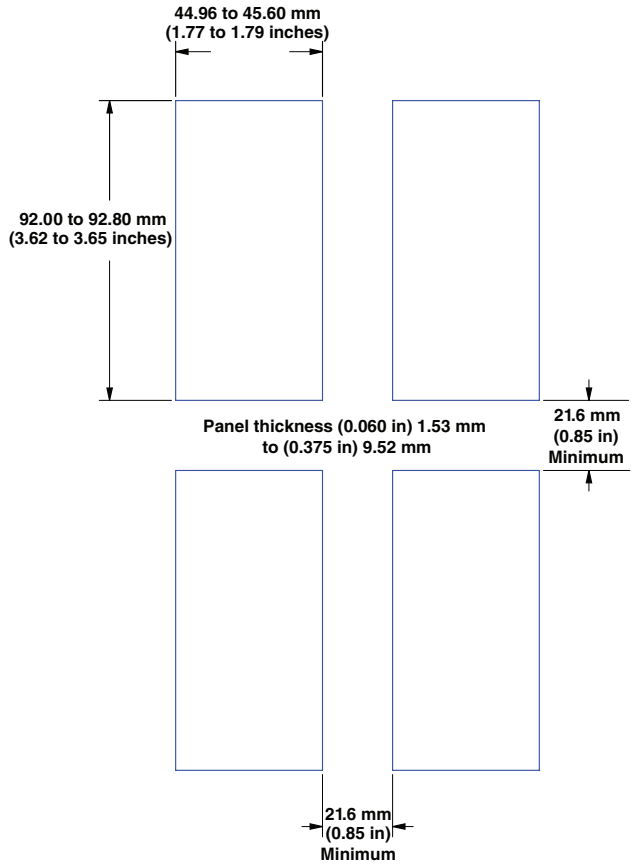

15.8 mm
(0.62 in)
101.6 mm
(4.00 in)
Side
53.3 mm
(2.10 in)
53.3 mm
(2.10 in)
Front
51.2 mm
(2.02 in)
Top
L1
K1
J1
L2
K2
T1
S1
R1
L3
K3
J3
L4
K4
T2
S2
R2
98
99
CF
CD
CE
B5
D6
D5
Back


44.96 to 45.47 mm
(1.77 to 1.79 inches)
44.96 to 45.47 mm
(1.77 to 1.79 inches)
panel thickness 1.53 to 9.52 mm
(0.060 to 0.375)
21.6 mm
(0.85 in)
Minimum
21.6 mm
(0.85 in)
Minimum

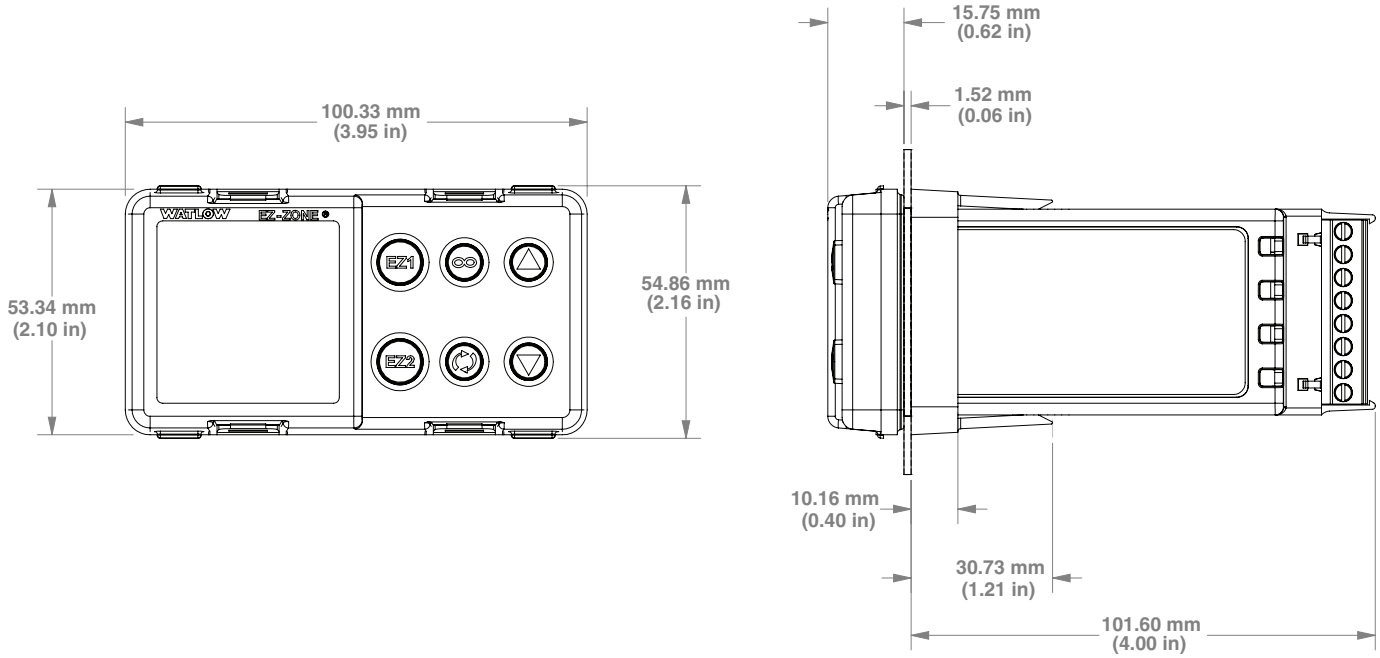
1/8 DIN (PM8) Vertical



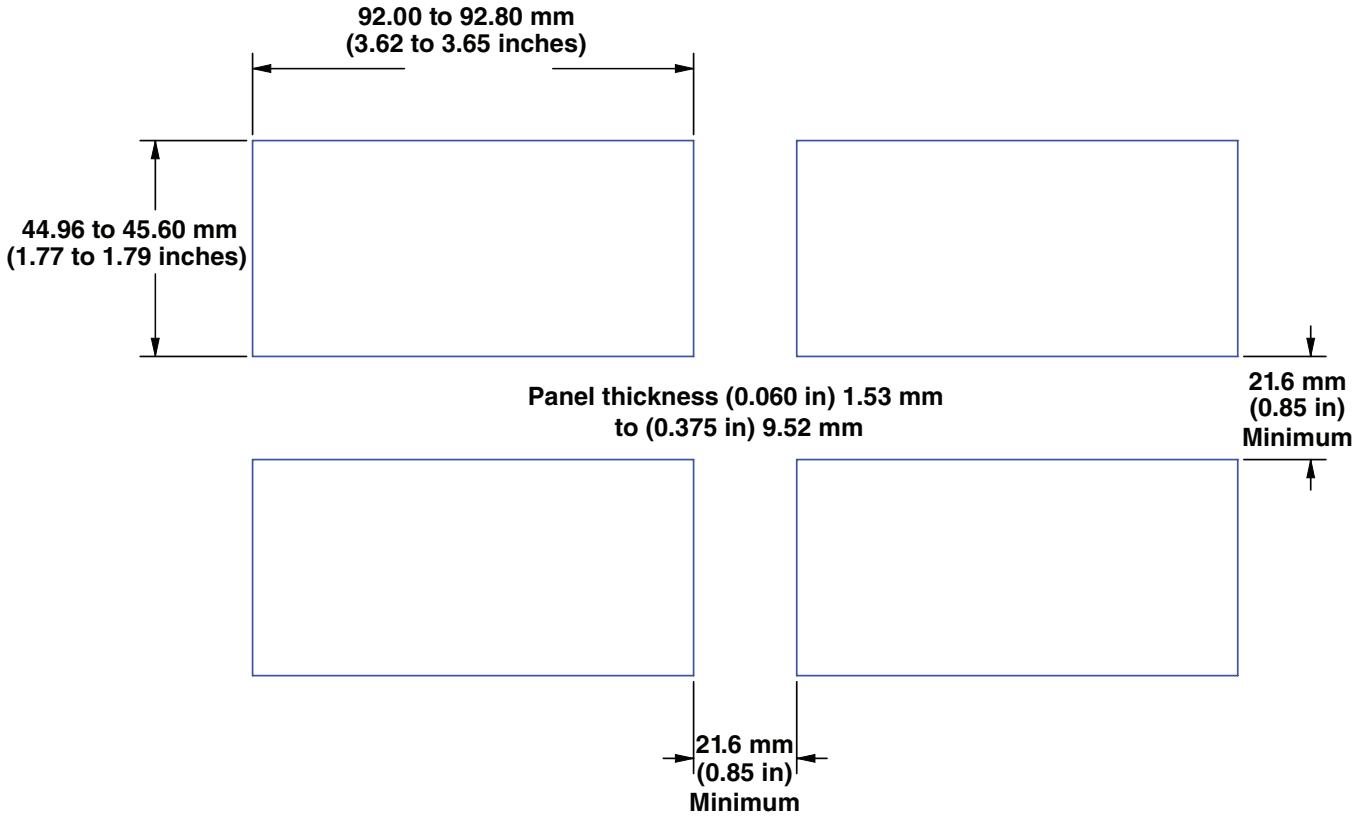
1/8 DIN (PM8) Vertical Recommended Panel Spacing



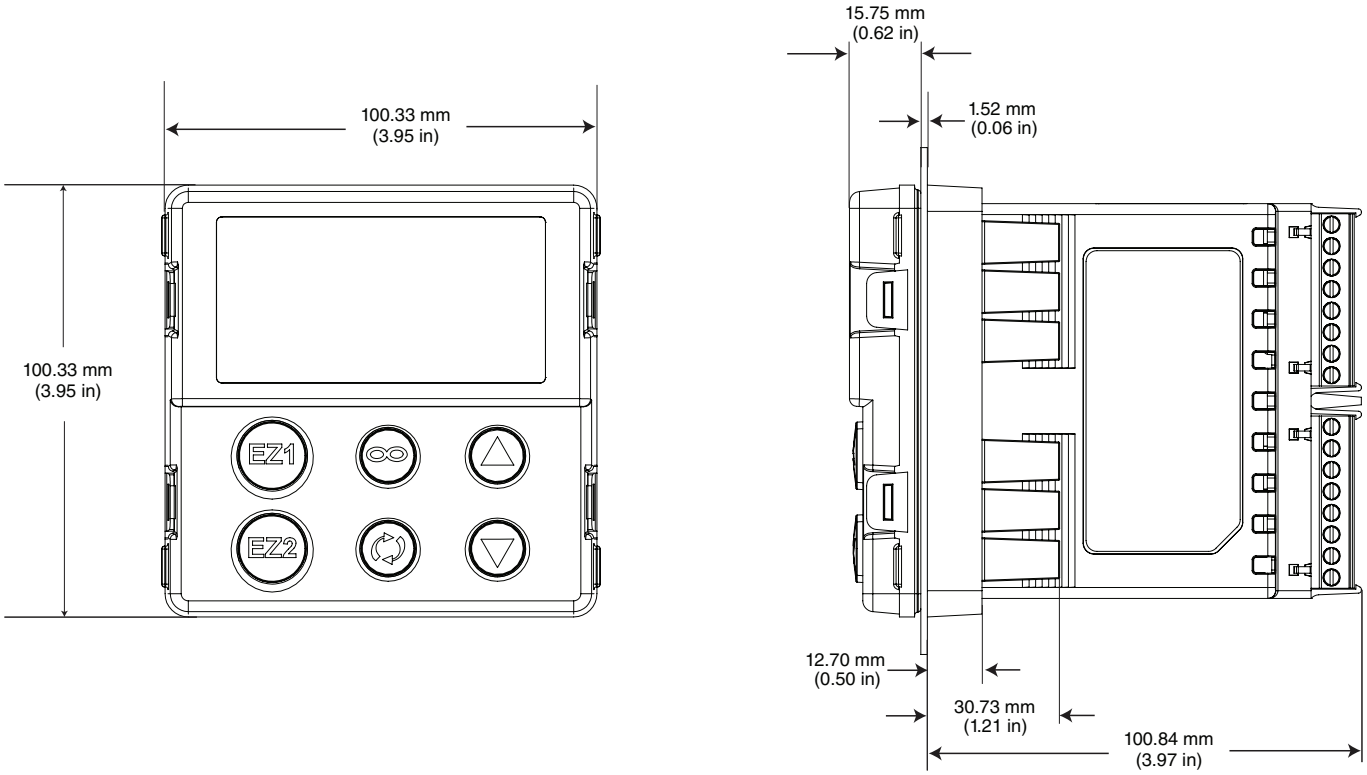
1/8 DIN (PM9) Horizontal



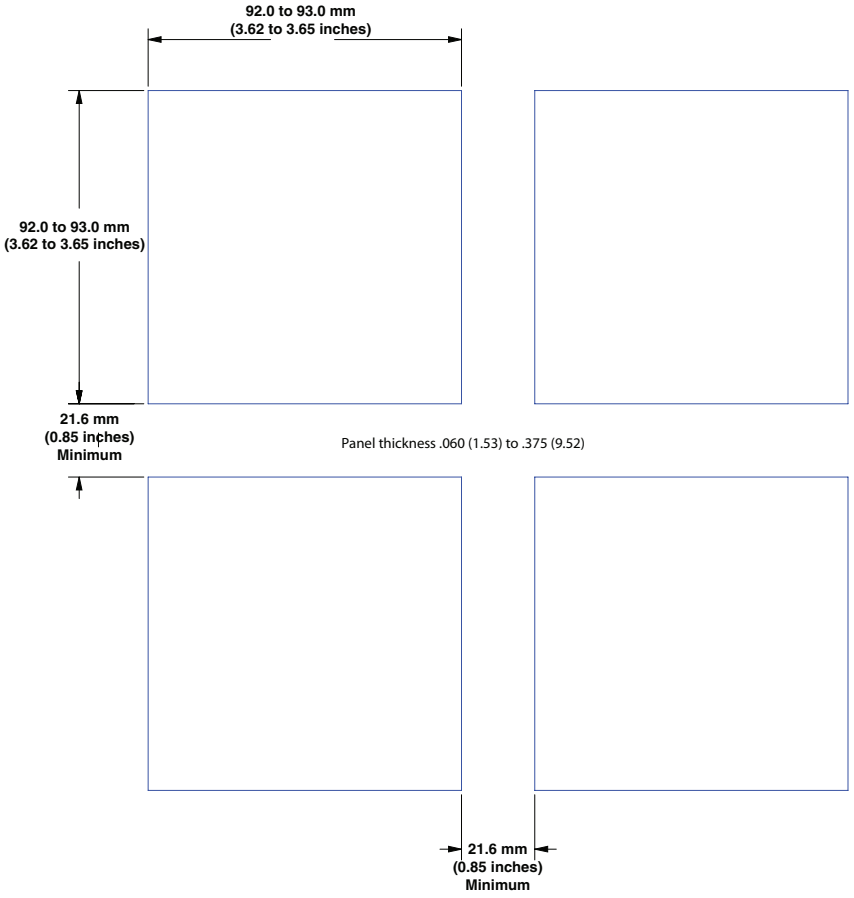
1/8 DIN (PM9) Horizontal Recommended Panel Spacing



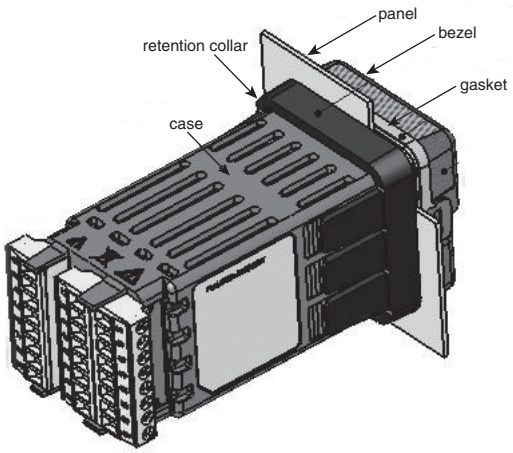
1/4 DIN (PM4)

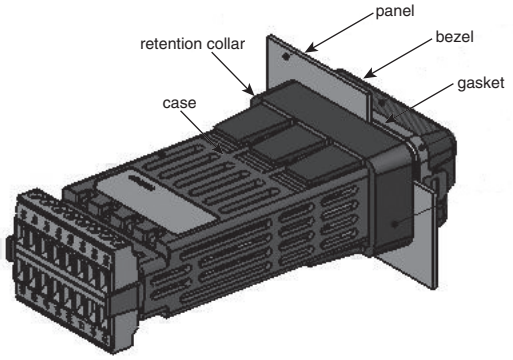


1/4 DIN (PM4) Recommended Panel Spacing



Installation



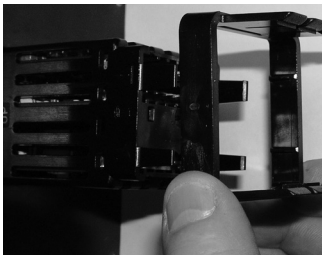


1. Make the panel cutout using the mounting template dimensions in this chapter.

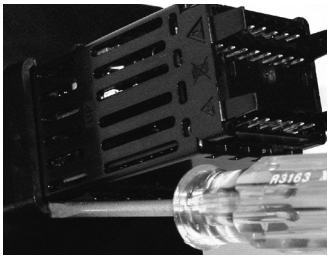
   Insert the case assembly into the panel cutout.

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, simply slide together until the gasket is compressed.



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, IP65) 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.

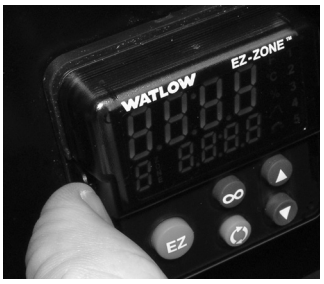
   The tabs on each side of the mounting collar have teeth that latch into the ridges on the sides of the controller. Each tooth is staggered at a different depth from the front so that only one of the tabs, on each side, is locked onto the ridges at a time.

Note:

There is a graduated measurement difference between the upper 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 tabs 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. On a PM6 control 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.

Warning:

- This equipment is suitable for use in class 1, div. 2, Groups A, B, C and D or Non-Hazardous locations only. Temperature Code T4A.
- WARNING – EXPLOSION HAZARD. Substitution of component may impair suitability for class 1, div. 2.
- WARNING – EXPLOSION HAZARD. Do not disconnect equipment unless power has been switched off or the area is known to be nonhazardous.

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.

Warning:

All electrical power to the controller and controlled circuits must be disconnected before removing the controller from the front panel or disconnecting other wiring.

Failure to follow these instructions may cause an electrical shock and/or sparks that could cause an explosion in class 1, div. 2 hazardous locations.

Wiring

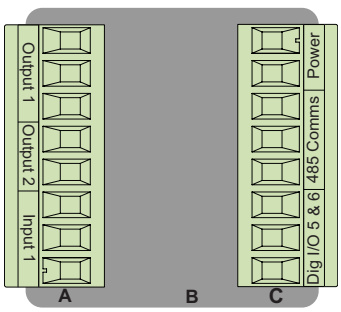
Terminal Definitions for Slots A

Slot A			
Output		**Terminal Function**	**Configuration**
1	**2**		
X1 W1 Y1		common (Any switched dc output can use this common.) dc- (open collector) dc+	Switched dc/open collector output 1: PM _ _ _ **[C]** _-_ AAAA _ _
	W2 Y2	dc- dc+	Switched dc output 2: PM _ _ _ _ **[C]**-_ AAAA _ _
F1 G1 H1		voltage or current - voltage + current +	Universal Process output 1: PM _ _ _ **[F]** _-_ AAAA _ _
L1 K1 J1		normally open common normally closed	Mechanical Relay 5 A, Form C output 1: PM _ _ _ **[E]** _-_ AAAA _ _
	L2 K2	normally open common	NO-ARC 15 A, Form A output 2: PM**[4, 6, 8, 9]** _ _ _ [**H**]-_ AAAA _ _
	L2 K2	normally open common	Mechanical Relay 5 A, Form A output 2: PM _ _ _ _ **[J]**-_ AAAA _ _
L1 K1	L2 K2	normally open common	Solid-state Relay 0.5 A, Form A output 1: PM _ _ _ **[K]** _-_ AAAA _ _ output 2: PM _ _ _ _ **[K]**-_ AAAA _ _
Inputs			
1			
T1 S1 R1		S2 (RTD) or current + S3 (RTD), thermocouple -, current -, volts - or potentiometer wiper, thermistor S1 (RTD), thermocouple + or volts +, thermistor, potentiometer	Universal / Thermistor Input input 1: all configurations
Slot A			

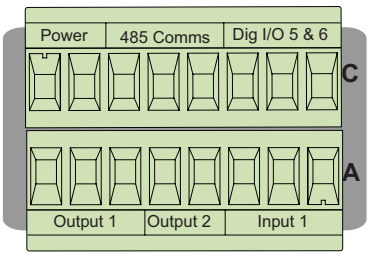
Terminal Definitions for Slot C

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 _ _ _ _ _-**[1]** AAAA _ _
CF CD CE	Standard Bus EIA-485 common Standard Bus EIA-485 T-/R- Standard Bus EIA-485 T+/R+	PM _ _ _ _ _-**[A]** AAAA _ _
B5 D6 D5	digital input-output common digital input or output 6 digital input or output 5	PM _ _ **[2]**_ _-_ AAAA _ _ PM _ _ **[4]** _ _-_ AAAA _ _

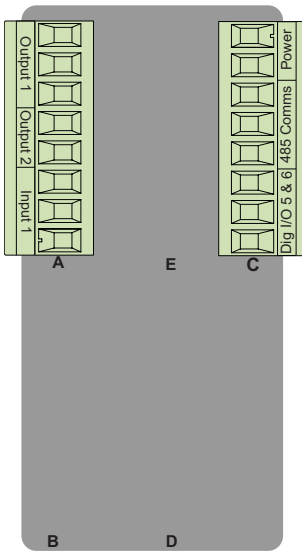
Back View
Slot Orientation
1/16 DIN **PM6**



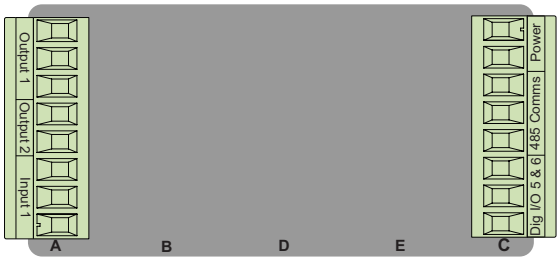
Back View
Slot Orientation
1/32 DIN **PM3**



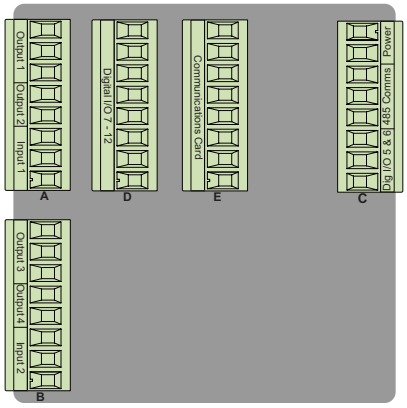
Back View
Slot Orientation 1/8
DIN Vertical **PM8**



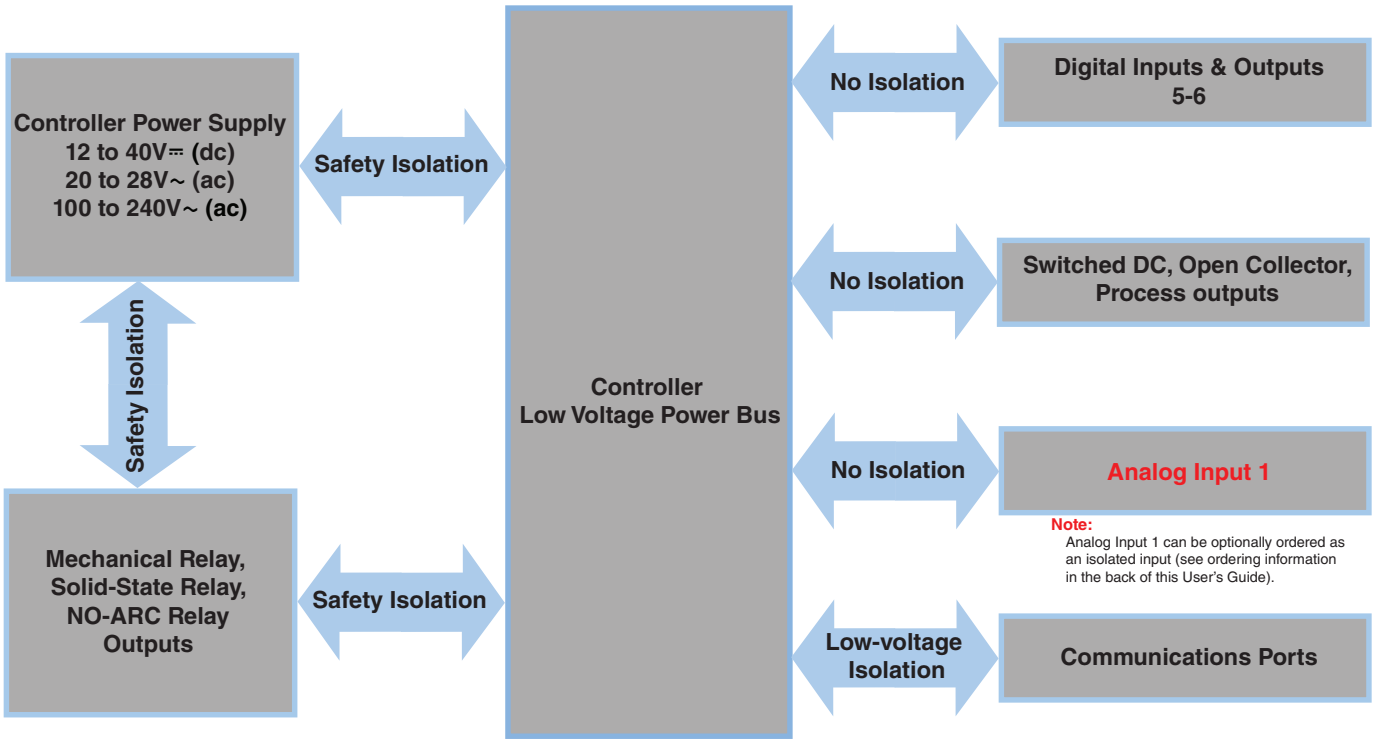
Back View
Slot Orientation
1/8 DIN Horizontal **PM9**



Back View
Slot Orientation
1/4 DIN Horizontal **PM4**



EZ-ZONE PM Isolation Blocks



Note:
Analog Input 1 can be optionally ordered as an isolated input (see ordering information in the back of this User's Guide).

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

Warning:

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Note:

Maximum wire size termination and torque rating:

- 0.0507 to 3.30 mm² (30 to 12 AWG) single-wire termination or two 1.31 mm² (16 AWG)
- 0.56 Nm (5.0 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.

Note:

This Equipment is suitable for use in CLASS I, DIVISION 2, Groups A, B, C and D or Non-Hazardous locations only. Temperature Code T4A

Warning:

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Warning:

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Warning:

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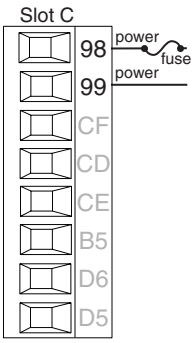
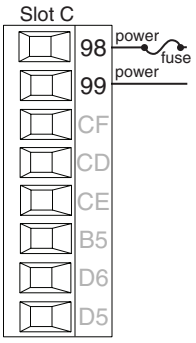
Low Power



- Minimum/Maximum Ratings
- 12 to 40V⎓ (dc)
- 20 to 28V~ (ac) Semi Sig F47
- 47 to 63 Hz
- 14VA maximum power consumption (PM4,8 & 9)
- 10VA maximum power consumption (PM3 & 6)

PM_ _ 3 0 4 _ _ - _ _ _ _ _ _ _

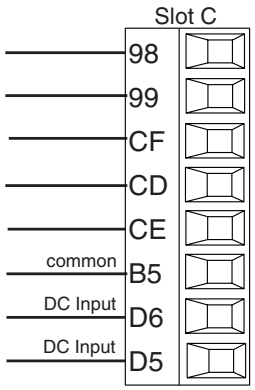
High Power



- Minimum/Maximum Ratings
- 85 to 264V~ (ac)
- 100 to 240V~ (ac) Semi Sig F47
- 47 to 63 Hz
- 14VA maximum power consumption (PM4,8 & 9)
- 10VA maximum power consumption (PM3 & 6)

PM_ _ 1 0 2 _ _ - _ _ _ _ _ _ _

Digital Input 5, 6



Digital Input

- Update rate 10 Hz
- Dry contact or dc voltage

DC Voltage

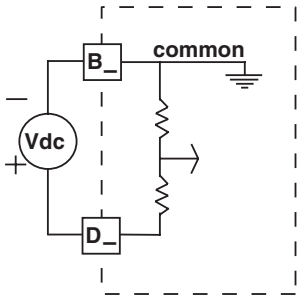
- Input not to exceed 36V at 3 mA
- Input active when > 3V @ 0.25 mA
- Input inactive when < 2V

Dry Contact

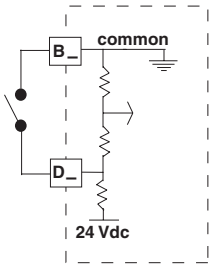
- Input inactive when > 500 Ω
- Input active when < 100 Ω
- maximum short circuit 13 mA

PM_ _ 2 0 4 _ _ - _ _ _ _ _ _ _

Voltage Input



Dry Contact



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Note:

Maximum wire size termination and torque rating:

- 0.0507 to 3.30 mm² (30 to 12 AWG) single-wire termination or two 1.31 mm² (16 AWG)
- 0.56 Nm (5.0 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.

Note:

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Warning:

Explosion Hazard – Substitution of component may impair suitability for CLASS I, DIVISION 2.

Warning:

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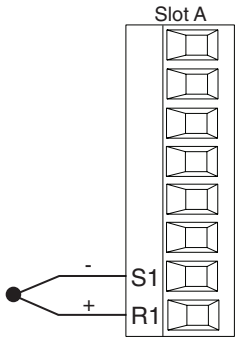
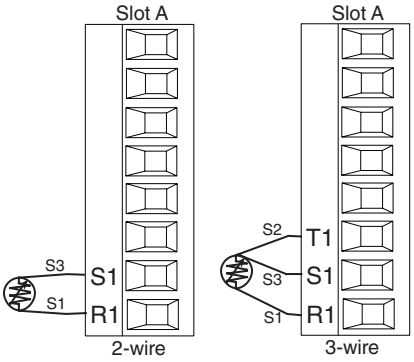
Input 1 Thermocouple



- 2 kΩ 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.

PM _ _ _ _ _-_ AAAA _ _

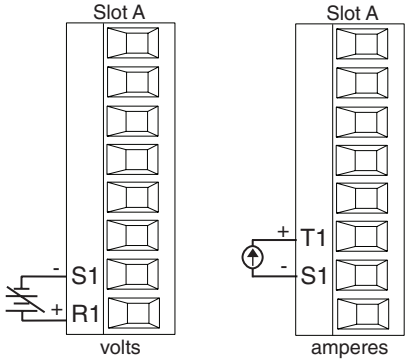
Input 1 RTD



- 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 _ _ _ _ _-_ AAAA _ _

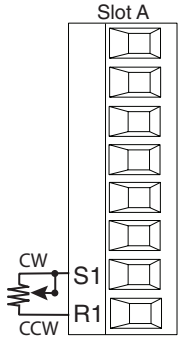
Input 1 Process



- 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 _ _ _ _ _-_ AAAA _ _

Input 1 Potentiometer



- Use a 1 kΩ potentiometer.

PM _ _ _ _ _-_ AAAA _ _

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Note:

Maximum wire size termination and torque rating:

- 0.0507 to 3.30 mm² (30 to 12 AWG) single-wire termination or two 1.31 mm² (16 AWG)
- 0.56 Nm (5.0 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:

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Note:

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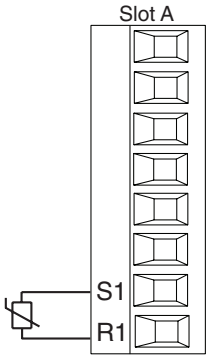
Input 1 Thermistor

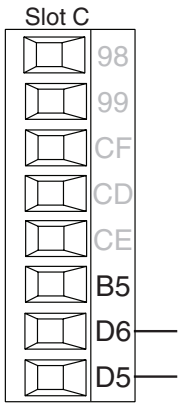


- >20 MΩ input impedance
- 3 microampere open-sensor detection

Input 1: PM _ **[J,N,E*]** _ _ _ _-_ _ _ _ _ _ _ (S1/R1)

*PM4,8 & 9 only

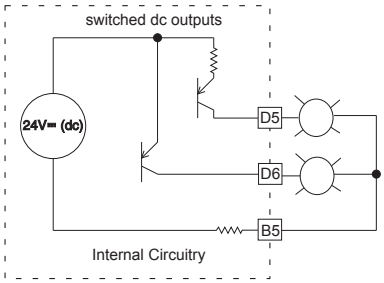
Digital Output 5, 6



Digital Output

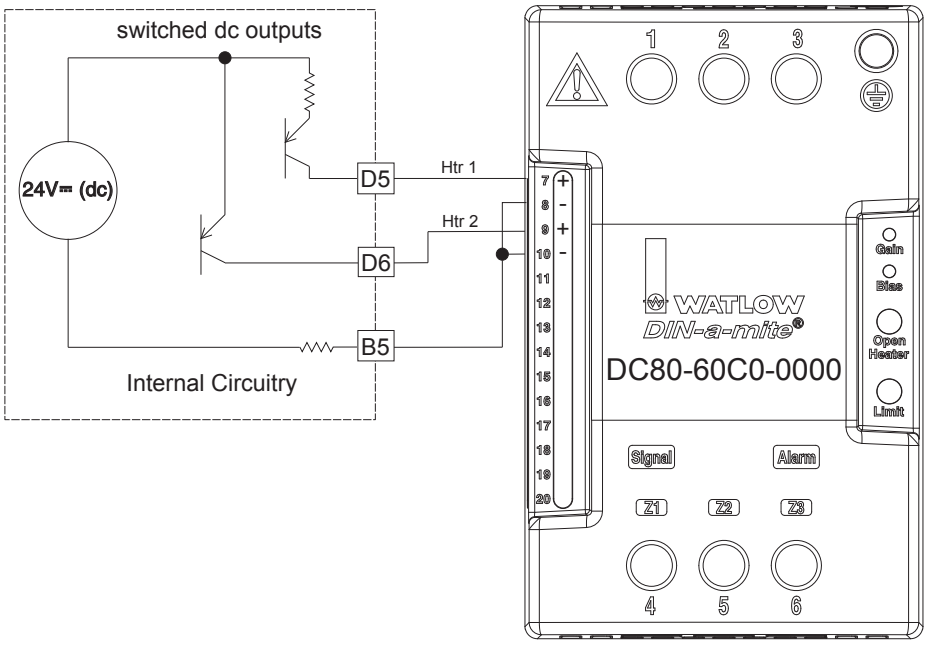
- SSR drive signal
- Update rate 10 Hz
- Maximum open circuit voltage is 22 to 25V⎓ (dc)
- PNP transistor source
- Typical drive; 21mA @ 4.5V for DO5, and 11mA @ 4.5V for DO6
- Current limit 24mA for Output 5 and 12mA Output 6
- Output 5 capable of driving one 3-pole DIN-A-MITE
- Output 6 capable of driving one 1-pole DIN-A-MITE

PM _ _ 2 0 4 _ _-_ _ _ _ _ _ _



* Output 5 only

Switched DC Wiring Example Using DO 5 and 6



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)
- 0.56 Nm (5.0 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:

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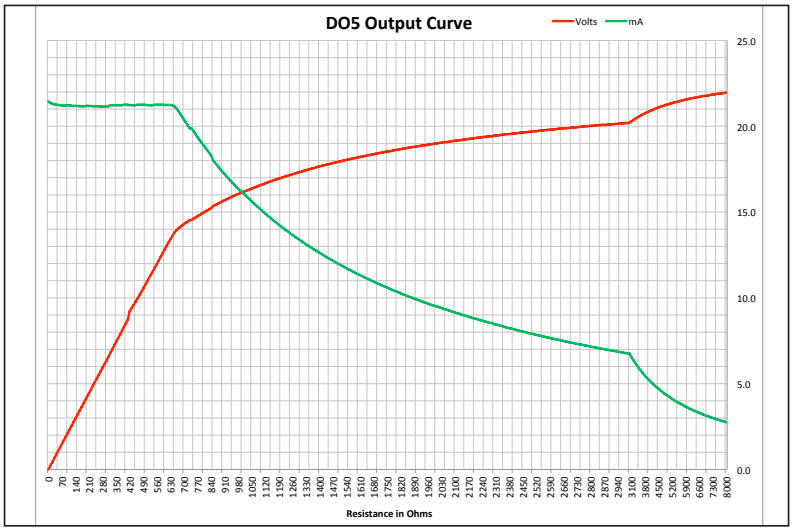
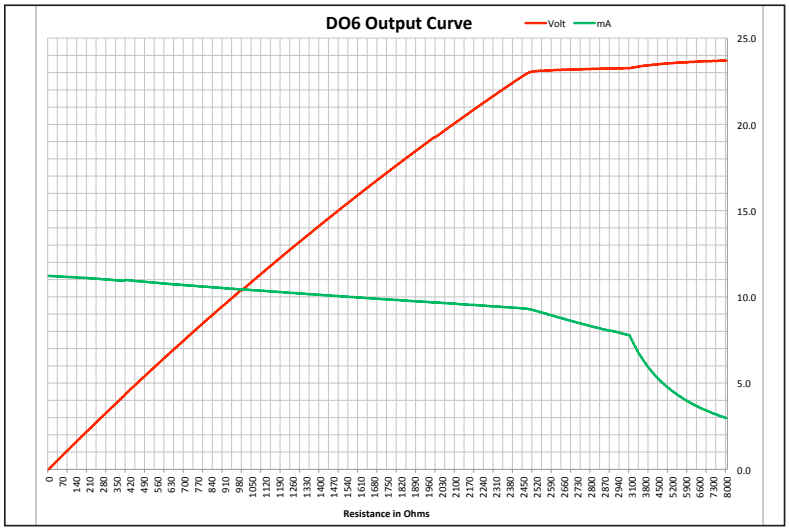
Quencharc Note:

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.





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Note:

Maximum wire size termination and torque rating:

- 0.0507 to 3.30 mm² (30 to 12 AWG) single-wire termination or two 1.31 mm² (16 AWG)
- 0.56 Nm (5.0 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:

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Quencharc Note:

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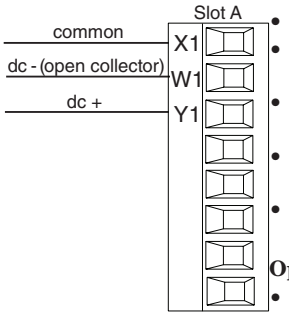
Output 1 Switched DC/Open Collector



Switched DC

- Maximum open circuit voltage is 22 to 25V⎓ (dc)
- 30mA max. per single output / 40mA max. total per paired outputs (1 & 2)
- Typical drive; 4.5V⎓ (dc) @ 30 mA
- Short circuit limited to <50 mA
- NPN transistor sink
- Use dc- and dc+ to drive external solid-state relay
- 1-pole DIN-A-MITE: up to 4 in parallel or 4 in series
- 2-pole DIN-A-MITE: up to 2 in parallel or 2 in series
- 3-pole DIN-A-MITE: up to 2 in series

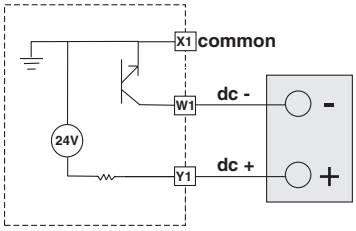
Open Collector

- 100 mA maximum output current sink
- 30V⎓ (dc) max. 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.

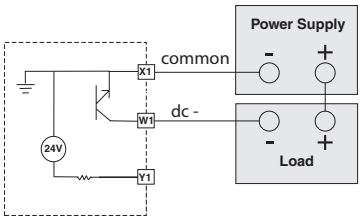
See Quencharc note.

PM _ _ _ **[C]** _-_ AAAA _ _

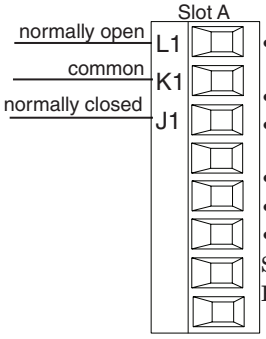
Switched DC



Open Collector



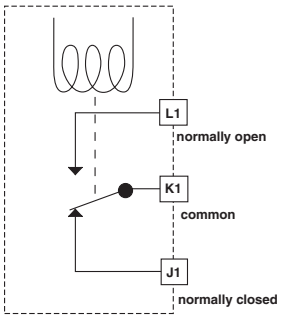
Output 1 Mechanical Relay, Form C



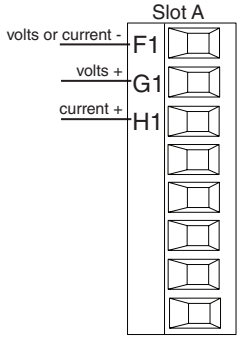
- 5 A at 240V~ (ac) or 30V⎓ (dc) maximum resistive load
- 20 mA at 24V minimum load
- 125 VA pilot duty at 120/240V~ (ac), 25 VA at 24V~ (ac)
- 100,000 cycles at rated load
- Output does not supply power.
- for use with ac or dc

See Quencharc note.

PM _ _ _ **[E]** _-_ AAAA _ _

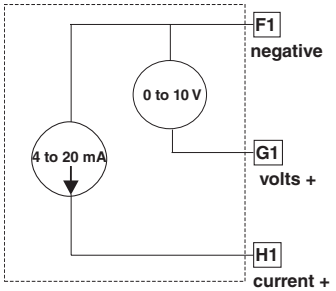


Output 1 Universal Process



- 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]** _-_ AAAA _ _



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Note:

Maximum wire size termination and torque rating:

- 0.0507 to 3.30 mm² (30 to 12 AWG) single-wire termination or two 1.31 mm² (16 AWG)
- 0.56 Nm (5.0 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:

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Note:

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Warning:

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Warning:

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Quencharc Note:

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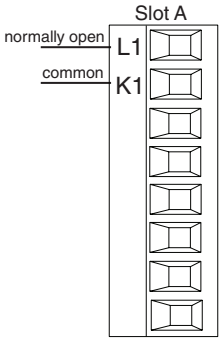
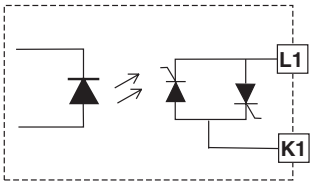
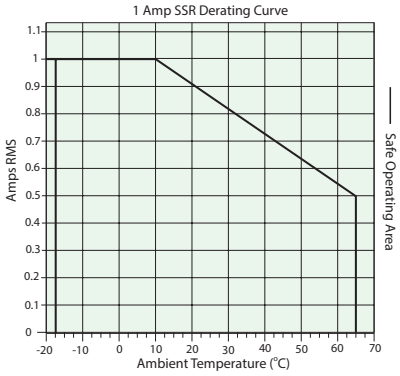
Output 1 Solid-State Relay, Form A



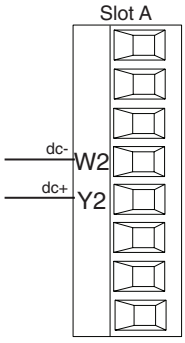
- 0.5 A at 20 to 264V~ (ac) maximum resistive load
- 20 VA 120/240V~ (ac) pilot duty
- opto-isolated, without contact suppression
- maximum off state leakage of 105 microamperes
- output does not supply power
- Do not use on dc loads.
- See Quencharc note.

PM _ _ _ **[K]** _-_ AAAA _ _



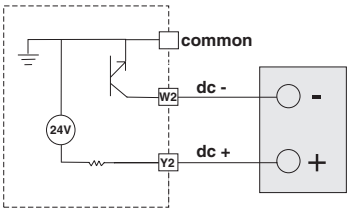


Output 2 Switched DC

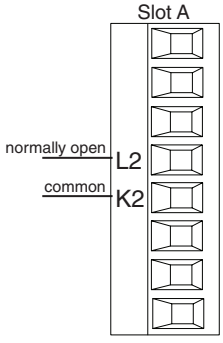


- Maximum open circuit voltage is 22 to 25V⎓ (dc)
- 30mA max. per single output / 40mA max. total per paired outputs (1 & 2)
- Typical drive; 4.5VDC @ 30 mA
- Short circuit limited to <50 mA
- NPN transistor sink
- Use dc- and dc+ to drive external solid-state relay
- 1-pole DIN-A-MITE: up to 4 in parallel or 4 in series
- 2-pole DIN-A-MITE: up to 2 in parallel or 2 in series
- 3-pole DIN-A-MITE: up to 2 in series

PM _ _ _ _ **[C]**-_ AAAA _ _

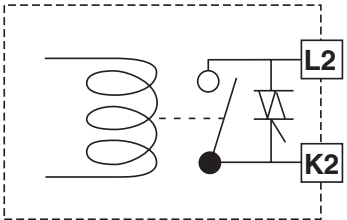


Output 2 NO-ARC Relay, Form A



- 15 A at 85 to 264V~ (ac) resistive load only
- 2,000,000 cycle rating for NO-ARC circuit
- 100 mA minimum load
- 2 mA maximum off state leakage
- Do not use on dc loads.
- Output does not supply power.

PM **[4, 6, 8, 9]** _ _ _ **[H]**-_ AAAA _ _



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 mm² (30 to 12 AWG) single-wire termination or two 1.31 mm² (16 AWG)
- 0.56 Nm (5.0 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.

Note:

This Equipment is suitable for use in CLASS I, DIVISION 2, Groups A, B, C and D or Non-Hazardous locations only. Temperature Code T4A

Warning:

Explosion Hazard - Dry contact closure Digital Inputs shall not be used in Class I Division 2 Hazardous Locations unless switch used is approved for this application.

Warning:

Explosion Hazard – Substitution of component may impair suitability for CLASS I, DIVISION 2.

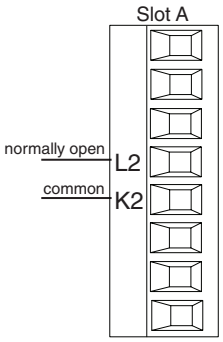
Warning:

Explosion Hazard - Do not disconnect while the circuit is live or unless the area is known to be free of ignitable concentrations of flammable substances.

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.

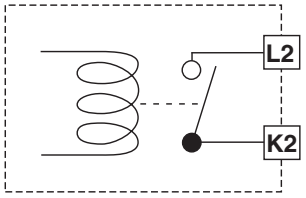
Output 2 Mechanical Relay, Form A



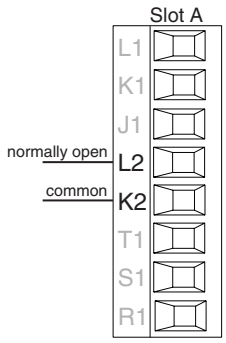
- 5 A at 240V~ (ac) or 30V⎓ (dc) maximum resistive load
- 20 mA at 24V minimum load
- 125 VA pilot duty @ 120/240V~ (ac), 25 VA at 24V~ (ac)
- 100,000 cycles at rated load
- Output does not supply power.
- for use with ac or dc

See Quencharc note.

PM _ _ _ _ **[J]**-_ AAAA _ _



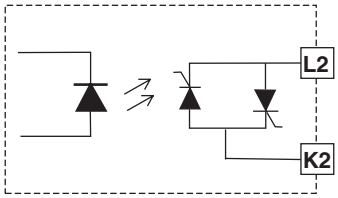
Output 2 Solid-State Relay, Form A

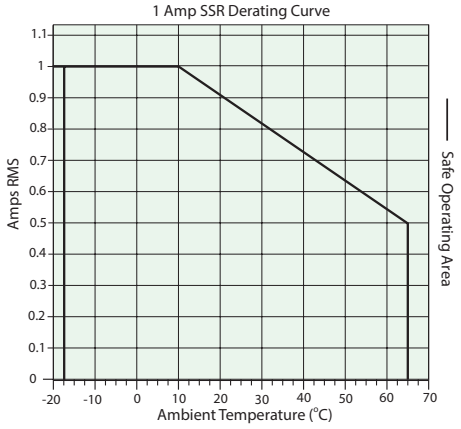


- 0.5 A at 20 to 264V~ (ac) maximum resistive load
- 20 VA 120/240V~ (ac) pilot duty
- opto-isolated, without contact suppression
- maximum off state leakage of 105 microamperes
- Output does not supply power.
- Do not use on dc loads.

See Quencharc note.

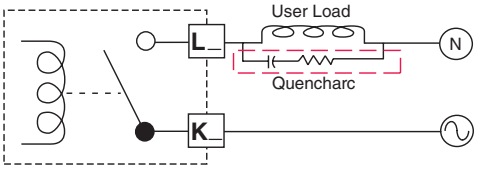
PM _ _ _ _ **[K]**-_ AAAA _ _





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)
- 0.56 Nm (5.0 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.

Note:

This Equipment is suitable for use in CLASS I, DIVISION 2, Groups A, B, C and D or Non-Hazardous locations only. Temperature Code T4A

Warning:

Explosion Hazard - Dry contact closure Digital Inputs shall not be used in Class I Division 2 Hazardous Locations unless switch used is approved for this application.

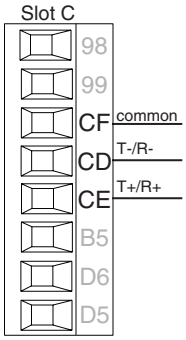
Warning:

Explosion Hazard – Substitution of component may impair suitability for CLASS I, DIVISION 2.

Warning:

Explosion Hazard - Do not disconnect while the circuit is live or unless the area is known to be free of ignitable concentrations of flammable substances.

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.
- 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]** AAAA _ _

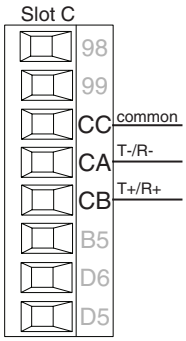
Note:

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

Note:

Do not leave a USB to EIA-485 converter connected to Standard Bus without power (i.e., disconnecting the USB end from the computer while leaving the converter connected on Standard Bus). Disturbance on the Standard Bus may occur.

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.
- Do not connect more than 247 EZ-ZONE PM controllers on a Modbus RTU network.
- maximum network length: 1,200 meters (4,000 feet)
- 1/8th unit load on EIA-485 bus.

PM _ _ _ _ _**-[1]** AAAA _ _

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

Note:

Do not leave a USB to EIA-485 converter connected to Standard Bus without power (i.e., disconnecting the USB end from the computer while leaving the converter connected on Standard Bus). Disturbance on the Standard Bus may occur.

Wiring a Serial EIA-485 Network

Two example networks are shown below where the first one is using Watlow's Standard Bus and the other showing connections over Modbus. 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.

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 mm² (30 to 12 AWG) single-wire termination or two 1.31 mm² (16 AWG)
- 0.56 Nm (5.0 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.

Note:

This Equipment is suitable for use in CLASS I, DIVISION 2, Groups A, B, C and D or Non-Hazardous locations only. Temperature Code T4A

Warning:

Explosion Hazard - Dry contact closure Digital Inputs shall not be used in Class I Division 2 Hazardous Locations unless switch used is approved for this application.

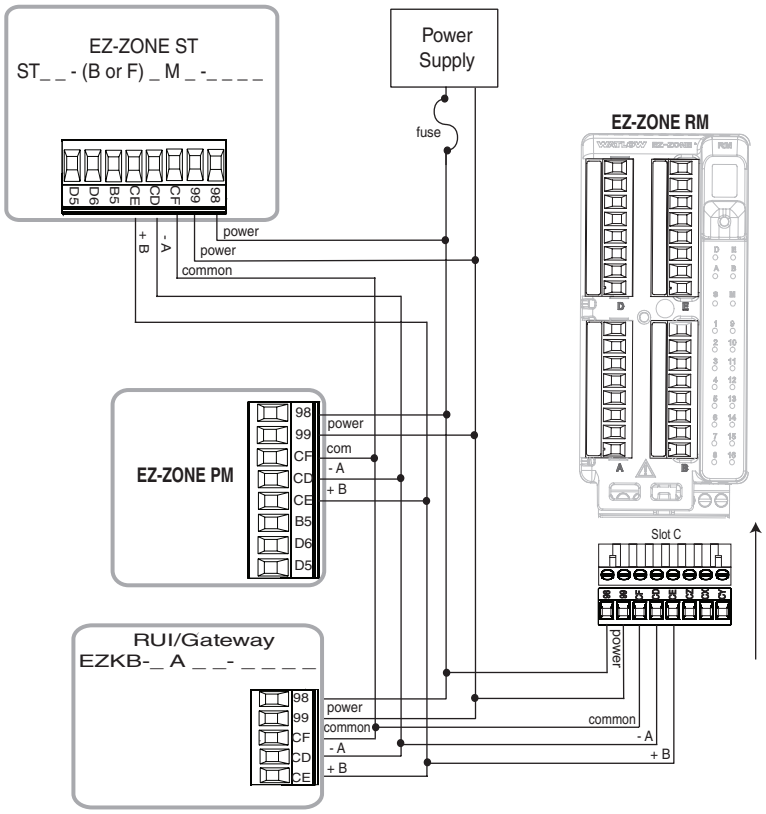
Warning:

Explosion Hazard – Substitution of component may impair suitability for CLASS I, DIVISION 2.

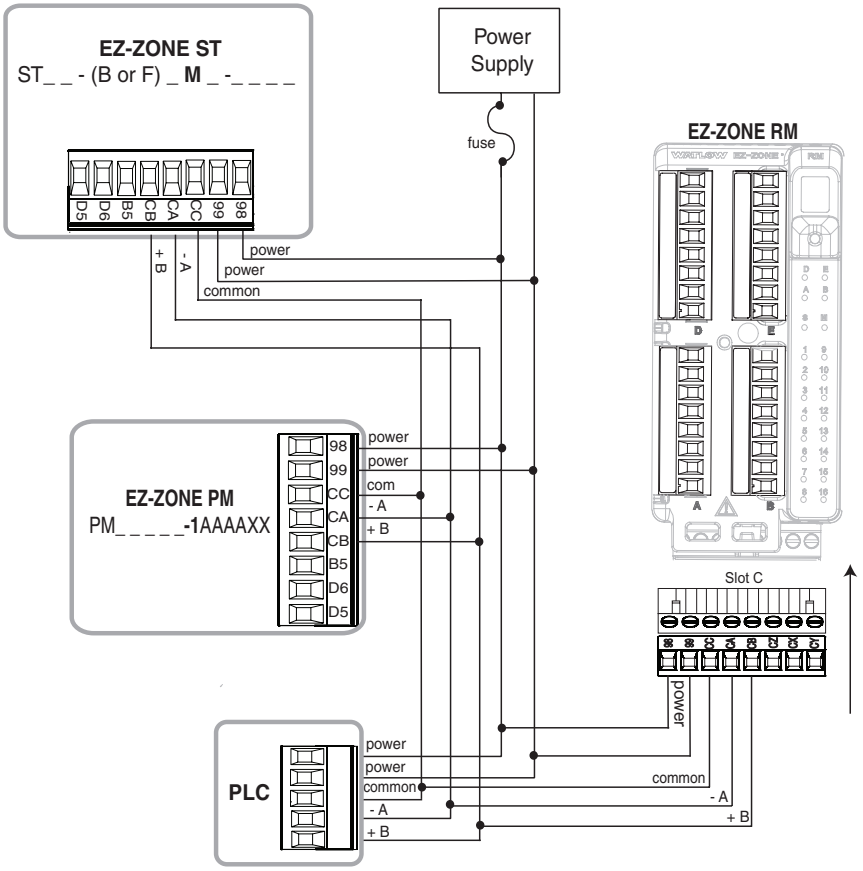
Warning:

Explosion Hazard - Do not disconnect while the circuit is live or unless the area is known to be free of ignitable concentrations of flammable substances.

A Network Using Watlow's Standard Bus and an RUI/Gateway



A Network Using Modbus RTU.



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 mm² (30 to 12 AWG) single-wire termination or two 1.31 mm² (16 AWG)
- 0.56 Nm (5.0 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.

Note:

This Equipment is suitable for use in CLASS I, DIVISION 2, Groups A, B, C and D or Non-Hazardous locations only. Temperature Code T4A

Warning:

Explosion Hazard - Dry contact closure Digital Inputs shall not be used in Class I Division 2 Hazardous Locations unless switch used is approved for this application.

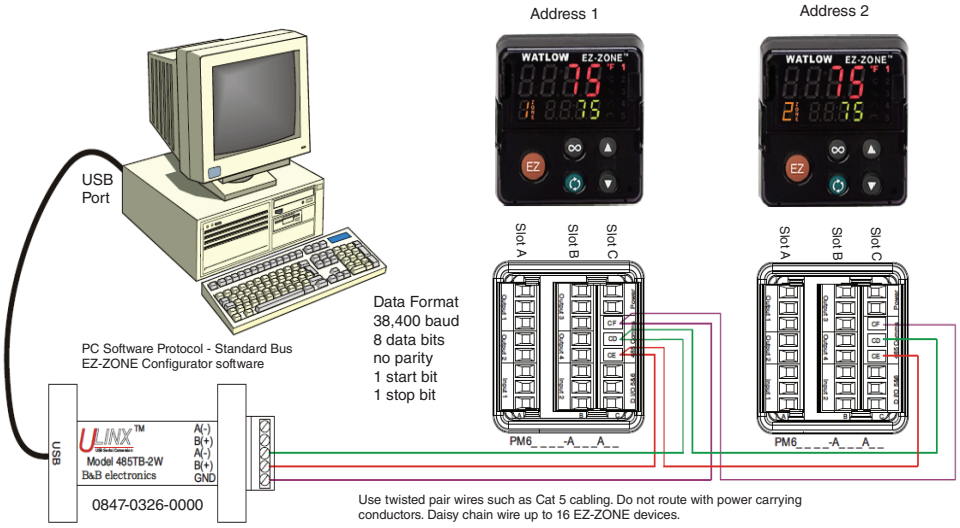
Warning:

Explosion Hazard – Substitution of component may impair suitability for CLASS I, DIVISION 2.

Warning:

Explosion Hazard - Do not disconnect while the circuit is live or unless the area is known to be free of ignitable concentrations of flammable substances.

Connecting a Computer to PM Controls Using B&B 485 to USB Converter



Note:

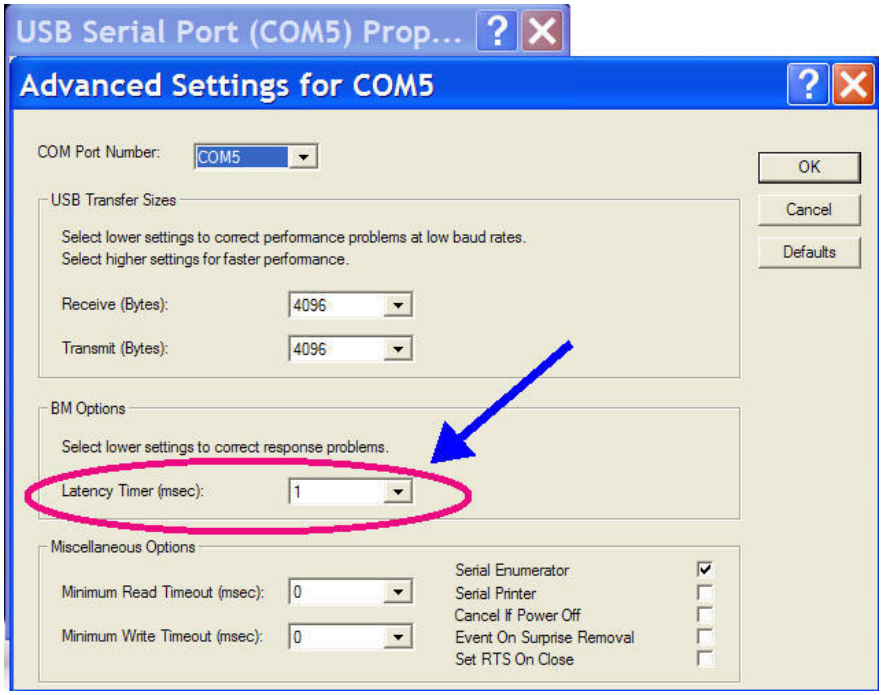
Do not leave a USB to EIA-485 converter connected to Standard Bus without power (i.e., disconnecting the USB end from the computer while leaving the converter connected on Standard Bus). Disturbance on the Standard Bus may occur.

Note:

When connecting the USB converter to the PC it is suggested that the Latency Timer be changed from the default of 16 msec to 1 msec. Failure to make this change may cause communication loss between the PC running ZE-ZONE Configurator software and the control.

To modify Latency Timer settings follow the steps below:

1. Navigate to Device Manager.
2. Double click on Ports.
3. Right click on the USB serial port in use and select Properties.
4. Click the tab labeled Port settings and then click the Advance button.



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

Percent Units:

Lights when the controller is displaying values as a percentage or when the Manual Power is displayed.

Channel Display:

Indicates the channel for any given EZ-ZONE module.

- Available with the PM4, 8 and PM9 only.

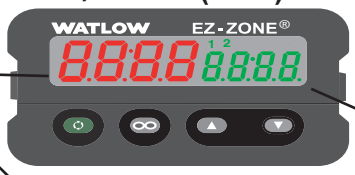
Infinity Key

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

Advance Key

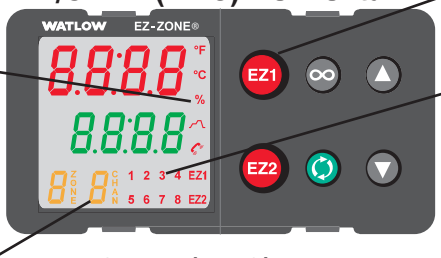
Advances through parameter prompts.

1/32 DIN (PM3)



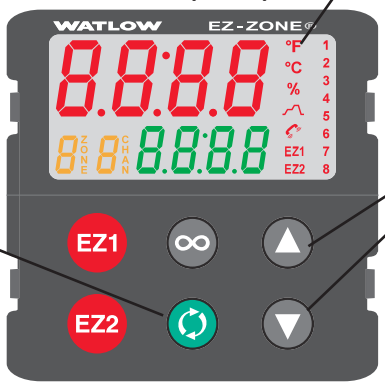
1/16 DIN (PM6)

1/8 DIN (PM9) Horizontal



1/8 DIN (PM8) Vertical

1/4 DIN (PM4)



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.

Profile Activity:

Lights when a profile is running. Flashes when a profile is paused.

EZ Key/s:

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

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 display. In other pages, changes the upper display to a higher or lower value, or changes a parameter selection.

Note:

Upon power up, the upper or left display will briefly indicate the firmware revision and the lower or right display will show PM representing the model.

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. Some messages, such as Ramping and Tuning, indicate that a process is underway. If the message was generated by a latched alarm and the condition no longer exists or if an alarm has silencing enabled it can be silenced simply by pushing the Infinity key. Alternatively, use the method below to view all and then clear.

Push the Advance Key to display [iGnr] in the upper display and the message source (such as [AL.h 1]) 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 Infinity key to execute the action. See the Home Page for further information on the Attention Codes.

Display	Parameter Name Description	Range	Appears If
[AtEn]	**Attention** 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. Some messages, such as Ramping and Tuning, indicate that a process is underway. If the message was generated by a latched alarm or limit condition, the message can be cleared when the condition no longer exists. If an alarm has silencing enabled, it can be silenced. Push the Advance Key to display [iGnr] in the upper display and the message source (such as [L.h 1]) 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 Infinity key to execute the action. Alternatively, rather than scrolling through all messages simply push the Infinity button to generate a clear.	[AL.L 1] [AL.L2] [AL.L3] [AL.L4] Alarm Low 1 to 4 [AL.h 1] [AL.h2] [AL.h3] [AL.h4] Alarm High 1 to 4 [AL.E 1] [AL.E2] [AL.E3] [AL.E4] Alarm Error 1 to 4 [Er.i 1] Error Input 1 [tUn 1] Tuning 1 [rP 1] Ramping 1 [LP.o 1] Loop Open Error 1 [LP.r 1] Loop Reversed Error 1 [uAL.h] Value to high to be displayed in 4 digit LED display [uAL.L] Value to low to be displayed in 4 digit LED display	an alarm or error message is active.

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 an Input Error [Er.1], or it could be for information only like Autotune [tUn1] taking place.

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 and Down keys to change the value of writable parameters, just as you would in any other menu.

Note:

If a writable value is placed on the upper display and is paired with another read only parameter on the lower display, the arrow keys affect the setting of the upper display. If two writable parameters are paired, the arrow keys affect the lower display.

If Control Mode is set to Auto, the Process Value is in the upper display and the Set Point (read-write) is in the lower display.

If a profile is running, the process value is in the upper display and the Target Set Point (read only) is in the lower display. If Control Mode is set to Manual, the Process Value is in the upper display and the output power level (read-write) is in the lower display.

If Control Mode is set to Off, the Process Value is in the upper display and [oFF] (read only) is in the lower display.

If a sensor failure has occurred, [----] is in the upper display and the output power level (read-write) is in the lower display.

Changing the Set Point

You can change the set point by using the Up or Down keys when a profile is not running.

Starting a Profile from the Home Page

1. When at the Home Page, press the Advance Key to locate Profile Start and select the file or step number to start. The upper display will show [1] and the lower display will show [P.St1].
2. Press the Up or Down key to choose the file or step number.
3. Press the Advance Key to select the Profile Action Request. The upper display will show [none] and the lower display will show [P.Ac1].
4. Press the Up or Down keys to select the Profile Start. The upper display will show [Prof] and the lower display will show [P.Ac1].
5. Press the Infinity Key to return Home. The Profile will Start

Ending a Profile from the Home Page

1. Press the Advance Key to select the Profile Action Request. The upper display will show [none] and the lower display will show [P.Ac1].
2. Press the Up or Down keys to select the End. The upper display will show [End] and the lower display will show [P.Ac1]
3. Press the Infinity Key to return Home. The Profile will End.

Modifying the Home Page

Follow the steps below to modify the Home Page:

1. Push and hold the Advance key and the Infinity key for approximately six seconds. Upon entering the Factory Page the first menu will be the Custom Menu [CuSt].
2. Push the Advance key where the lower display will show [CuSt] and the upper display will show [1].
3. Push the Advance button where the prompt for the Process Value [AC.Pu] will be displayed on top and Parameter [PAr] in the bottom. There are twenty positions available that can be customized.
4. Pushing the Up or Down arrow keys will allow for a customized selection to be made (see list of available parameters below).

Custom Menu Parameter Options

Description	Prompt *
All Models	
None	Blank
Analog Input Value	[A.in1]
Cal In Offset	[i.CA1]
Display Units	[C_F1]
Load Parameter Set	[USr.1] [USr.2]
Alarm Set Point Low	[A.Lo1] [A.Lo2] [A.Lo3] [A.Lo4]
Alarm Set Point High	[A.hi1] [A.hi2] [A.hi3] [A.hi4]
Hysteresis	[A.hy1] [A.hy2] [A.hy3] [A.hy4]
Set Point	[C.SP1]
Active Process Value	[AC.P1]
Active Set Point	[AC.S1]
Manual Power	[o.SP1]
Autotune	[Aut1]
Control Mode	[C.md1]
Heat Power	[h.Pr1]
Cool Power	[C.Pr1]
Time Integral	[ti1]
Time Derivative	[td1]
Dead Band	[db1]
Heat Prop Band	[h.Pb1]
On/Off Heat Hysteresis	[h.hy1]
Cool Prop Band	[C.Pb1]
On/Off Cool Hysteresis	[C.hy1]
Ramp Rate	[r.rt1]
TRU-TUNE+ Enable	[t.tu1]
Idle	[id.S1]
If 4th digit of part number is B, E, R or N	
Profile Start	[P.St1]
Profile Action Request	[P.AC1]
Guaranteed Soak Deviation 1	[gSd1]

* The numerical digit shown in the prompts above (last digit), represents the parameter instance and can be greater than one.

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 is what one may typically find in the Home Page as defaults based on controller part numbers. 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 Cool Power [C.Pr 1] will not appear unless the Cool algorithm [C.AG] is turned on in the Setup Page under the Loop menu. The Display Pairs [d.Pr5] prompt will default to 1, therefore the upper display will reflect the Active Process Value [AC.Pu] and the lower display will reflect the Active Set Point [AC.SP] by default.

As stated above, the user can define pairs of prompts to appear on the display every time the Advance key is pushed. When configuring the Custom Menu to your liking it should be noted that if 2 changeable (writable) prompts are displayed in a pair, i.e., Control Mode on top and Idle Set Point on the bottom, only the lower display (Idle Set Point) can be changed. If a writable value is placed on the upper display and is paired with another read only parameter on the lower display, the arrow keys affect the setting of the upper display.

The display can be configured to scroll by going to the Factory Page under the Diagnostic Menu and changing the Display Time [d.t 1] prompt to something greater than 0. If set to 2, the display will scroll every 2 seconds from one Display Pair to another. If the Display Pair prompt [d.Pr5] is set to 1 the Display Time [d.t 1] prompt will have no effect on the display.

	Home Page Defaults	Home Page Display	Parameter Page and Menu
All Models			
1	Active Process Value (1)	Numerical value	Operations Page, Monitor Menu
2	Active Set Point (1)	Numerical value	Operations Page, Monitor Menu
3	Control Mode (1)	C.M 1	Operations Page, Monitor Menu
4	Heat Power (1)	h.Pr 1	Operations Page, Monitor Menu
5	Cool Power (1)	C.Pr 1	Operations Page, Monitor Menu
6	Autotune (1)	AUt 1	Operations Page, Loop Menu
7	Idle Set Point (1)	id.S 1	Operations Page, Loop Menu
8	* Profile Start	P.St 1	
9	* Action Request	P.AC 1	
10	None		
11	None		
12	None		
13	None		
14	None		
15	None		
16	None		
17	None		
18	None		
19	None		
20	None		

* The fourth digit of the part number must be:
PM _ **[R, B, N or E]** _ _ _ - _ _ _ _ _ _ _

Note:

The numerical digit shown in the prompts (last digit) and within the parentheses above, represents the parameter instance and can be greater than one.

Navigating the EZ-ZONE® PM PID Controller

Applies to All Models - 1/16 DIN Shown Below

Home Page from anywhere: Press the Infinity Key ∞ for two seconds to return to the Home Page.

Factory Page from Home Page: Press both the Advance ◎ and Infinity ∞ keys for six seconds.

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.

Profiling Page from Home Page: Press the Advance Key ◎ for three seconds.

Note:

Keys must be held continuously until SEt is displayed in green. If keys are released when OPEr is displayed, press the infinity key or reset key to exit and repeat until SEt is displayed.

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.
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).
Profibus Index	Identifies unique parameters using Profibus DP protocol (further explanation below).
Parameter ID	Identifies unique parameters used with other software such as, LabVIEW.
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**eadable **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 [A i] menu and then the Sensor Type [SEn] prompt. To turn the sensor off simply write the value of 62 (off) to Modbus register 368 and send that value to the control.

Modbus RTU 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 [Loh i] to high/low [hiLo].

Note:

With the release of firmware revision 7.00 and above new functions where introduced into this 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. If the new functions, namely; Linearization, Process Value and Real Time Clock are to be used than use Map 2 Modbus regis ters. The Data Map [MAP] for Modbus registers can be changed in the Setup Page under the [COMM] 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.

Note:

There are two columns shown in the menus that follow for communications protocols identified as CIP (Common Industrial Protocol) and Profibus. These columns will be useful if this control is used in conjunction with the EZ-ZONE Remote User Interface/Gateway (RUI/GTW) where those protocols can be selected as optional hardware. For this control, as a secondary protocol beyond Standard Bus, Modbus RTU can be ordered as optional hardware.

To learn more about the RUI/GTW point your browser to the link below and search for keyword EZ-ZONE.

http://www.watlow.com/literature/pti_search.cfm

5 Chapter 5: Operations Page

Navigating the Operations Page

To navigate to the Operations Page, follow the steps below:

1. 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.
2. Press the Up ▲ or Down ▼ key to view available menus.
3. Press the Advance Key ◍ to enter the menu of choice.
4. If a submenu exists (more than one instance), press the Up ▲ or Down ▼ key to select and then press the Advance Key ◍ to enter.
5. Press the Up ▲ or Down ▼ key to move through available menu prompts.
6. Press the Infinity Key ∞ to move backwards through the levels: parameter to submenu; submenu to menu; menu to Home Page.
7. Press and hold the Infinity Key ∞ for two seconds to return to the Home Page.

On the following pages, top level menus are identified with a yellow background color.

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.

Note:

Some of the listed parameters may not be visible. Parameter visibility is dependent upon controller part number.

A1
oPEr **Analog Input Menu**
- A1n **Analog Input Value**
- iEr **Input Error**
- iCA **Calibration Offset**

Lnr
oPEr **Linearization Menu**
- Su.A **Source Value A**
- oFSt **Offset**
- ou **Output Value**

Pu
oPEr **Process Value Menu**
- Su.A **Source Value A**
- oFSt **Offset**
- ou **Output Value**

d1o
oPEr **Digital Input/Output Menu**
- 5
- d1o **Digital Input/Output (5 to 6)**
  - do.S **Output State**
  - di.S **Input State**
  - Ei.S **Event State**

MMon
oPEr **Monitor Menu**
- CMMA **Control Mode Active**
- hPr **Heat Power**
- CPr **Cool Power**
- CSP **Set Point**
- PuA **Process Value Active**

LooP
oPEr **Control Loop Menu**
- CMM **Control Mode**
- AtSP **Autotune Set Point**
- AUt **Autotune**
- CSP **Set Point**
- idS **Idle Set Point**
- hPb **Heat Proportional Band**
- hhy **On/Off Heat Hysteresis**
- CPb **Cool Proportional Band**
- Chy **On/Off Cool Hysteresis**
- ti **Time Integral**
- td **Time Derivative**
- db **Dead Band**
- oSP **Manual Power**

ALM1
oPEr **Alarm Menu**
- 1
- ALM1 **Alarm 1 (1 to 4)**
  - ALo **Low Set Point**
  - Ahi **High Set Point**
  - ACLr **Clear Alarm**
  - ASir **Silence Alarm**
  - ASt **Alarm State**

tMr1
oPEr **Timer Menu**
- Su.A **Source Value A**
- Su.C **Source Value C**
- Su.d **Source Value D**
- PPS1 **Produced Set Point 1**
- tEo1 **Timer Event Output 1**
- tEo2 **Timer Event Output 2**
- tEo3 **Timer Event Output 3**
- tr **Time Remaining**
- rbS **Ready Band State**
- hour **Hours**
- MMin **Minutes**
- SEC **Seconds**
- CtSP **Closed Loop Timer Set Point**

PSta
oPEr **Profile Status Menu**
- 1
- PSta **Profile Status (1 to 4)**
  - PStr **Profile Start**
  - PACr **Profile Action Request**
  - Stp **Step**
  - StyP **Step Type**
  - tSP1 **Target Set Point Loop 1**
  - ACSP **Produced Set Point 1**
  - hour **Hours**
  - MMin **Minutes**
  - SEC **Seconds**
  - Ent1 **Event 1**
  - Ent2 **Event 2**
  - JC **Jump Count Remaining**

Operations Page								
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
A i oPEr **Analog Input Menu**								
A in [Ain]	*Analog Input (1)* **Analog Input Value** View the process value. **Note:** Ensure that the Input Error (below) indicates no error (61) when reading this value using a field bus protocol. If an error exists, the last known value prior to the error occurring will be returned.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	- - - -	***Instance 1*** *Map 1* *Map 2* 360 360	0x68 (104) 1 1	0	4001	float R
i.Er [i.Er]	*Analog Input (1)* **Input Error** View the cause of the most recent error. If the AtEn message is Er.i1 or Er.i2, this parameter will display the cause of the input error.	nonE None (61) OPEn Open (65) FAiL Fail (32) Shrt Shorted (127) EMF Measurement Error (140) ECAL Bad Calibration Data (139) Er.Ab Ambient Error (9) Er.td RTD Error (141) nSrc Not Sourced (246)	None	***Instance 1*** *Map 1* *Map 2* 362 362	0x68 (104) 1 2	1	4002	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	***Instance 1*** *Map 1* *Map 2* 382 382	0x68 (104) 1 0xC (12)	2	4012	float RWES
Lnr oPEr **Linearization Menu**								
Su.A [Su.A]	*Linearization (1)* **Source Value A** View the value of Source A. Source A of Linearization 1 is connected to Analog Input 1	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 3566	0x86 (134) 1 4	- - - -	34004	float R
oFSt [oFSt]	*Linearization (1)* **Offset** Set an offset to be applied to this function's output.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	0	***Instance 1*** *Map 1* *Map 2* - - - - 3570	0x86 (134) 1 6	- - - -	34006	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**

Operations Page								
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
o.u [o.v]	*Linearization (1)* **Output Value** View the value of this function's output.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 3572	0x86 (134) 1 7	- - - -	34007	float R
No Display	*Linearization (1)* **Output Error** View reported cause for Linearization output malfunction.	None (61) Open (65) Shorted (127) Measurement error (140) Bad calibration data (139) Ambient error (9) RTD error (14) Fail (32) Math error (1423) Not sourced (246) Stale (1617) Can't process (1659)	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 3614	0x86 (134) 1 0x1C (28)	- - - -	34028	uint R
Pu oPEr **Process Value Menu**								
Su.A [Sv.A]	*Process Value (1)* **Source Value A** View the value of Source A. Linearization 1 is connected to Source A of Process Value 1	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 3310	0x7E (126) 1 0x10 (16)	- - - -	26016	float R
oFSt [oFSt]	*Process Value (1)* **Offset** Set an offset to be applied to this function's output.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	0	***Instance 1*** *Map 1* *Map 2* - - - - 3324	0x7E (126) 1 0x17 (23)	- - - -	26023	float RWES
o.u [o.v]	*Process Value (1)* **Output Value** View the value of this function block's output.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 3322	0x7E (126) 1 0x16 (22)	- - - -	26022	float R
No Display	*Process Value (1)* **Output Error** View reported cause for Process output malfunction.	nonE None (61) oPEn Open (65) Shrt Shorted (127) E.rn Measurement error (140) E.CAL Bad calibration data (139) Er.Ab Ambient error (9) E.rtd RTD error (14) FAIL Fail (32) E.rrn Math error (1423) nSrc Not sourced (246) StAL Stale (1617) no.Pr Can't process (1659)	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 3332	0x86 (134) 1 to 2 0x1B (27)	- - - -	26027	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
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)	- - - -	***Instance 5*** *Map 1* *Map 2* 1012 1132 Offset to next instance equals +30	0x6A (106) 5 to 6 7	90	6007	uint R
di.S [di.S]	*Digital Input (5 to 6)* **Input State** View this event input state.	oFF Off (62) on On (63)	- - - -	***Instance 5*** *Map 1* *Map 2* 1020 1140 Offset to next instance equals +30	0x6A (106) 5 to 6 0xB (11)	- - - -	6011	uint R
Ei.S [Ei.S]	*Digital Input (5 to 6)* **Event Status** View this event input state.	iAct Inactive (41) Act Active (5)	- - - -	***Instance 5*** *Map 1* *Map 2* 1328 1568 Offset to next instance equals +20	0x6E (110) 5 to 6 5	140	10005	uint R
No Display	*EZ-Key/s (1 to 2)* **Event Status** View this event input state.	iAct Inactive (41) Act Active (5)	- - - -	***Instance 1*** *Map 1* *Map 2* 1368 1608 ***Instance 2*** *Map 1* *Map 2* - - - - 1628	0x6E (110) 3 to 4 5	140	10005	uint R
MMon oPEr **Monitor Menu**								
C.MA [C.MA]	*Monitor (1)* **Control Mode Active** View the current control mode.	oFF Off (62) Auto Auto (10) MAn Manual (54)	Off	***Instance 1*** *Map 1* *Map 2* 1882 2362	0x97 (151) 1 2	- - - -	8002	uint R
h.Pr [h.Pr]	*Monitor (1)* **Heat Power** View the current heat output level.	0.0 to 100.0%	0.0	***Instance 1*** *Map 1* *Map 2* 1904 2384	0x97 (151) 1 0xD (13)	- - - -	8011	float R
C.Pr [C.Pr]	*Monitor (1)* **Cool Power** View the current cool output level.	-100.0 to 0.0%	0.0	***Instance 1*** *Map 1* *Map 2* 1906 2386	0x97 (151) 1 0xE (14)	- - - -	8014	float R
C.SP [C.SP]	*Monitor (1)* **Set Point** View the set point currently in effect.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	- - - -	***Instance 1*** *Map 1* *Map 2* 2172 2652	0x6B (107) 1 7	- - - -	8029	float R
Pv.A [Pv.A]	*Monitor (1)* **Process Value Active** View the current filtered process value using the control input.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	- - - -	***Instance 1*** *Map 1* *Map 2* 402 402	0x68 (104) 1 0x16 (22)	- - - -	8031	float 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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
No Display	*Monitor (1)* **Set Point Active** Read the current active set point.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	- - - -	***Instance 1*** *Map 1* 2172 *Map 2* 2652	0x6B (107) 1 7	- - - -	7018	float R
No Display	*Monitor (1)* **Autotune Status** Read the present status of Autotune.	oFF Off (62) tS.1P Waiting for cross 1 positive (119) tS.1n Waiting for cross 1 negative (120) tS.2P Waiting for cross 2 positive (121) tS.2n Waiting for cross 2 negative (122) tS.3P Waiting for cross 3 positive (123) tS.3n Waiting for cross 3 negative (150) PMn Measuring maximum peak (151) PMA Measuring minimum peak (152) CALC Calculating (153) CPLt Complete (18) to Timeout (118)	- - - -	***Instance 1*** *Map 1* 1932 *Map 2* 2412	0x97 (151) 1 0x1B (27)	- - - -	8027	uint R
LooP oPEr **Control Loop Menu**								
CM [C.M]	*Control Loop (1)* **Control Mode** Select the method that this loop will use to control.	oFF Off (62) AUto Auto (10) MAn Manual (54)	Auto	***Instance 1*** *Map 1* 1880 *Map 2* 2360	0x97 (151) 1 1	63	8001	uint RWES
A.tSP [A.tSP}	*Control Loop (1)* **Autotune Set Point** Set the set point that the autotune will use, as a percentage of the current set point.	50.0 to 200.0%	90.0	***Instance 1*** *Map 1* 1998 *Map 2* 2398	0x97 (151) 1 0x14 (20)	- - - -	8025	float RWES
AUt [AUt]	*Control Loop (1)* **Autotune** Start an autotune. While the autotune is active, the Home Page will display AtEn tUn 1. When the autotune is complete, the message will clear automatically.	no No (59) YES Yes (106)	No	***Instance 1*** *Map 1* 1920 *Map 2* 2400	0x97 (151) 1 0x15 (21)	64	8026	uint RW
CSP [C.SP]	*Control Loop (1)* **Set Point** Set the set point that the controller will automatically control to.	Minimum Set Point to Maximum Set Point (Setup Page)	75.0°F or units 24.0°C	***Instance 1*** *Map 1* 2160 *Map 2* 2640	0x6B (107) 1 1	49	7001	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**

Operations Page								
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
id.S [id.S]	*Control Loop (1)* **Idle Set Point** Set a Set Point that can be triggered by an event state.	Minimum Set Point to Maximum Set Point (Setup Page)	75.0°F or units 24.0°C	***Instance 1*** *Map 1* 2176 *Map 2* 2656	0x6B (107) 1 9	50	7009	float RWES
h.Pb [h.Pb]	*Control Loop (1)* **Heat Proportional Band** Set the PID proportional band for the heat outputs.	0.001 to 9,999.000°F or units 0.001 to 5,555.000°C	25.0°F or units 14.0°C	***Instance 1*** *Map 1* 1890 *Map 2* 2370	0x97 (151) 1 6	65	8009	float RWES
h.hy [h.hy]	*Control Loop (1)* **On/Off Heat Hysteresis** Set the control switching hysteresis for on-off control. This determines how far into the "on" region the process value needs to move before the output turns on.	0.001 to 9,999.000°F or units 0.001 to 5,555.000°C	3.0°F or units 2.0°C	***Instance 1*** *Map 1* 1900 *Map 2* 2380	0x97 (151) 1 0xB (11)	66	8010	float RWES
C.Pb [C.Pb]	*Control Loop (1)* **Cool Proportional Band** Set the PID proportional band for the cool outputs.	0.001 to 9,999.000°F or units 0.001 to 5,555.000°C	25.0°F or units 14.0°C	***Instance 1*** *Map 1* 1892 *Map 2* 2372	0x97 (151) 1 7	67	8012	float RWES
C.hy [C.hy]	*Control Loop (1)* **On/Off Cool Hysteresis** Set the control switching hysteresis for on-off control. This determines how far into the "on" region the process value needs to move before the output turns on.	0.001 to 9,999.000°F or units 0.001 to 5,555.000°C	3.0°F or units 2.0°C	***Instance 1*** *Map 1* 1902 *Map 2* 2382	0x97 (151) 1 0xC (12)	68	8013	float RWES
t i [ti]	*Control Loop (1)* **Time Integral** Set the PID integral for the outputs.	0 to 9,999 seconds per repeat	180 seconds per repeat	***Instance 1*** *Map 1* 1894 *Map 2* 2374	0x97 (151) 1 8	69	8006	float RWES
td [td]	*Control Loop (1)* **Time Derivative** Set the PID derivative time for the outputs.	0 to 9,999 seconds	0 seconds	***Instance 1*** *Map 1* 1896 *Map 2* 2376	0x97 (151) 1 9	70	8007	float RWES
db [db]	*Control Loop (1)* **Dead Band** Set the offset to the proportional band. With a negative value, both heating and cooling outputs are active when the process value is near the set point. A positive value keeps heating and cooling outputs from fighting each other.	-1,000.0 to 1,000.0°F or units -556 to 556°C	0	***Instance 1*** *Map 1* 1898 *Map 2* 2378	0x97 (151) 1 0xA (10)	71	8008	float RWES
o.SP [o.SP]	*Control Loop (1)* **Manual Power** Set a fixed level of output power when in manual (open-loop) mode.	-100 to 100% (heat and cool) 0 to 100% (heat only) -100 to 0% (cool only)	0.0	***Instance 1*** *Map 1* 2162 *Map 2* 2642	0x6B (107) 1 2	51	7002	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**

Operations Page								
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
No Display	*Control Loop (1)* **Loop Error** Open Loop detect deviation has been exceeded.	nonE None (61) LP.o Open Loop (1274) LP.r Reversed Sensor (1275)	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 2408	0x6C (108) 1 0x30 (48)	- - - -	8030	uint R
No Display	*Control Loop (1)* **Clear Loop Error** Current state of limit output.	CLr Clear (129) ,gnr Ignore (204)	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 2410	0x6C (108) 1 0x31 (49)	- - - -	8031	uint W
No Display	*Control Loop (1)* **Loop Output Power** View the loop output power.	-100.0 to 100.0	- - - -	***Instance 1*** *Map 1* *Map 2* 1908 2388	0x97 (151) 1 0x0F (15)	- - - -	8033	float R
ALM1 oPEr **Alarm Menu**								
A.Lo [A.Lo]	*Alarm (1 to 4)* **Low Set Point** If Type (Setup Page, Alarm Menu) is set to: **process** - set the process value that will trigger a low alarm. **deviation** - set the span of units from the Set Point that will trigger a low alarm. A negative set point represents a value below Set Point. A positive set point represents a value above Set Point.	-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	***Instance 1*** *Map 1* *Map 2* 1482 1882 Offset to next instance (*Map 1*) equals +50 Offset to next instance (*Map 2*) equals +60	0x6D (109) 1 to 4 2	18	9002	float RWES
A.hi [A.hi]	*Alarm (1 to 4)* **High Set Point** If Type (Setup Page, Alarm Menu) is set to: **process** - set the process value that will trigger a high alarm. **deviation** - set the span of units from the Set Point 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	***Instance 1*** *Map 1* *Map 2* 1480 1880 Offset to next instance (*Map 1*) equals +50 Offset to next instance (*Map 2*) equals +60	0x6D (109) 1 to 4 1	19	9001	float RWES
No Display	*Alarm (1 to 4)* **Alarm State** Current state of alarm	Str Startup (88) nonE None (61) bLo Blocked (12) ALL Alarm low (8) ALh Alarm high (7) Err Error (28)	None	***Instance 1*** *Map 1* *Map 2* 1496 1896 Offset to next instance [Map1 +50], [*Map 2* +60]	0x6D (109) 1 to 4 9	- - - -	9009	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
No Display	*Alarm (1 to 4)* **Alarm Clearable** Indicates if the alarm can be cleared.	no No (59) YES Yes (106)	- - - -	***Instance 1*** *Map 1* *Map 2* 1502 1902 Offset to next instance (Map1 1 equals +50, *Map 2* equals +60)	0x6D (109) 1 to 4 0xC (12)	- - - -	9012	uint R
No Display	*Alarm (1 to 4)* **Clear Alarm** Write to this register to clear an alarm	CLr Clear (0) Ignr Ignore (204)	0	***Instance 1*** *Map 1* *Map 2* 1504 1904 Offset to next instance (Map1 1 equals +50, *Map 2* equals +60)	0x6D (109) 1 to 4 0xD (13)	- - - -	9013	uint W
No Display	*Alarm (1 to 4)* **Silence Alarm** Write to this register to silence an alarm	SIL Silence Alarm (1010)	0	***Instance 1*** *Map 1* *Map 2* 1506 1906 Offset to next instance (Map1 1 equals +50, *Map 2* equals +60)	0x6D (109) 1 to 4 0xE (14)	- - - -	9014	uint W
No Display	*Alarm (1 to 4)* **Alarm Silenced** Indicates if alarm is silenced.	no No (59) YES Yes (106)	- - - -	***Instance 1*** *Map 1* *Map 2* 1500 1900 Offset to next instance (Map1 1 equals +50, *Map 2* equals +60)	0x6D (109) 1 to 4 0x0B (11)	- - - -	9011	uint R
No Display	*Alarm (1 to 4)* **Alarm Latched** Indicates if alarm is latched.	no No (59) YES Yes (106)	- - - -	***Instance 1*** *Map 1* *Map 2* 1498 1898 Offset to next instance (Map1 1 equals +50, *Map 2* equals +60)	0x6D (109) 1 to 4 0x0A (10)	- - - -	9010	uint R
tMr oPEr **Timer Menu**								
SuA [Su.A]	*Timer* **Source Value A** View the state of Source Function A.	on On (63) oFF Off (62)	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 8012	0x83 (109) 1 0x07 (7)	- - - -	31007	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
Su.C [Su.C]	*Timer* **Source Value C** View the value of Source Function C.	-1999.000 to 999.000°F or units -1110.555 to 5555.000	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 8572	0x83 (109) 1 0x25 (37)	- - - -	31037	float R
Su.d [Su.d]	*Timer* **Source Value D** View the state of Source Function D.	on On (63) oFF Off (62)	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 8574	0x83 (109) 1 0x26 (38)	- - - -	31038	uint R
P.SP1 [P.SP1]	*Timer* **Produced Set Point 1** View the value of Set Point 1.	-1999.000 to 999.000°F or units -1110.555 to 5555.000	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 8576	0x83 (109) 1 0x27 (39)	- - - -	31039	float R
tE.o1 [tE.o1]	*Timer* **Timer Event Output 1** View the state of Event Output 1.	on On (63) oFF Off (62)	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 8578	0x83 (109) 1 0x28 (40)	- - - -	31040	uint R
tE.o2 [tE.o2]	*Timer* **Timer Event Output 2** View the state of Event Output 2.	on On (63) oFF Off (62)	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 8580	0x83 (109) 1 0x29 (41)	- - - -	31041	uint R
tE.o3 [tE.o3]	*Timer* **Timer Event Output 3** View the state of Event Output 3.	on On (63) oFF Off (62)	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 8590	0x83 (109) 1 0x2E (46)	- - - -	31046	uint R
t.r [t.r]	*Timer* **Time Remaining** Display the time remaining on the timer.	00.00 00:00 to 99:59	7	***Instance 1*** *Map 1* *Map 2* - - - -	0x83 (131) 1 0x15 (21)	- - - -	31021	string R
r.bS [r.bS]	*Timer* **Ready Band State** Display whether the process value is in the ready band.	YES Yes (106) no No (59)	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 8542	0x83 (131) 1 0x16 (22)	- - - -	31022	uint R
hoUr [hoUr]	*Timer* **Hours** Set the timer period hours.	0 to 99	0	***Instance 1*** *Map 1* *Map 2* - - - - 8548	0x83 (131) 1 0x19 (25)	- - - -	31025	uint RWES
MN.in MN.in	*Timer* **Minutes** Set the timer period minutes.	0 to 59	0	***Instance 1*** *Map 1* *Map 2* - - - - 8550	0x83 (131) 1 0x1A (26)	- - - -	31026	uint RWES
SEC [SEC]	*Timer* **Seconds** Set the timer period seconds.	0 to 59	10	***Instance 1*** *Map 1* *Map 2* - - - - 8552	0x83 (131) 1 0x1B (27)	- - - -	31027	uint RWES
Ct.SP [Ct.SP]	*Timer* **Closed Loop Timer Set Point** Set the set point that will be in effect during the timer period.	-1999.000 to 9999.000°F or units -1110.555 to 5555.000°C	75	***Instance 1*** *Map 1* *Map 2* - - - - 8554	0x83 (131) 1 0x1C (28)	- - - -	31028	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**

Operations Page								
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
No Display	*Timer* **Timer Timing** Indicates whether the timer is running.	On (63) Off (62)	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 8528	0x83 (131) 1 0x0F (15)	- - - -	31015	uint R
No Display	*Timer* **Output Error** Indicates errors that may have interfered with the timer operation.	None (61) Open (65) Shorted (127) Measurement Error (140) Bad Calibration Data (139) Ambient Error (9) RTD Error (141) Fail (32) Math Error (1423) Not Sourced (246 Stale (1617)	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 8534	0x83 (131) 1 0x12 (18)	- - - -	31018	uint R
No Display	*Timer* **Indicator Request** View the status of the timer illuminated indicators.	Off (62) Ready (1662) Ready Ack (1950) Running (149)	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 8582	0x83 (131) 1 0x2A (42)	- - - -	31042	uint R
No Display	*Timer* **Countdown State** View the state of the countdown cycle.	Inactive (41) Wait Process (209) Wait Event (144) Running (149) Pause (146) Complete (18) End (27)	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 8584	0x83 (131) 1 0x2B (43)	- - - -	31043	uint R
No Display	*Timer* **Elapsed Signal Time** Counts from 0 to Signal Time while signal time is active.	0 to 4,294,967,295 mS	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 8592	0x83 (131) 1 0x2F (47)	- - - -	31047	udint R
No Display	*Timer* **Elapsed Time** Counts from 0 to Countdown Time while time cycle is active.	0 to 4,294,967,295 mS	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 8594	0x83 (131) 1 0x30 (48)	- - - -	31048	udint R
PSTA oPEr **Profile Status Menu** Profile Menu appears if: (PM _ **[R, B*, N, E*]** _ _ _-_ _ _ _ _ _ _)			* Available with PM8/9 only * Some parameters in the Profile Status Menu can be changed for the currently running profile, but should only be changed by knowledgeable personnel and with caution. Changing parameters via the Profile Status Menu will not change the stored profile but will have an immediate impact on the profile that is running. Changes made to profile parameters in the Profiling Pages will be saved and will also have an immediate impact on the running profile.					
PStr [P.Str]	*Profile Status* **Profile Start** Select step to act upon.	1 to 40	1	***Instance 1*** *Map 1* *Map 2* 2520 4340	0x7A (122) 1 1	204	22001	uint RW
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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
PACr [PACr]	*Profile Status* **Action Request**	nonE None (61) StEP Step Start (89) End Terminate (148) rESU Resume (147) PAUS Pause (146) Prof Profile (77)	None	***Instance 1*** *Map 1* *Map 2* 2540 4360	0x7A (122) 1 0xB (11)	205	22011	uint RW
StP [StP]	*Profile Status* **Step** View the currently running step.	1 to 40	0 (none)	***Instance 1*** *Map 1* *Map 2* 2526 4346	0x7A (122) 1 4	- - - -	22004	uint R
S.typ [S.typ]	*Profile Status* **Step Type** View the currently running step type.	UStP Unused Step (50) End End (27) JL Jump (116) CLoC Wait For Time (1543) UJbo Wait For Both (210) UJPr Wait For Process (209) UJE Wait For Event (144) SoAK Soak (87) t.r Ramp Time (143) rAtE Ramp Rate (81)	- - - -	***Instance 1*** *Map 1* *Map 2* 2544 4364	0x7A (122) 1 0xD (13)	- - - -	22013	uint R
t.SP1 [t.SP1]	*Profile Status* ***Target Set Point Loop 1** View or change the target set point of the current step.	-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	***Instance 1*** *Map 1* *Map 2* 2542 4502	0x7A (122) 1 0xC (12)	- - - -	22012	uint RW
AC.SP [AC.SP]	*Profile Status* **Produced Set Point 1** Display the current set point, even if the profile is ramping.	-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	***Instance 1*** *Map 1* *Map 2* 2528 4348	- - - -	- - - -	22005	float R
hoUr [hoUr]	*Profile Status* **Hours** Step time remaing in hours.	0 to 99	0	***Instance 1*** *Map 1* *Map 2* - - - - 4494	0x7A (122) 1 0x4E (78)	- - - -	22078	uint RW
Min [Min]	*Profile Status* **Minutes** Step time remaing in minutes.	0 to 59	0	***Instance 1*** *Map 1* *Map 2* - - - - 4492	0x7A (122) 1 0x4D (77)	- - - -	22077	uint RW
SEC [SEC]	*Profile Status* **Seconds** Step time remaing in seconds.	0 to 59	0	***Instance 1*** *Map 1* *Map 2* - - - - 4490	0x7A (122) 1 0x4C (76)	- - - -	22076	uint RW
Ent1 [Ent1]	*Profile Status* **Event 1** View or change the event output states.	oFF Off (62) on On (63)	Off	***Instance 1*** *Map 1* *Map 2* 2546 4512	0x7A (122) 1 0xE (14)	- - - -	22014	uint RW
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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
Ent2 [Ent2]	*Profile Status* **Event 2** View or change the event output states.	oFF Off (62) on On (63)	Off	***Instance 1*** *Map 1* *Map 2* 2548 4514	0x7A (122) 1 0xF (15)	- - - -	22015	uint RW
JC [JC]	*Profile Status* **Jump Count Remaining** View the jump counts remaining for the current loop. In a profile with nested loops, this may not indicate the actual jump counts remaining.	0 to 9,999	0	***Instance 1*** *Map 1* *Map 2* 2538 4358	0x7A (122) 1 0xA (10)	- - - -	22010	uint R
No Display	*Profile Status* **Profile State** Read currentProfile state.	off (62) Running (149) Pause (146)	- - - -	***Instance 1*** *Map 1* *Map 2* 2522 4342	0x7A (122) 1 2	- - - -	22002	uint R
No Display	*Profile Status* **Current File** Indicates current file being executed.	1 to 4	0	***Instance 1*** *Map 1* *Map 2* 2524 4344	0x7A (122) 1 3	- - - -	22003	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**

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 the menu of choice.
- If a submenu exists (more than one instance), press the Up ▲ or Down ▼ key to select and then press the Advance Key ◉ to enter.
- 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:

Keys must be held continuously until [SEt] is displayed in green. If keys are released when [OPEr] is displayed, press the infinity key or reset key to exit and repeat until [SEt] is displayed, if you are using firmware 13 or earlier.

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.

[A1]
[SEt] **Analog Input Menu**
- [SEn] **Sensor Type**
- [t.in] **TC Linearization**
- [rtLd] **RTD Leads**
- [Unit] **Units**
- [SLo] **Scale Low**
- [Sh1] **Scale High**
- [rLo] **Range Low**
- [rh1] **Range High**
- [PEE] **Process Error Enable**
- [PEL] **Process Error Low Value**
- [tC] **Thermistor Curve**
- [rr] **Resistance Range**
- [Fil] **Filter**
- [Err] **Error Latching**
- [dEC] **Display Precision**
- [CAL] **Calibration Offset ****
- [A1n] **Analog Input Value ****
- [Er] **Input Error ****

[Lnr]
[SEt] **Linearization Menu**
- [Fn] **Function**
- [Unit] **Units**
- [iP1] **Input Point 1**
- [oP1] **Output Point 1**
- [iP2] **Input Point 2**
- [oP2] **Output Point 2**
- [iP3] **Input Point 3**
- [oP3] **Output Point 3**
- [iP4] **Input Point 4**
- [oP4] **Output Point 4**
- [iP5] **Input Point 5**
- [oP5] **Output Point 5**
- [iP6] **Input Point 6**
- [oP6] **Output Point 6**
- [iP7] **Input Point 7**
- [oP7] **Output Point 7**
- [iP8] **Input Point 8**
- [oP8] **Output Point 8**
- [iP9] **Input Point 9**
- [oP9] **Output Point 9**
- [iP10] **Input Point 10**
- [oP10] **Output Point 10**

[Pu]
[SEt] **Process Value**
- [Fn] **Function**
- [Punt] **Pressure Units**
- [Aunt] **Altitude Units**
- [Fil] **Filter**

[dio]
[SEt] **Digital Input/Output Menu**
- [5]
- [dio] **Digital Input/Output (5 to 6)**
  - [dir] **Direction**
  - [Fn] **Output Function**
  - [F1] **Output Function Instance**
  - [otb] **Time Base Type**
  - [otb] **Fixed Time Base**
  - [oLo] **Low Power Scale**
  - [oh1] **High Power Scale**
  - [LEu] **Active Level**
  - [Fn] **Active Level Function**
  - [F1] **Function Instance**

[LooP]
[SEt] **Control Loop Menu**
- [hAG] **Heat Algorithm**
- [CAG] **Cool Algorithm**
- [CCr] **Cool Output Curve**
- [hPb] **Heat Proportional Band ****
- [hhy] **On/Off Heat Hysteresis ****
- [CPb] **Cool Proportional Band ****
- [Chy] **On/Off Cool Hysteresis ****
- [t1] **Time Integral ****
- [td] **Time Derivative ****
- [db] **Dead Band ****
- [tEUn] **TRU-TUNE+™ Enable**
- [tbnd] **TRU-TUNE+™ Band**
- [tGn] **TRU-TUNE+™ Gain**
- [AtSP] **Autotune Set Point**
- [tAGr] **Autotune Aggressiveness**
- [Pdl] **Peltier Delay**
- [UFA] **Auto-to-Manual Power**
- [FA1L] **Input Error Power**
- [MAn] **Fixed Power**
- [LdE] **Open Loop Detect Enable**
- [Ldt] **Open Loop Detect Time**
- [Ldd] **Open Loop Detect Deviation**
- [rP] **Ramp Action**
- [rSC] **Ramp Scale**
- [rrt] **Ramp Rate**
- [LSP] **Minimum Set Point**
- [hSP] **Maximum Set Point**
- [CSP] **Set Point ****
- [idS] **Idle Set Point ****
- [SPLo] **Minimum Manual Power**
- [SPh1] **Maximum Manual Power**
- [oSP] **Manual Power ****
- [CM] **Control Mode ****

****** These parameters/prompts are available with firmware revisions 11.0 and above.

oUPt
SEt Output Menu
1
oUPt Output (1 to 2)
Fn Function
F1 Output Function Instance
oCt Time Base Type
otb Fixed Time Base
oLo Low Power Scale
oh1 High Power Scale
oUPt Output 1 process
oty Output Type
Fn Function
F1 Output Function Instance
SLo Scale Low
Sh1 Scale High
rLo Range Low
rh1 Range High
oLo Low Power Scale
oho High Power Scale
oCA Calibration Offset

ALMn
SEt Alarm Menu
1
ALMn Alarm (1 to 4)
Aty Type
Src.A Alarm Source
Ahy Hysteresis
ALg Logic
ASd Sides
ALo Low Set Point **
Ah1 High Set Point **
ALA Latching
Abl Blocking
AS1 Silencing
AdSP Alarm Display
Adl Delay Time
ACLr Clear Alarm
AS1r Silence Alarm
ASt Alarm State

tmrA
SEt Timer Menu
t1En Timer Enable
t1St Timer Start Method
SFn.A Source Function A
S1.A Source Instance A
SFn.C Source Function C
S1.C Source Instance C
SFn.d Source Function D
S1.d Source Instance D
tr Time Remaining
rbS Ready Band State
rdy Ready Band
tFor Time Format
hour Hours
Min Minutes
SEC Seconds
CtSP Closed Loop Timer Set Point
St Signal Time

FUn
SEt Function Key Menu
1
FUn Function Key (1 to 2)
LEv Level
Fn Action Function
F1 Function Instance

GLbL
SEt Global Menu
C_F Display Units
ACLF AC Line Frequency
rtyP Ramping Type
PtyP Profile Type
GSE Guaranteed Soak Enable
GSd1 Guaranteed Soak Deviation 1
S1.A Source Instance A
S1.b Source Instance B
Pot1 Power Off Time
Subt Synchronized Variable Time Base
CLEd Communications LED Action
Zone Zone
Chan Channel
dPrS Display Pairs
dt1 Display Time
USr.S Restore Settings From
USr.r Save Settings As

COMn
SEt Communications Menu
PCol Protocol
AdS Standard Bus Address
AdMn Modbus Address
bAUd Baud Rate
PAr Parity
MnhL Modbus Word Order
C_F Display Units
MnAP Data Map
nvS Non-Volatile Save

rtC*
SEt Real Time Clock Menu
hour Hours
Min Minutes
dowd Day of Week

* Available with PM4, PM8 and PM9 models only

** These parameters/prompts are available with firmware revisions 11.0 and above.

Setup Page								
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
AI SEt **Analog Input Menu**								
SEn [SEn]	*Analog 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)	- - - -	***Instance 1*** *Map 1* *Map 2* 368 368	0x68 (104) 1 5	3	4005	uint RWES
Lin [Lin]	*Analog Input (1)* **TC Linearization** Set the linearization to match the thermocouple wired to this input.	b B (11) H K (48) C C (15) n N (58) d D (23) r R (80) E E (26) S S (84) F F (30) t T (93) J J (46)	J	***Instance 1*** *Map 1* *Map 2* 370 370	0x68 (104) 1 6	4	4006	uint RWES
rtL [rt.L]	*Analog 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	***Instance 1*** *Map 1* *Map 2* 372 372	0x68 (104) 1 7	- - - -	4007	uint RWES
Unit [Unit]	*Analog Input (1)* **Units** Set the type of units the sensor will measure.	AtP Absolute Temperature (1540) rh Relative Humidity (1538) Pro Process (75) PWr Power (73)	Process	***Instance 1*** *Map 1* *Map 2* - - - - 442	0x68 (104) 1 0x2A (42)	5	4042	uint RWES
S.Lo [S.Lo]	*Analog 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	***Instance 1*** *Map 1* *Map 2* 388 388	0x68 (104) 1 0xF (15)	6	4015	float RWES
S.hi [S.hi]	*Analog 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	***Instance 1*** *Map 1* *Map 2* 390 390	0x68 (104) 1 0x10 (16)	7	4016	float RWES
r.Lo [r.Lo]	*Analog Input (1)* **Range Low** Set the low range for this function block's output.	-1,999.000 to 9,999.000	0.0	***Instance 1*** *Map 1* *Map 2* 392 392	0x68 (104) 1 0x11 (17)	8	4017	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
r.hi [r.hi]	*Analog Input (1)* **Range High** Set the high range for this function block's output.	-1,999.000 to 9,999.000	9,999	***Instance 1*** *Map 1* *Map 2* 394 394	0x68 (104) 1 0x12 (18)	9	4018	float RWES
P.EE [P.EE]	*Analog Input (1)* **Process Error Enable** Turn the Process Error Low feature on or off.	oFF Off (62) Lou Low (53)	Off	***Instance 1*** *Map 1* *Map 2* 418 418	0x68 (104) 1 0x1E (30)	10	4030	uint RWES
P.EL [P.EL]	*Analog Input (1)* **Process Error Low Value** If the process value drops below this value, it will trigger an input error.	-100.0 to 1,000.0	0.0	***Instance 1*** *Map 1* *Map 2* 420 420	0x68 (104) 1 0x1F (31)	11	4031	float RWES
t.C [t.C]	*Analog 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	***Instance 1*** *Map 1* *Map 2* 434 434	0x68 (104) 1 0x26 (38)	- - - -	4038	uint RWES
r.r [r.r]	*Analog 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	***Instance 1*** *Map 1* *Map 2* 432 432	0x68 (104) 1 0x25 (37)	- - - -	4037	uint RWES
F.iL [FiL]	*Analog 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	***Instance 1*** *Map 1* *Map 2* 386 386	0x68 (104) 1 0xE (14)	12	4014	float RWES
i.Er [i.Er]	*Analog Input (1)* **Input 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	***Instance 1*** *Map 1* *Map 2* 414 414	0x68 (104) 1 0x1C (28)	- - - -	4028	uint RWES
dEC [dEC]	*Analog 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	***Instance 1*** *Map 1* *Map 2* 398 398	0x68 (104) 1 0x14 (20)	- - - -	4020	uint RWES
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	***Instance 1*** *Map 1* *Map 2* 382 382	0x68 (104) 1 0x0C (12)	2	4012	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
A in [Ain]	*Analog Input (1)* **Analog Input Value** View the process value. **Note:** Ensure that the Input Error Status (below) indicates no error (61) when reading this value using a field bus protocol. If an error exists, the last known value prior to the error occurring will be returned.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	- - - -	***Instance 1*** *Map 1* *Map 2* 360 360	0x68 (104) 1 1	0	4001	float R
i.Er [i.Er]	*Analog Input (1)* **Input Error Status** View the cause of the most recent error. If the AEtn message is Er.i1 or Er.i2, this parameter will display the cause of the input error.	nonE None (61) OPEn Open (65) Shrt Shorted (127) E.rr Measurement Error (140) E.CAL Bad Calibration Data (139) Er.Ab Ambient Error (9) Er.td RTD Error (141) FAiL Fail (32) nSrc Not Sourced (246)	None	***Instance 1*** *Map 1* *Map 2* 362 362	0x68 (104) 1 2	1	4002	float R
Lnr SEt **Linearization Menu**								
Fn [Fn]	*Linearization (1)* **Function** Set how this function will linearize Source A which is Analog Input 1.	oFF Off (62) intr Interpolated (1482)	Off	***Instance 1*** *Map 1* *Map 2* - - - - 3568	0x86 (134) 1 5	155	34005	uint RWES
Unit [Unit]	*Linearization (1)* **Units** Set the units of Source A which is Analog Input 1.	nonE None (61) Src Source (1539) rh Relative Humidty (1538) Pro Process (75) PWJr Power (73) rtP Relative Temperature (1541) AtP Absolute Temperature (1540)	Source	***Instance 1*** *Map 1* *Map 2* - - - - 3616	0x86 (134) 1 0x29 (41)	156	34029	uint RWES
ip.1 [ip.1]	*Linearization (1)* **Input Point 1** Set the value that will be mapped to output 1.	-1,999.000 to 9,999.000	0.0	***Instance 1*** *Map 1* *Map 2* - - - - 3574	0x86 (134) 1 8	157	34008	float RWES
op.1 [op.1]	*Linearization (1)* **Output Point 1** Set the value that will be mapped to input 1.	-1,999.000 to 9,999.000	0.0	***Instance 1*** *Map 1* *Map 2* - - - - 3594	0x86 (134) 1 0x12 (18)	158	34018	float RWES
ip.2 [ip.2]	*Linearization (1)* **Input Point 2** Set the value that will be mapped to output 2.	-1,999.000 to 9,999.000	1.0	***Instance 1*** *Map 1* *Map 2* - - - - 3576	0x86 (134) 1 9	159	34009	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
oP.2 [op.2]	*Linearization (1)* **Output Point 2** Set the value that will be mapped to input 2.	-1,999.000 to 9,999.000	1.0	***Instance 1*** *Map 1* - - - - *Map 2* 3596	0x86 (134) 1 0x13 (19)	160	34019	float RWES
iP.3 [ip.3]	*Linearization (1)* **Input Point 3** Set the value that will be mapped to output 3.	-1,999.000 to 9,999.000	2.0	***Instance 1*** *Map 1* - - - - *Map 2* 3578	0x86 (134) 1 0xA (10)	161	34010	float RWES
oP.3 [op.3]	*Linearization (1)* **Output Point 3** Set the value that will be mapped to input 3.	-1,999.000 to 9,999.000	2.0	***Instance 1*** *Map 1* - - - - *Map 2* 3598	0x86 (134) 1 0x14 (20)	162	34020	float RWES
iP.4 [ip.4]	*Linearization (1)* **Input Point 4** Set the value that will be mapped to output 4.	-1,999.000 to 9,999.000	3.0	***Instance 1*** *Map 1* - - - - *Map 2* 3580	0x86 (134) 1 0xB (11)	163	34011	float RWES
oP.4 [op.4]	*Linearization (1)* **Output Point 4** Set the value that will be mapped to input 4.	-1,999.000 to 9,999.000	3.0	***Instance 1*** *Map 1* - - - - *Map 2* 3600	0x86 (134) 1 0x15 (21)	164	34021	float RWES
iP.5 [ip.5]	*Linearization (1)* **Input Point 5** Set the value that will be mapped to output 5.	-1,999.000 to 9,999.000	4.0	***Instance 1*** *Map 1* - - - - *Map 2* 3582	0x86 (134) 1 0xC (12)	165	34012	float RWES
oP.5 [op.5]	*Linearization (1)* **Output Point 5** Set the value that will be mapped to input 5.	-1,999.000 to 9,999.000	4.0	***Instance 1*** *Map 1* - - - - *Map 2* 3602	0x86 (134) 1 0x16 (22)	166	34022	float RWES
iP.6 [ip.6]	*Linearization (1)* **Input Point 6** Set the value that will be mapped to output 6.	-1,999.000 to 9,999.000	5.0	***Instance 1*** *Map 1* - - - - *Map 2* 3584	0x86 (134) 1 0xD (13)	167	34013	float RWES
oP.6 [op.6]	*Linearization (1)* **Output Point 6** Set the value that will be mapped to input 6.	-1,999.000 to 9,999.000	5.0	***Instance 1*** *Map 1* - - - - *Map 2* 3604	0x86 (134) 1 0x17 (23)	168	34023	float RWES
iP.7 [ip.7]	*Linearization (1)* **Input Point 7** Set the value that will be mapped to output 7.	-1,999.000 to 9,999.000	6.0	***Instance 1*** *Map 1* - - - - *Map 2* 3586	0x86 (134) 1 0xE (14)	169	34014	float RWES
oP.7 [op.7]	*Linearization (1)* **Output Point 7** Set the value that will be mapped to input 7.	-1,999.000 to 9,999.000	6.0	***Instance 1*** *Map 1* - - - - *Map 2* 3606	0x86 (134) 1 0x18 (24)	170	34024	float RWES
iP.8 [ip.8]	*Linearization (1)* **Input Point 8** Set the value that will be mapped to output 8.	-1,999.000 to 9,999.000	7.0	***Instance 1*** *Map 1* - - - - *Map 2* 3588	0x86 (134) 1 0xF (15)	171	34015	float RWES
oP.8 [op.8]	*Linearization (1)* **Output Point 8** Set the value that will be mapped to input 8.	-1,999.000 to 9,999.000	7.0	***Instance 1*** *Map 1* - - - - *Map 2* 3608	0x86 (134) 1 0x19 (25)	172	34025	float RWES
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Setup Page								
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
ip.9 [ip.9]	*Linearization (1)* **Input Point 9** Set the value that will be mapped to output 9.	-1,999.000 to 9,999.000	8.0	***Instance 1*** *Map 1* *Map 2* - - - - 3590	0x86 (134) 1 0x10 (16)	173	34016	float RWES
op.9 [op.9]	*Linearization (1)* **Output Point 9** Set the value that will be mapped to input 9.	-1,999.000 to 9,999.000	8.0	***Instance 1*** *Map 1* *Map 2* - - - - 3610	0x86 (134) 1 0x1A (26)	174	34026	float RWES
ip.10 [ip.10]	*Linearization (1)* **Input Point 10** Set the value that will be mapped to output 10.	-1,999.000 to 9,999.000	9.0	***Instance 1*** *Map 1* *Map 2* - - - - 3592	0x86 (134) 1 0x11 (17)	175	34017	float RWES
op.10 [op.10]	*Linearization (1)* **Output Point 10** Set the value that will be mapped to input 10.	-1,999.000 to 9,999.000	9.0	***Instance 1*** *Map 1* *Map 2* - - - - 3612	0x86 (134) 1 0x1B (27)	176	34027	float RWES
Pu SEt **Process Value Menu**								
Fn [Fn]	*Process Value (1)* **Function** Set the function that will be applied to the source or sources.	oFF Off (62) ALt *Pressure to Altitude (1649)	Off	***Instance 1*** *Map 1* *Map 2* - - - - 3320	0x7E (126) 1 0x15 (21)	123	26021	uint RWES
P.unt [P.unt]	*Process Value (1)* **Pressure Units*** Set the units that will be applied to the source.	PSI Pounds per Square Inch (1671) PASc Pascal (1674) ATM Atmosphere (1675) mbr Millibar (1672) torr Torr (1673)	PSI	***Instance 1*** *Map 1* *Map 2* - - - - 3334	0x7E (126) 1 0x1C (28)	- - - -	26028	uint RWES
A.unt [A.unt]	*Process Value (1)* **Altitude Units*** Set the units that will be applied to the source.	HFt Kilofeet (1677) Ft Feet (1676)	HFt	***Instance 1*** *Map 1* *Map 2* - - - - 3336	0x7E (126) 1 0x1D (29)	- - - -	26029	uint RWES
FiL [FiL]	*Process Value (1)* **Filter** Filtering smooths out the output signal of this function block. Increase the time to increase filtering.	0.0 to 60.0 seconds	0.0	***Instance 1*** *Map 1* *Map 2* - - - - 3330	0x7E (126) 1 0x1A (26)	- - - -	26026	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**

* Pressure Altitude calculation is based on the International Standard Atmosphere, 1976

Setup Page								
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
d io SEt **Digital Input/Output Menu**								
d ir [dir]	*Digital Input/Output (5 to 6)* **Direction** Set this function to operate as an input or output.	OtPt Output (68) iCon Input Dry Contact (44) in Input Voltage (193)	Output	***Instance 5*** *Map 1* 1000 *Map 2* 1120 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 5 to 6 1	82	6001	uint RWES
Fn [Fn]	*Digital Output (5 to 6)* **Output Function** Select what function will drive this output.	oFF Off (62) ALM Alarm (6) hEAt Heat (36) Cool Cool (20) tE.o1 Timer Event Output 1 (1951) tE.o2 Timer Event Output 2 (1952) tE.o3 Timer Event Output 3 (1953) h.Er Heater Error (184) Ent.b Profile Event Out B (234) Ent.A Profile Event Out A (233)	Off	***Instance 5*** *Map 1* 1008 *Map 2* 1128 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 5 to 6 5	83	6005	uint RWES
Fi [Fi]	*Digital Output (5 to 6)* **Output Function Instance** Set the instance of the function selected above.	1 to 4	1	***Instance 5*** *Map 1* 1010 *Map 2* 1130 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 5 to 6 6	84	6006	uint RWES
o.Ct [o.Ct]	*Digital Output (5 to 6)* **Time Base Type** Set the Time Base Type type. This parameter is only used with PID control, but can be set anytime.	FtB Fixed Time Base (34) vtB Variable Time Base (103)	Fixed Time Base	***Instance 5*** *Map 1* 1002 *Map 2* 1122 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 5 to 6 2	85	6002	uint RWES
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Setup Page								
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
o.tb [o.tb]	*Digital Output (5 to 6)* **Fixed Time Base** Set the time base for fixed-time-base control.	0.1 to 60.0	1.0 seconds	***Instance 5*** *Map 1* 1004 *Map 2* 1124 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 5 to 6 3	86	6003	float RWES
o.Lo [o.Lo]	*Digital Output (5 to 6)* **Low Power Scale** The power output will never be less than the value specified and will represent the value at which output scaling begins.	0.0 to 100.0	0.0	***Instance 5*** *Map 1* 1016 *Map 2* 1136 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 5 to 6 9	87	6009	float RWES
o.hi [o.hi]	*Digital Output (5 to 6)* **High Power Scale** The power output will never be greater than the value specified and will represent the value at which output scaling stops.	0.0 to 100.0	100.0	***Instance 5*** *Map 1* 1018 *Map 2* 1138 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 5 to 6 0xA (10)	88	6010	float RWES
LEv [LEv]	*Digital Input (5 to 6)* **Action Level** Select which action will be interpreted as a true state.	High High (37) Lo Low (53)	High	***Instance 5*** *Map 1* 1320 *Map 2* 1560 Offset to next instance (*Map 1 & Map 2*) equals +20	0x6E (110) 5 to 6 1	137	10001	uint RW
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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
Fn [Fn]	*Digital Input (5 to 6)* **Action Function** Select the function that will be triggered by a true state for Digital Input 5 and or 6.	nonE None (61) StSt Start Step (1077) P.StS Profile Start/Stop, level triggered (208) ProF Start Profile, edge triggered (196) P.hoL Profile Hold/ Resume, level triggered (207) P.d.S Profile Disable, level triggered (206) t.dA TRU-TUNE+® Disable, level triggered (219) oFF Switch Control Loop Off, level triggered (90) MAn Manual, level triggered (54) tUnE Tune, edge triggered (98) idLE Idle Set Point, level triggered (107) F.AL Force Alarm To Occur, level triggered (218) AoF Control Loops Off and Alarms to Non-alarm State, level triggered (220) S.iL Silence Alarms, edge triggered (108) ALM Alarm Reset, edge triggered (6) P.LoC Keypad Lockout, level triggered (217) uSr.r User Set Restore, edge triggered (227)	None	***Instance 5*** *Map 1* *Map 2* 1324 1564 Offset to next instance (*Map 1 & Map 2*) equals +20	0x6E (110) 5 to 6 3	138	10003	uint RWES
Fi [Fi]	*Digital Input (5 to 6)* **Function Instance** Select which instance of the function selected in Action Function will be triggered.	0 to 4	0	***Instance 5*** *Map 1* *Map 2* 1326 1566 Offset to next instance (*Map 1 & Map 2*) equals +20	0x6E (110) 5 to 6 4	139	10004	uint RWES
LooP SEt **Control Loop Menu**								
h.Ag [h.Ag]	*Control Loop (1)* **Heat Algorithm** Set the heat control method.	oFF Off (62) P.id PID (71) on.oF On-Off (64)	PID	***Instance 1*** *Map 1* *Map 2* 1884 2364	0x97 (151) 1 3	72	8003	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
C.Ag [C.Ag]	*Control Loop (1)* **Cool Algorithm** Set the cool control method.	oFF Off (62) P id PID (71) on.oF On-Off (64)	Off	***Instance 1*** *Map 1* *Map 2* 1886 2366	0x97 (151) 1 4	73	8004	uint RWES
C.Cr [C.Cr]	*Control Loop (1)* **Cool Output Curve** Select a cool output curve to change the responsiveness of the system.	oFF Off (62) Cr.A Non-linear Curve 1 (214) Cr.b Non-linear Curve 2 (215)	Off	***Instance 1*** *Map 1* *Map 2* 1888 2368	0x97 (151) 1 5	- - - -	8038	uint RWES
h.Pb [h.Pb]	*Control Loop (1)* **Heat Proportional Band** Set the PID proportional band for the heat outputs.	0.001 to 9,999.000°F or units -1,110.555 to 5,555.000°C	25.0°F or units 14.0°C	***Instance 1*** *Map 1* *Map 2* 1890 2370	0x97 (151) 1 6	65	8009	float RWES
h.hy [h.hy]	*Control Loop (1)* **On/Off Heat Hysteresis** Set the control switching hysteresis for on-off control. This determines how far into the "on" region the process value needs to move before the output turns on.	0.001 to 9,999.000°F or units 0.001 to 5,555.000°C	3.0°F or units 2.0°C	***Instance 1*** *Map 1* *Map 2* 1900 2380	0x97 (151) 1 0xB (11)	66	8010	float RWES
C.Pb [C.Pb]	*Control Loop (1)* **Cool Proportional Band** Set the PID proportional band for the cool outputs.	0.001 to 9,999.000°F or units 0.001 to 5,555.000°C	25.0°F or units 14.0°C	***Instance 1*** *Map 1* *Map 2* 1892 2372	0x97 (151) 1 7	67	8012	float RWES
C.hy [C.hy]	*Control Loop (1)* **On/Off Cool Hysteresis** Set the control switching hysteresis for on-off control. This determines how far into the "on" region the process value needs to move before the output turns on.	0.001 to 9,999.000°F or units 0.001 to 5,555.000°C	3.0°F or units 2.0°C	***Instance 1*** *Map 1* *Map 2* 1902 2382	0x97 (151) 1 0xC (12)	68	8013	float RWES
t i [ti]	*Control Loop (1)* **Time Integral** Set the PID integral for the outputs.	0 to 9,999 seconds per repeat	180 seconds per repeat	***Instance 1*** *Map 1* *Map 2* 1894 2374	0x97 (151) 1 8	69	8006	float RWES
t d [td]	*Control Loop (1)* **Time Derivative** Set the PID derivative time for the outputs.	0 to 9,999 seconds	0 seconds	***Instance 1*** *Map 1* *Map 2* 1896 2376	0x97 (151) 1 9	70	8007	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
db [db]	*Control Loop (1)* **Dead Band** Set the offset to the proportional band. With a negative value, both heating and cooling outputs are active when the process value is near the set point. A positive value keeps heating and cooling outputs from fighting each other.	-1,000.0 to 1,000.0°F or units -556 to 556°C	0	***Instance 1*** *Map 1* *Map 2* 1898 2378	0x97 (151) 1 0xA (10)	71	8008	float RWES
t.tUn [t.tUn]	*Control Loop (1)* **TRU-TUNE+™ Enable** Enable or disable the TRU-TUNE+™ adaptive tuning feature.	no No (59) YES Yes (106)	No	***Instance 1*** *Map 1* *Map 2* 1910 2390	0x97 (151) 1 0x10 (16)	- - - -	8022	uint RWES
t.bnd [t.bnd]	*Control Loop (1)* **TRU-TUNE+™ Band** Set the range, centered on the set point, within which TRU-TUNE+™ will be in effect. Use this function only if the controller is unable to adaptive tune automatically.	0 to 100	0	***Instance 1*** *Map 1* *Map 2* 1912 2392	0x97 (151) 1 0x11 (17)	- - - -	8034	uint RWES
t.gn [t.gn]	*Control Loop (1)* **TRU-TUNE+™ Gain** Select the responsiveness of the TRU-TUNE+™ adaptive tuning calculations. More responsiveness may increase overshoot.	1 to 6	3	***Instance 1*** *Map 1* *Map 2* 1914 2394	0x97 (151) 1 0x12 (18)	- - - -	8035	uint RWES
A.tSP [A.tSP}	*Control Loop (1 to 2)* **Autotune Set Point** Set the set point that the autotune will use, as a percentage of the current set point.	50.0 to 200.0%	90.0	***Instance 1*** *Map 1* *Map 2* 1918 2398 ***Instance 2*** *Map 1* *Map 2* 1988 2468	0x97 (151) 1 to 2 0x14 (20)	- - - -	8025	float RWES
t.Agr [t.Agr]	*Control Loop (1)* **Autotune Aggressiveness** Select the aggressiveness of the autotuning calculations.	Undr Under damped (99) Crit Critical damped (21) OvEr Over damped (69)	Critical	***Instance 1*** *Map 1* *Map 2* 1916 2396	0x97 (151) 1 0x13 (19)	- - - -	8024	uint RWES
P.dL [P.dL]	*Control Loop (1)* **Peltier Delay** Set a value that will cause a delay when switching from heat mode to cool mode.	0.0 to 5.0	0.0	***Instance 1*** *Map 1* *Map 2* - - - - - - - -	0x97 (151) 1 0x1C (28)	- - - -	8051	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
UFA [UFA]	*Control Loop (1)* **Auto-to-Manual Power** Select what the controller outputs will do when the user switches control to manual mode.	oFF Off, sets output power to 0% (62) bPLS Bumpless Transfer, maintains same output power, if it was less than 75% and stable, otherwise 0% (14) MAn Fixed Power, sets output power to Fixed Power setting (33) USEr User, sets output power to last Fixed Power the user entered (100)	User	***Instance 1*** *Map 1* 2182 *Map 2* 2662	0x6B (107) 1 0xC (12)	- - - -	7012	uint RWES
FAiL [FAiL]	*Control Loop (1)* **Input Error Power** Select what the controller outputs will do when an input error switches control to manual mode.	oFF Off, sets output power to 0% (62) bPLS Bumpless, maintains same output power, if it was less than 75% and stable, otherwise 0% (14) MAn Fixed Power, sets output power to Fixed Power setting (33) USEr User, sets output power to last Fixed Power the user entered (100)	User	***Instance 1*** *Map 1* 2184 *Map 2* 2664	0x6B (107) 1 0xD (13)	- - - -	7013	uint RWES
MAn [MAn]	*Control Loop (1)* **Fixed Power** Set the manual output power level that will take effect if an Input Error Power occurs while Auto-to-Manual Power is set to Manual Fixed.	Set Point Open Loop Limit Low to Set Point Open Loop Limit High (Setup Page)	0.0	***Instance 1*** *Map 1* 2180 *Map 2* 2660	0x6B (107) 1 0xB (11)	- - - -	7011	float RWES
L.dE [L.dE]	*Control Loop (1)* **Open Loop Detect Enable** Turn on the open-loop detect feature to monitor a closed-loop operation for the appropriate response. Select Yes to detect conditions that prevent the process from changing in a specified time frame by a specified amount when PID power is at 100%. An open loop detect error will disable the control loop.	no No (59) YES Yes (106)	No	***Instance 1*** *Map 1* 1922 *Map 2* 2402	0x97 (151) 1 0x16 (22)	74	8039	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
L.dt [L.dt]	*Control Loop (1)* **Open Loop Detect Time** The Open Loop Detect Deviation value must occur for this time period to trigger an open-loop error. Process must deviate by the Open Loop Detect Deviation value in this specified time while at 100% PID to prevent an open loop error.	0 to 3,600 seconds	240	***Instance 1*** *Map 1* *Map 2* 1924 2404	0x97 (151) 1 0x17 (23)	75	8040	uint RWES
L.dd [L.dd]	*Control Loop (1)* **Open Loop Detect Deviation** Set the value that the process must deviate from the set point to trigger an open-loop error. Process must deviate by this value in the Open Loop Detect Time while at 100% PID power to prevent an open loop error.	-1,999.000 to 9,999.000°F or units -1,110.555 to 5,555.000°C	10.0°F or units 6.0°C	***Instance 1*** *Map 1* *Map 2* 1926 2406	0x97 (151) 1 0x18 (24)	76	8041	float RWES
rP [rP]	*Control Loop (1)* **Ramp Action** Select when the controller's set point will ramp to the defined end set point.	oFF Off (62) Str Startup (88) StPt Set Point Change (85) both Both (13)	Off	***Instance 1*** *Map 1* *Map 2* 2186 2666	0x6B (107) 1 0xE (14)	56	7014	uint RWES
r.SC [r.SC]	*Control Loop (1)* **Ramp Scale** Select the scale of the ramp rate.	hour Hours (39) Min Minutes (57)	Minutes	***Instance 1*** *Map 1* *Map 2* 2188 2668	0x6B (107) 1 0xF (15)	57	7015	uint RWES
r.rt [r.rt]	*Control Loop (1)* **Ramp Rate** Set the rate for the set point ramp. Set the Ramp Time units for the rate with the Ramp Scale parameter.	0.0 to 9,999.000°F or units 0.0 to 5,555.000°C	1.0°F or units 1.0°C	***Instance 1*** *Map 1* *Map 2* 2192 2672	0x6B (107) 1 0x11 (17)	58	7017	float RWES
L.SP [L.SP]	*Control Loop (1)* **Minimum Set Point** Set the minimum value of the Set Point range.	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	-1,999°F or units -1,128°C	***Instance 1*** *Map 1* *Map 2* 2164 2644	0x6B (107) 1 3	52	7003	float RWES
h.SP [h.SP]	*Control Loop (1)* **Maximum Set Point** Set the maximum value of the Set Point range..	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	-1,999°F or units -1,128°C	***Instance 1*** *Map 1* *Map 2* 2166 2646	0x6B (107) 1 4	53	7004	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
C.SP [`C;SP]	*Control Loop (1)* **Set Point** Set the set point that the controller will automatically control to.	Minimum Set Point to Maximum Set Point (Setup Page)	75.0°F or units 24.0°C	***Instance 1*** *Map 1* *Map 2* 2160 2640	0x6B (107) 1 1	49	7001	float RWES
id.S [id.S]	*Control Loop (1)* **Idle Set Point** Set a Set Point that can be triggered by an event state.	Minimum Set Point to Maximum Set Point (Setup Page)	75.0°F or units 24.0°C	***Instance 1*** *Map 1* *Map 2* 2176 2656	0x6B (107) 1 9	50	7009	float RWES
SP.Lo [SP.Lo]	*Control Loop (1)* **Minimum Manual Power** Set the minimum value of the Fixed Power range.	-100 to 100%	-100	***Instance 1*** *Map 1* *Map 2* 2168 2648	0x6B (107) 1 5	54	7005	float RWES
SP.hi [SP;hi]	*Control Loop (1)* **Maximum Manual Power** Set the maximum value of the Fixed Power range.	-100.0 to 100.0%	100	***Instance 1*** *Map 1* *Map 2* 2170 2650	0x6B (107) 1 6	55	7006	float RWES
o.SP [`o;SP]	*Control Loop (1)* **Manual Power** Set the fixed power.	-100.0 to 100.0%	0	***Instance 1*** *Map 1* *Map 2* 2162 2642	0x6B (107) 1 0x02 (2)	55	7002	float RWES
C.MM [`C;M]	*Control Loop (1)* **Control Mode** Select the method that this loop will use to control.	oFF Off (62) AUto Auto (10) MMAn Manual (54)	Auto	***Instance 1*** *Map 1* *Map 2* 1880 2360	0x97 (151) 1 1	63	8001	uint RWES
oUPt SEt **Output Menu**								
Fn [Fn]	*Output Digital (1 to 2)* **Output Function** Select what function will drive this output.	oFF Off (62) ALM Alarm (6) hEAt Heat (36) CooL Cool (20) tE.o1 Timer Event Output 1 (1951) tE.o2 Timer Event Output 2 (1952) tE.o3 Timer Event Output 3 (1953) h.Er Heater Error (184) Ent.A Profile Event Out A (233) Ent.b Profile Event Out B (234)	Output 1 - Heat Output 2 - Alarm	***Instance 1*** *Map 1* *Map 2* 888 1008 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 1 to 2 5	83	6005	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
F1 [Fi]	*Output Digital (1 to 2)* **Output Function Instance** Set the instance of the function selected above.	1 to 2	1	***Instance 1*** *Map 1* 890 *Map 2* 1010 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 1 to 2 6	84	6006	uint RWES
o.Ct [o.Ct]	*Output Digital (1 to 2)* **Time Base Type** Set the Time Base Type type. This parameter is only used with PID control, but can be set anytime.	FtB Fixed Time Base (34) vtB Variable Time Base (103)	Fixed Time Base	***Instance 1*** *Map 1* 882 *Map 2* 1002 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 1 to 2 2	85	6002	uint RWES
o.tb [o.tb]	*Output Digital (1 to 2)* **Fixed Time Base** Set the time base for fixed-time-base control.	0.1 to 60.0 seconds (solid-state relay or switched dc) 5.0 to 60.0 seconds (mechanical relay or no-arc power control)	0.1 sec. [SSR & sw dc] 20.0 sec. [mech, relay, no-arc]	***Instance 1*** *Map 1* 884 *Map 2* 1004 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 1 to 2 3	86	6003	float RWES
o.Lo [o.Lo]	*Output Digital (1 to 2)* **Low Power Scale** The power output will never be less than the value specified and will represent the value at which output scaling begins.	0.0 to 100.0%	0.0%	***Instance 1*** *Map 1* 896 *Map 2* 1016 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 1 to 2 9	87	6009	float RWES
o.hi [o.hi]	*Output Digital (1 to 2)* **High Power Scale** The power output will never be greater than the value specified and will represent the value at which output scaling stops.	0.0 to 100.0%	100.0%	***Instance 1*** *Map 1* 898 *Map 2* 1018 Offset to next instance (*Map 1 & Map 2*) equals +30	0x6A (106) 1 to 2 0xA (10)	88	6010	float RWES
o.ty [o.ty]	*Output Process (1)* **Output Type** Select whether the process output will operate in volts or milliamps.	volt Volts (104) mA Milliamps (112)	Volts	***Instance 1*** *Map 1* 720 *Map 2* 840	0x76 (118) 1 1	95	18001	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
Fn [Fn]	*Output Process (1)* **Output Function** Set the type of function that will drive this output.	oFF Off (62) duPl Duplex (212) Cool Cool (20) hEAt Heat (36) rMtr Retransmit (213) Ent.b Profile Event Out B (234) Ent.A Profile Event Out A (233) ALM Alarm (6)	Off	***Instance 1*** *Map 1* *Map 2* 722 842	0x76 (118) 1 2	96	18002	uint RWES
r.Sr [r.Sr]	*Output Process (1)* **Retransmit Source** Select the value that will be retransmitted.	A i Analog Input (142) StPt Set Point (85) Curr Current (22) Pu Process Value (241)	Analog Input	***Instance 1*** *Map 1* *Map 2* 724 844	0x76 (118) 1 3	97	18003	uint RWES
F i [Fi]	*Output Process (1)* **Output Function Instance** Set the instance of the function selected above.	1 to 4	1	***Instance 1*** *Map 1* *Map 2* 726 846	0x76 (118) 1 4	98	18004	uint RWES
S.Lo [S.Lo]	*Output Process (1)* **Scale Low** Set the scale low for process output in electrical units. This value; in volts or milliamps, will correspond to 0% PID power output or range low retransmit output.	-100.0 to 100.0	0.00	***Instance 1*** *Map 1* *Map 2* 736 856	0x76 (118) 1 9	99	18009	float RWES
S.hi [S.hi]	*Output Process (1)* **Scale High** Set the scale high for process output in electrical units. This value; in volts or milliamps, will correspond to 100% PID power output or range high retransmit output. .	-100.0 to 100.0	10.00	***Instance 1*** *Map 1* *Map 2* 738 858	0x76 (118) 1 0xA (10)	100	18010	float RWES
r.Lo [r.Lo]	*Output Process (1)* **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	***Instance 1*** *Map 1* *Map 2* 740 860	0x76 (118) 1 0xB (11)	101	18011	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
r.hi [r.hi]	*Output Process (1)* **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	100°F or units 38°C	***Instance 1*** *Map 1* *Map 2* 742 862	0x76 (118) 1 0xC (12)	102	18012	float RWES
o.CA [o.CA]	*Output Process (1)* **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	***Instance 1*** *Map 1* *Map 2* 732 852	0x76 (118) 1 7	105	18007	float RWES
ALM1 SEt **Alarm Menu**								
A.ty [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) dE.AL Deviation Alarm (24)	Off	***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)	20	9015	uint RWES
Sr.A [Sr.A]	*Alarm (1 to 4)* **Alarm Source** Select what will trigger this alarm.	nonE None (61) A 1 Analog Input (142) Lnr Linearization (238) Pu Process Value (241) PUJr Power (73) CUr Current RMS (179) CUrr Current Read Sample and Hold (22)	- - - -	***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)	21	9017	uint RWES
A.hy [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	***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	24	9003	float RWES
A.Lg [A.Lg]	*Alarm (1 to 4)* **Logic** Select what the output condition will be during the alarm state.	AL.C Close On Alarm (17) AL.o Open On Alarm (66)	Close On Alarm	***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	25	9005	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
A.Sd [A.Sd]	*Alarm (1 to 4)* **Sides** Select which side or sides will trigger this alarm.	both Both (13) h igh High (37) Lolo Low (53)	Both	***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	26	9004	uint RWES
A.Lo [A.Lo]	*Alarm (1 to 4)* **Low Set Point** If Type (Setup Page, Alarm Menu) is set to: **process** - set the process value that will trigger a low alarm. **deviation** - set the span of units from the Set Point that will trigger a low alarm. A negative set point represents a value below Set Point. A positive set point represents a value above Set Point.	-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	***Instance 1*** *Map 1* *Map 2* 1482 1882 Offset to next instance (*Map 1*) equals +50 Offset to next instance (*Map 2*) equals +60	0x6D (109) 1 to 4 2	18	9002	float RWES
A.hi [A.hi]	*Alarm (1 to 4)* **High Set Point** If Type (Setup Page, Alarm Menu) is set to: **process** - set the process value that will trigger a high alarm. **deviation** - set the span of units from the Set Point 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	***Instance 1*** *Map 1* *Map 2* 1480 1880 Offset to next instance (*Map 1*) equals +50 Offset to next instance (*Map 2*) equals +60	0x6D (109) 1 to 4 1	19	9001	float RWES
A.LA [A.LA]	*Alarm (1 to 4)* **Latching** Turn Latching on or off. A latched alarm has to be turned off by the user.	nLAt Non-Latching (60) LAt Latching (49)	Non-Latching	***Instance 1*** *Map 1* *Map 2* 1492 1892 Offset to next instance (*Map 1 equals +50, for Map 2* equals +60)	0x6D (109) 1 to 4 7	27	9007	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	***Instance 1*** *Map 1* *Map 2* 1494 1894 Offset to next instance (*Map 1 equals +50, for Map 2* equals +60)	0x6D (109) 1 to 4 8	28	9008	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
A.Si [A.Si]	*Alarm (1 to 4)* **Silencing** Turn Silencing on to allow the user to disable this alarm.	oFF Off (62) on On (63)	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	29	9006	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	***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)	30	9016	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	***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)	31	9021	uint RWES
A.CLr [A.CLr]	*Alarm (1 to 4)* **Clear Request** Clear a latched alarm. **Note:** If an alarm is setup to latch when active A.CLr will appear on the display.	CLr Clear (0) iGnr Ignore (204)	- - - -	***Instance 1*** *Map 1* 1504 *Map 2* 1904 Offset to next instance (*Map 1 equals +50, for Map 2* equals +60)	0x6D (109) 1 to 4 0x0D (13)	- - - -	9013	uint W
A.Sir [A.Sir]	*Alarm (1 to 4)* **Silence Alarm** Disable alarm action. **Note:** If an alarm is setup to silence an alarm, when active A.Sir will appear on the display.	SiL Silence (1010)	- - - -	***Instance 1*** *Map 1* 1506 *Map 2* 1906 Offset to next instance (*Map 1 equals +50, for Map 2* equals +60)	0x6D (109) 1 to 4 0x0E (14)	- - - -	9014	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**

Setup Page								
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
A.St [`A.St]	*Alarm (1 to 4)* **Alarm State** Display the alarm state in the Home Page.	Str Startup (88) nonE None (61) bLo Blocked (12) AL.L Alarm Low (8) AL.h Alarm High (7) AL.E Error (28)	- - - -	***Instance 1*** *Map 1* *Map 2* 1496 1896 Offset to next instance (*Map 1 equals +50, for Map 2* equals +60)	0x6D (109) 1 to 4 0x09 (9)	- - - -	9009	uint R
tMr SEt **Timer Menu**								
t.En [ti.En]	*Timer* **Timer Enable** Enable the timer function.	YES Yes (106) no No (59)	Yes	***Instance 1*** *Map 1* *Map 2* - - - - 8556	0x83 (131) 1 0x1D (29)	- - - -	31029	uint RWES
t.St [ti.St]	*Timer* **Timer Start Method** Select what will start the timer.	IMd Immediate (1049) rdY Ready Band (1942) rdYA Ready Ack (1950) PLdr Power (73)	Immediate	***Instance 1*** *Map 1* *Map 2* - - - - 8558	0x83 (131) 1 0x1E (30)	- - - -	31030	uint RWES
SFn.A [SFn.A]	*Timer* **Source Function A** Select which input will start or terminate the timer.	FUn Function Key (1001) nonE None (61) d.io Digital I/O (1142)	Function Key	***Instance 1*** *Map 1* *Map 2* - - - - 8500	0x83 (131) 1 0x01 (1)	- - - -	31001	uint RWES
S.iA [Si.A]	*Timer* **Source Instance A** Select an instance of Function A.	1 to 24	8	***Instance 1*** *Map 1* *Map 2* - - - - 8504	0x83 (131) 1 0x03 (3)	- - - -	31003	uint RWES
SFn.C [SFn.C]	*Timer* **Source Function C** Select the analog source for the ready band.	Pu Process Value (241) nonE None (61) Ai.i Analog Input (142) Lnr Linearization (238)	Process Value	***Instance 1*** *Map 1* *Map 2* - - - - 8560	0x83 (131) 1 0x1F (31)	- - - -	31031	uint RWES
S.iC [Si.C]	*Timer* **Source Instance C** Select an instance of Function C.	1 to 24	1	***Instance 1*** *Map 1* *Map 2* - - - - 8564	0x83 (131) 1 0x21 (33)	- - - -	31033	uint RWES
SFn.d [SFn.D]	*Timer* **Source Function D** Select which input will acknowledge the ready band.	FUn Function Key (1001) nonE None (61) d.io Digital I/O (1142)	Function Key	***Instance 1*** *Map 1* *Map 2* - - - - 8562	0x83 (131) 1 0x20 (32)	- - - -	31032	uint RWES
S.id [Si.d]	*Timer* **Source Instance D** Select an instance of Function D.	1 to 24	7	***Instance 1*** *Map 1* *Map 2* - - - - 8566	0x83 (131) 1 0x22 (34)	- - - -	31034	uint RWES
t.r [t.r]	*Timer* **Time Remaining** Display the time remaining on the timer.	00.00 00:00 to 99:59	7	***Instance 1*** *Map 1* *Map 2* - - - - - - - -	0x83 (131) 1 0x15 (21)	- - - -	31021	string 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**

Setup Page								
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
r.bS [r.bS]	*Timer* **Ready Band State** Display whether the process value is in the ready band.	YES Yes (106) no No (59)	- - - -	***Instance 1*** *Map 1* *Map 2* - - - - 8542	0x83 (131) 1 0x16 (22)	- - - -	31022	uint R
rdY [rdY]	*Timer* **Ready Band** Set the how close the process value must be to the closed loop timer set point to be in the ready band.	0.000 to 9999.000°F or units 0.000 to 5555.000°C	5.000	***Instance 1*** *Map 1* *Map 2* - - - - 8544	0x83 (131) 1 0x17 (23)	- - - -	31023	float RWES
t.For [t.For]	*Timer* **Time Format** Select the time format.	tPnS Time Minutes:Seconds (1943) thnn Time Hours:Minutes (1944)	Time Minutes: Seconds	***Instance 1*** *Map 1* *Map 2* - - - - 8546	0x83 (131) 1 0x18 (24)	- - - -	31024	uint RWES
hoUr [hoUr]	*Timer* **Hours** Set the timer period hours.	0 to 99	0	***Instance 1*** *Map 1* *Map 2* - - - - 8548	0x83 (131) 1 0x19 (25)	- - - -	31025	uint RWES
Mn in [Min]	*Timer* **Minutes** Set the timer period minutes.	0 to 59	0	***Instance 1*** *Map 1* *Map 2* - - - - 8550	0x83 (131) 1 0x1A (26)	- - - -	31026	uint RWES
SEC [SEC]	*Timer* **Seconds** Set the timer period seconds.	0 to 59	10	***Instance 1*** *Map 1* *Map 2* - - - - 8552	0x83 (131) 1 0x1B (27)	- - - -	31027	uint RWES
Ct.SP [Ct.SP]	*Timer* **Closed Loop Timer Set Point** Set the set point that will be in effect during the timer period.	-1999.000 to 9999.000°F or units -1110.555 to 5555.000°C	75	***Instance 1*** *Map 1* *Map 2* - - - - 8554	0x83 (131) 1 0x1C (28)	- - - -	31028	float RWES
St [St]	*Timer* **Signal Time** Set the period of time that a signal output to be activated after the timer period is complete. Assign a digital output for this function in Timer Event Output 3.	1 to 3600 Seconds	1	***Instance 1*** *Map 1* *Map 2* - - - - 8588	0x83 (131) 1 0x2D (45)	- - - -	31045	uint RWES
FUn SEt **Function Key Menu**								
LEv [LEv]	*Function Key (1 to 2)* **Active Level** The Function Key will always power up in the low state. Pressing the Function Key will toggle the selected action.	High High (37) Low Low (53)	High	***Instance 1*** *Map 1* *Map 2* 1360 1600 ***Instance 2*** *Map 1* *Map 2* 1380 1620	0x6E (110) 1 to 2 1	137	10001	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
Fn [Fn]	*Function Key (1 to 2)* **Action Function** Program the EZ Key to trigger an action. Functions respond to a level state change or an edge level change.	nonE None (61) uSr.r User Set Restore, edge triggered (227) PLoC Keypad Lockout, level triggered (217) ALM9 Alarm Reset, edge triggered (6) S.iL Silence Alarms, edge triggered (108) AoF Control Loops Off and Alarms to Non-alarm State, level triggered (220) F.AL Force Alarm To Occur, level triggered (218) .dLE Idle Set Point, level triggered (107) tUnE Tune, edge triggered (98) M9An Manual Mode, level triggered (54) oFF Switch Control Loop Off, level triggered (90) t.dA TRU-TUNE+® Disable, level triggered (219) P.d.S Profile Disable, level triggered (206) P.hoL Profile Hold/ Resume, level triggered (207) ProF Start Profile, edge triggered (196) P.StS Profile Start/Stop, level triggered (208) S.StP Start Step (1077)	None	***Instance 1*** *Map 1* *Map 2* 1364 1604 ***Instance 2*** *Map 1* *Map 2* 1384 1624	0x6E (110) 1 to 2 3	138	10003	uint RWES
F. [Fi]	*Function Key (1 to 2)* **Function Instance** Select which instance the EZ Key will affect. If only one instance is available, any selection will affect it.	0 to 4	0	***Instance 1*** *Map 1* *Map 2* 1364 1606 ***Instance 2*** *Map 1* *Map 2* 1384 1626	0x96 (110) 1 to 2 4	139	10004	uint RWES
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	***Instance 1*** *Map 1* *Map 2* 1838 2308	0x67 (103) 1 5	110	3005	uint RWES
AC.LF [AC.LF]	*Global* **AC Line Frequency** Set the frequency to the applied ac line power source.	50 50 Hz (3) 60 60 Hz (4)	60 Hz	***Instance 1*** *Map 1* *Map 2* 886 1006	0x6A (106) 1 4	89	1034	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
r.tYP [R.tyP]	*Global* **Ramping Type**	rATE Ramp Rate (81) t i Ramp Time (143)	Ramp Time	***Instance 1*** *Map 1* *Map 2* - - - - 4414	0x7A (122) 1 0x26 (38)	- - - -	22038	uint RWE
P.tYP [P.tyP]	*Global* **Profile Type** Set the profile startup to be based on a set point or a process value.	StPt Set Point (85) Pro Process (75)	Set Point	***Instance 1*** *Map 1* *Map 2* 2534 4354	0x7A (122) 1 8	- - - -	22008	uint RWE
gSE [gSE]	*Global* **Guaranteed Soak Enable** Enables the guaranteed soak deviation function in profiles.	oFF Off (62) on On (63)	Off	***Instance 1*** *Map 1* *Map 2* 2530 4350	0x7A (122) 1 6	- - - -	22006	uint RWE
gSd1 [gSd1]	*Global* **Guaranteed Soak Deviation 1** Set the value of the deviation band that will be used in all profile step types. The process value must enter the deviation band before the step can proceed.	0.0 to 9,999.000°F or units 0.0 to 5,555.000°C	10.0°F or units 6.0°C	***Instance 1*** *Map 1* *Map 2* 2532 4352	0x7A (122) 1 7	- - - -	22007	float RWE
Si.A [Si.A]	*Global* **Source Instance A** Set the digital source for Wait for Event 1 in profile.	5 to 6	5	***Instance 1*** *Map 1* *Map 2* - - - - 4390	0x7A (122) 1 0x1A (26)	- - - -	22060	uint RWES
Si.b [Si.b]	*Global* **Source Instance B** Set the digital source for Wait for Event 2 in profile.	5 to 6	5	***Instance 1*** *Map 1* *Map 2* - - - - 4392	7A (122) 1 0x1B (27)	- - - -	22061	uint RWES
Poti [Poti]	*Global* **Power Off Time** If profile is running and power is lost, profile will resume where it left off provided time set has not expired prior to power restoration.	0 to 9999 seconds	0	***Instance 1*** *Map 1* *Map 2* - - - - 4484	7A (122) 1 0x49 (73)	- - - -	22073	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**

***** Available with PM4, PM8 and PM9 models only

Setup Page								
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
Sutb [Sutb]	*Global* **Synchronized Variable Time Base** Used to acquire tighter accuracy when running a profile or using the Timer feature. A setting of +0.01 would equate to approximately +9 seconds/day (faster) where a setting of -0.01 would equate to approximately -9 seconds/day (slower).	-2.00 to 2.00 Percent	0.00	- - - -	- - - -	- - - -	- - - -	float RWES
C.LEd [C.LEd]	*Global* **Communications LED Action** Turns comms LED on or off for selected comms ports.	Con1 Comm port 1 (1189) oFF Off (62)	Comm port 1	***Instance 1*** *Map 1* 1856 *Map 2* 2326	0x6A (103) 1 0x0E (14)	- - - -	3014	uint RWES
Zone [Zone]	*Global* **Zone** Turns Zone LED on or off based on selection.	oFF Off (62) on On (63)	On	***Instance 1*** *Map 1* - - - - *Map 2* 2350	0x6A (103) 1 0x1A (26)	- - - -	3026	uint RWES
Chan [Chan]	*Global* **Channel** Turns Channel LED on or off based on selection.	oFF Off (62) on On (63)	On	***Instance 1*** *Map 1* - - - - *Map 2* 2352	0x6A (103) 1 0x1B (27)	- - - -	3027	uint RWES
dPrS [dPrS]	*Global* **Display Pairs** Defines the number of Display Pairs.	1 to 10	2	***Instance 1*** *Map 1* - - - - *Map 2* 2354	0x6A (103) 1 0x1C (28)	- - - -	3028	uint RWES
dt i [d.ti]	*Global* **Display Time** Time delay in toggling between display pairs.	0 to 60	0	***Instance 1*** *Map 1* - - - - *Map 2* 2356	0x6A (103) 1 0x1D (29)	- - - -	3029	uint RWES
USr.S [USr.S]	*Global* **Restore Settings From** Save all of this controller's settings to the selected set.	SEt1 User Set 1 (101) SEt2 User Set 2 (102) nonE None (61)	None	***Instance 1*** *Map 1* 26 *Map 2* 26	0x(101) 1 0xE (14)	118	1014	uint RWE
USr.r [USr.r]	*Global* **Save Settings As** Save all of the controller's settings to the selected set.	FCty Factory (31) nonE None (61) SEt1 User Set 1 (101) SEt2 User Set 2 (102)	None	***Instance 1*** *Map 1* 24 *Map 2* 24	0x65 (101) 1 0xD (13)	117	1013	uint RWE
CoM SEt **Communications Menu**								
PCoL [PCoL]	*Communications* **Protocol** Set the protocol of this controller to the protocol that this network is using.	Std Standard Bus (1286) Mod Modbus RTU (1057)	Modbus	***Instance 1*** *Map 1* 2492 *Map 2* 2972	0x96 (150) 1 7	- - - -	17009	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
Ad.S [Ad.S]	*Communications* **Standard Bus Address** 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	***Instance 1*** *Map 1* *Map 2* 2480 2960	0x96 (150) 1 1	- - - -	17001	uint RWE
Ad.M [Ad.M]	*Communications* **Modbus Address** Set the network address of this controller. Each device on the network must have a unique address.	1 to 247	1	***Instance 1*** *Map 1* *Map 2* 2482 2962	0x96 (150) 1 2	- - - -	17007	uint RWE
bAUd [bAUd]	*Communications* **Baud Rate** Set the speed of this controller's communications to match the speed of the Modbus serial network.	9600 9,600 (188) 19.2 19,200 (189) 38.4 38,400 (190)	9,600	***Instance 1*** *Map 1* *Map 2* 2484 2964	0x96 (150) 1 3	- - - -	17002	uint RWE
PAr [PAr]	*Communications* **Parity** *(1)* Set the parity of this controller to match the parity of the Modbus serial network.	nonE None (61) EuEn Even (191) odd Odd (192)	None	***Instance 1*** *Map 1* *Map 2* 2486 2966	0x96 (150) 1 4	- - - -	17003	uint RWE
M.hL [M.hL]	*Communications* **Modbus Word Order** Select the word order of the two 16-bit words in the floating-point values.	Loh ı Low-High (1331) h ıLo High-Low (1330)	Low-High	***Instance 1*** *Map 1* *Map 2* 2488 2968	0x96 (150) 1 5	- - - -	17043	uint RWE
C_F [C_F]	*Communications* **Display Units** Select whether this communications channel will display in Celsius or Fahrenheit. **Note:** Applies to Modbus only.	F Fahrenheit (30) C Celsius (15)	F	***Instance 1*** *Map 1* *Map 2* 2490 2970	0x96 (150) 1 6	- - - -	17050	uint RWE
MAP [Map]	*Communications* **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	If 9th digit of part number is a 1, 2, 3 or D.	- - - -	- - - -	- - - -	17059	- - - -
nV.S [nV.S]	*Communications* **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	***Instance 1*** *Map 1* *Map 2* 2494 2974	0x96 (150) 1 8	198	17051	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**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
rtC (Available with PM4, PM8 and PM9 models only) SEt **Real Time Clock Menu**								
hour [hoUr]	*Real Time Clock* **Hours** Set the current time.	0 to 23	0	***Instance 1*** *Map 1* *Map 2* - - - - 4004	0x88 (136) 1 3	- - - -	36003	uint RW
Min [Min]	*Real Time Clock* **Minutes** Set the current time.	0 to 59	0	***Instance 1*** *Map 1* *Map 2* - - - - 4006	0x88 (136) 1 4	- - - -	36004	uint RW
dowd [doW]	*Real Time Clock* **Day of Week** Set the current day of the week.	Sun Sunday (1565) Mon Monday (1559) tuE Tuesday (1560) wEd Wednesday (1561) thur Thursday (1562) Fri Friday (1563) SAt Saturday (1564)	Sun	***Instance 1*** *Map 1* *Map 2* - - - - 4002	0x88 (136) 1 2	- - - -	36002	uint RW
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**

7 Chapter 7: Profiling Page

Navigating the Profiling 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 sub-menus will appear.

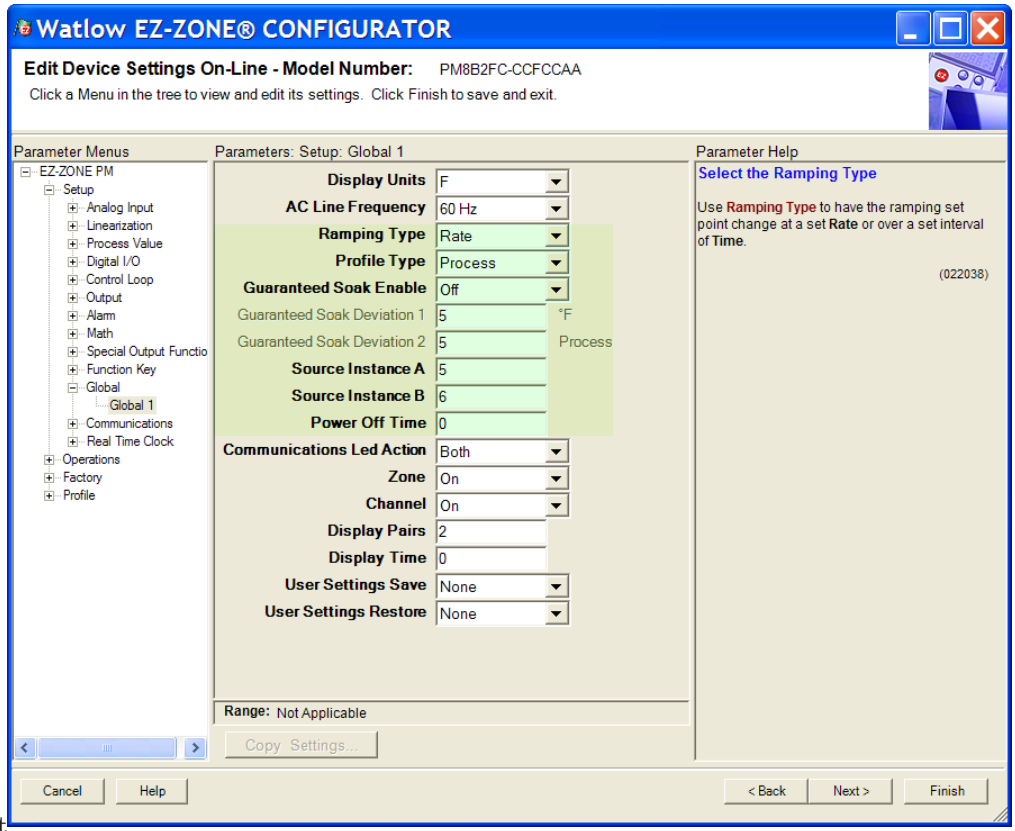
Profile Setup

First, consider some foundational profile *setup* features that once configured, will apply to all configured profiles.

The screen shot below (EZ-ZONE Configurator software) graphically shows the settings (shaded green)that will apply to all profiles; e.g., if Guaranteed Soak is not enabled here this feature will not be available in any individual profile configuration.

Some of those features that apply to all profiles are listed below with a brief description of their function.

- **Ramping Type** (Ramp Time or Ramp Rate) which changes the profile set point based on a set interval of time or set rate.
- **Profile Type** (Set Point or Process) determines whether a step (any step changing the set point) of a profile will begin by using the process value (Process) or the last Set Point (Set Point).
- **Guaranteed Soak Enable**, when set to On makes this feature available in all profiles. If Guaranteed Soak Enable is on, use Guaranteed Soak Deviation 1 to 2 to set the value for the corresponding loop. Set the deviation or band above or below the working set point where this condition must be met before the profile can proceed.



Note:

Changes made in the Profiling Page take effect on the next pass through the step. Changes made in the Profile Status Page effect the current step being executed and do not update the step setting in the profiling page. These parameters should only be changed by knowledgeable personnel and with caution.

Once these global profile features are configured, the next step will require navigation to the Profiling Page. Here, each desired ramp and soak profile will be configured.

To navigate to the Profile Page from the front panel, follow the steps below:

1. From the Home Page, press and hold the Advance Key for approximately five seconds. The profile prompt [PrOF] will appear in the lower display and the profile number (e.g. [P 1]) appears in the upper display.

2. Press the Up or Down key to change to another profile (1 to 4).
3. Press the Advance Key to move to the selected profiles first step.
4. Press the Up or Down keys to move through and select the step type.
5. Press the Advance Key to move through the se- lected step settings.
6. Press the Up or Down keys to change the steps settings.
7. Press the Infinity Key at any time to return to the step number prompt.
8. Press the Infinity Key again to return to the profile number prompt.
9. From any point press and hold the Infinity Key for two seconds to return to the Home Page.

If using EZ-ZONE Configurator software, simply click on the plus sign next to Profiles in the left hand column, as shown in the screen shot below.

Notice in the screen shot to the right some fields or parameters are not selectable (grayed out) based on the Step Type that is selected.

Starting a Profile

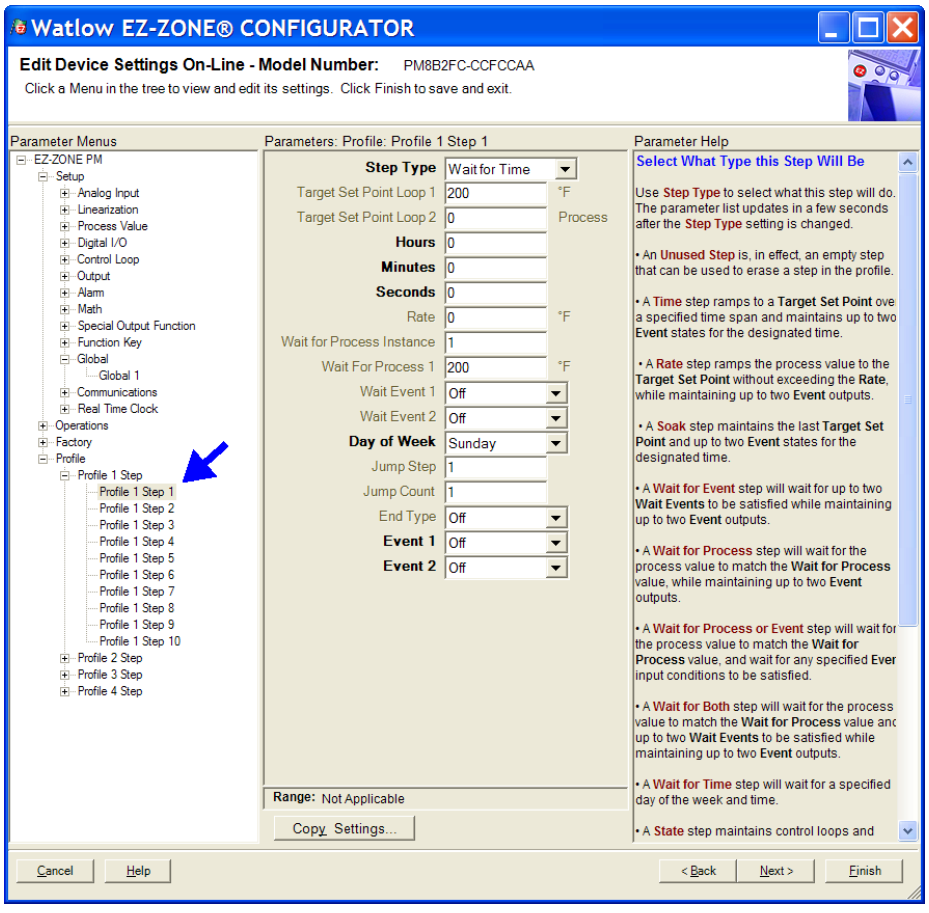
There are several ways to start a profile. Some of the examples that follow requires that certain optional hardware be available on the control. If you are uncertain as to how your control is equipped, compare the part number of your control to the "Ordering Information" page found in the Appendix of this Users Guide.

Ways to start a profile:

- Function Key
- Digital Input
- Profile Request

Configuring the Function Key to Start and Stop a Profile

1. Navigate to the Setup Page and then the Function menu. From the Home Page, press and hold the Up or Down key for approximately six seconds where the upper display will show [A1] and the lower display will show [SEt].
2. Press the Up or Down key to navigate to the Function [Fun] menu.
3. Press the Advance Key to enter this menu. The upper display will show [hIGh] and the lower display will show [LEv].
4. Press the Up or Down keys to select the level that will start the profile (high or low).
5. Press the Advance Key to select the function. In this example, select Profile Start / Stop [PSES].



6. Press the Advance Key to select the function instance (Profile to start).
7. Return to the Home Page by pressing and holding the Infinity Key for approximately three seconds.

Note:

The state of the EZ-Function Key (high or low) is maintained with each successive push of the key.

Configuring a Digital Input to Start and Stop a Profile

1. Navigate to the Setup Page and then the Digital I/O menu. From the Home Page, press and hold the Up or Down key for approximately six seconds where the upper display will show [A 1] and the lower display will show [SEt].
2. Press the Up or Down key to navigate to the Digital I/O menu. Upper display will show [d IO] and the lower display will show [SEt].
3. Press the Advance Key where the first available digital instance will be displayed in the upper display.
4. Press the Up or Down key to select the input of choice.
5. Press the Advance Key to select the direction (input or output). In this example, select Dry Contact [dIcn].
6. Select the level (high or low) that will activate the function by pressing the Advance Key where the upper display will show [hIGh] and the lower display will show [LEv].
7. Press the Up or Down keys to select the level that will start the profile (high = closed or low = open).
8. Press the Advance Key to select the function. In this example, select Profile Start / Stop [P.StS].
9. Press the Advance Key to select the function instance (Profile to start).
10. Return to the Home Page by pressing and holding the Infinity Key for approximately three seconds.

Starting a Profile from the Operations Page

1. Navigate to the Operations Page and then the Profile Status menu. From the Home Page, press and hold the Up or Down key for approximately three seconds where the upper display will show [A 1] and the lower display will show [oPEr].
2. Press the Up or Down key to navigate to the Profile Status [P.StA] menu.
3. Press the Advance Key to enter this menu. The upper display will show [1] and the lower display will show [P.Str].
4. Press the Up or Down keys to select the Profile or Step to start. In this example select 1.
5. Press the Advance Key to select the Profile Action Request. The upper display will show [nonE] and the lower display will show [P.ACr].
6. Press the Up or Down keys to select the Profile start. The upper display will show [PrOF] and the lower display will show [P.ACr].

Note:

As soon as the Green Advance key is pressed (step 7 below) the designated Profile or Step (as determined in step 4 above) will start.

7. Press the Advance Key to select whether Event 1 will be on or off. The upper display will show [oFF] and the lower display will show [Ent 1].

Note:

This setting will temporally override the profile configuration.

8. Press the Up or Down keys to select whether Event 1 will be on or off. This will immediately drive the Event to the specified state regardless of the Profile configuration.
9. Press the Advance Key to select whether Event 2 will be on or off. The upper display will show [oFF] and the lower display will show [Ent2]. The event state will continue as when the profile ended and may be toggled in the Profile Status Menu.
10. Press the Up or Down keys to select whether Event 2 will be on or off. This will immediately drive the Event to the specified state regardless of the Profile configuration.
11. Press the Advance Key to see the current Jump Count. The upper display will show [0] and the lower display will show [JC].
12. Return to the Home Page by pressing and holding the Infinity Key for approximately three seconds.

Ending a Profile from the Operations Page

1. Navigate to the Operations Page and then the Profile Status menu. From the Home Page, press and hold the Up or Down key for approximately three seconds where the upper display will show [A 1] and the lower display will show [oPEr].
2. Press the Up or Down key to navigate to the Profile Status [P.StA] menu.
3. Press the Advance Key to enter this menu. The upper display will show [1] and the lower display will show [P.Str].
4. Press the Advance Key to select the Profile Action Request. The upper display will show [nonE] and the lower display will show [P.ACr].
6. Press the Up or Down keys to select the End. The upper display will show [End] and the lower display will show [P.ACr].
7. Press the Advance Key to end the Profile.
8. Return to the Home Page by pressing and holding the Infinity Key for approximately three seconds.

Starting a Profile from the Home Page

1. When at the Home Page, press the Advance Key to locate Profile Start and select the file or step number to start. The upper display will show [1] and the lower display will show [P.St 1].
2. Press the Up or Down key to choose the file or step number.
3. Press the Advance Key to select the Profile Action Request. The upper display will show [nonE] and the lower display will show [P.AC 1].
4. Press the Up or Down keys to select the Profile Start. The upper display will show [ProF] and the lower display will show [P.AC 1].
5. Press the Infinity Key to return Home. The Profile will Start

Ending a Profile from the Home Page

1. Press the Advance Key to select the Profile Action Request. The upper display will show [nonE] and the lower display will show [P.AC 1].
2. Press the Up or Down keys to select the End. The upper display will show [End] and the lower display will show [P.AC 1]
3. Press the Infinity Key to return Home. The Profile will End.

Profiling Parameters

[P 1]
[ProF] **Profile (1 to 4)**
  [1]
  [P 1] **Profile [1 to 4] Step (1 to 40)**
    [StYP] **Step Type**
    [tSP 1] **Target Set Point Loop 1**
    [hour] **Hours**
    [Min] **Minutes**
    [SEC] **Seconds**
    [rAtE] **Ramp Rate**
    [WtP 1] **Wait For Process 1**
    [WtE 1] **Wait Event 1**
    [WtE2] **Wait Event 2**
    [dowt] **Day of Week**
    [JS] **Jump Step**
    [JC] **Jump Count**
    [End] **End Type**
    [Ent 1] **Event 1**
    [Ent2] **Event 2**

Profiling Page							
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Parameter ID**	**Data Type & Read/ Write**
PI ProF **Profiling Menu**							
PI [P1] to P4 [P4]	**Profile [1 to 4] Step** Select a step to edit or view.	1 to 10 [profile 1] 11 to 20 [profile 2] 21 to 30 [profile 3] 31 to 40 [profile 4]	- - - -	- - - -	- - - -	- - - -	- - - -
StYP [S.typ]	**Step Type** Select a step type. **Note:** When configuring the profile type there will be a Ramp Time prompt as delivered from the factory (default). If rate is desired navigate to the Setup Page and then the Global Menu where Ramping Type can be changed.	USTP Unused Step (50) SoAH Soak (87) LuE Wait For Event (144) LuPr Wait For Process (209) Lubo Wait For Both (210) JL Jump (116) End End (27) CLoC Wait For Time (1543) t1 Ramp Time (143) rAtE Ramp Rate (81)	Unused	***Instance 1*** *Map 1* *Map 2* 2570 4500 Offset to next instance (*Map 1 equals +50, Map 2* equals +100)	0x79 (121) 1 to (40) 1	21001	uint RWE
t.SP1 [t.SP1]	*Step Type Parameters* **Target Set Point Loop 1** When Step Type is Ramp Time or Ramp Rate, enter the Set Point for loop 1 to ramp to for this step.	-1,999.000 to 9,999.000°F or units -1,128 to 5,537.000°C	0.0°F or units -18°C	***Instance 1*** *Map 1* *Map 2* 2572 4502 Offset to next instance (*Map 1 equals +50, Map 2* equals +100)	0x79 (121) 1 to (40) 2	21002	float RWE
hoUr [hoUr]	*Step Type Parameters* **Hours** When Step Type is Time, Soak, or Wait For Time, enter Hours (plus Minutes and Seconds) for this step.	0 to 99	0	***Instance 1*** *Map 1* *Map 2* 2574 4504 Offset to next instance (*Map 1 equals +50, Map 2* equals +100)	0x79 (121) 1 to (40) 3	21003	uint RWE
Min [Min]	*Step Type Parameters* **Minutes** When Step Type is Ramp Time, Soak, or Wait For Time enter Minutes (plus Hours and Seconds) for this step.	0 to 59	0	***Instance 1*** *Map 1* *Map 2* 2576 4506 Offset to next instance (*Map 1 equals +50, Map 2* equals +100)	0x79 (121) 1 to (40) 4	21004	uint RWE
SEC [SEC]	*Step Type Parameters* **Seconds** When Step Type is Ramp Time, Soak, or Wait For Time enter Seconds (plus Hours and Minutes) for this step.	0 to 59	0	***Instance 1*** *Map 1* *Map 2* 2578 4508 Offset to next instance (*Map 1 equals +50, Map 2* equals +100)	0x79 (121) 1 to (40) 5	21005	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**

Profiling Page							
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Parameter ID**	**Data Type & Read/ Write**
rAtE [rAtE]	*Step Type Parameters* **Ramp Rate** When Step Type is Ramp Rate, enter the rate for ramping in degrees or units per minute.	0 to 9,999.000°F or units per minute 0 to 5,555.000°C per minute	0.0	***Instance 1*** *Map 1* *Map 2* 2580 4510 Offset to next instance (*Map 1 equals +50, Map 2* equals +100)	0x79 (121) 1 to (40) 6	21006	float RWE
W.P1 [W.P1]	*Step Type Parameters* **Wait For Process 1** When Step Type is Wait for Process or Wait For Both, enter wait for process value for analog input 1 before proceeding in profile.	-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	***Instance 1*** *Map 1* *Map 2* 2590 4520 Offset to next instance (*Map 1 equals +50, Map 2* equals +100)	0x79 (121) 1 to (40) 0xB (11)	21011	float RWE
WE.1 [WE.1]	*Step Type Parameters* **Wait Event 1** When Step Type is Wait for Event or Wait For Both, select the event state that must be satisfied during this step. **Note:** Wait Event 1 can be mapped to any available digital input (5 or 6). Navigate to the Global Menu in the Setup Page to find and modify Source Instance A S.iA is Wait Event 1 and Source Instance B S.ib is Wait Event 2.	oFF Off (62) on On (63) nonE None (61)	Off	***Instance 1*** *Map 1* *Map 2* 2586 4516 Offset to next instance (*Map 1 equals +50, Map 2* equals +100)	0x79 (121) 1 to (40) 9	21009	uint RWE
WE.2 [WE.2]	*Step Type Parameters* **Wait Event 2** When Step Type is Wait for Event or Wait For Both, select the event state that must be satisfied during this step. **Note:** Wait Event 1 can be mapped to any available digital input (5 or 6). Navigate to the Global Menu in the Setup Page to find and modify Source Instance A S.iA is Wait Event 1 and Source Instance B S.ib is Wait Event 2.	oFF Off (62) on On (63) nonE None (61)	Off	***Instance 1*** *Map 1* *Map 2* 2588 4518 Offset to next instance (*Map 1 equals +50, Map 2* equals +100)	0x79 (121) 1 to (40) 0xA (10)	21010	uint RWE
dow [dow]	*Step Type Parameters* **Day of Week** When Step Type is Wait for Ramp Time, the profile waits until this setting (Day of Week) along with Hours, Minutes and Seconds are met.	Ed Every Day (1567) wd Week days (1566) Sun Sunday (1565) Mon Monday (1559) tuE Tuesday (1560) wEd Wednesday (1561) thUr Thursday (1562) Fri Friday (1563) SAt Saturday (1564)	Sunday	***Instance 1*** *Map 1* *Map 2* - - - - 4580 Offset to next instance *Map 2* equals +100)	0x79 (121) 1 to (40) 0x29 (41)	21041	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**

Profiling Page							
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Parameter ID**	**Data Type & Read/ Write**
JS [JS]	*Step Type Parameters* **Jump Step** When Step Type is Jump, this setting specifies which step to jump back to. Jump Step must be a lower step number than the current step number.	1 to 40	0	***Instance 1*** *Map 1* *Map 2* 2592 4522 Offset to next instance (*Map 1 equals +50, Map 2* equals +100)	0x79 (121) 1 to (40) 0xC (12)	21012	uint RWE
JC [JC]	*Step Type Parameters* **Jump Count** When Step Type is Jump, this specifies the number of jumps to repeat. A value of 0 creates an infinite loop. Loops can be nested four deep.	0 to 9,999	0	***Instance 1*** *Map 1* *Map 2* 2594 4524 Offset to next instance (*Map 1 equals +50, Map 2* equals +100)	0x79 (121) 1 to (40) 0xD (13)	21013	uint RWE
End [End]	*Step Type Parameters* **End Type** When Step Type is End, this setting specifies what the controller will do when this profile ends. **Note:** End Hold does not affect the control mode, only the Set Point. The profile will return to the control mode before a profile was started.	oFF Control Mode set to Off (62) HoLd Hold last Set Point in the profile (47) USEr User, reverts to previous set point (100)	Off	***Instance 1*** *Map 1* *Map 2* 2596 4526 Offset to next instance (*Map 1 equals +50, Map 2* equals +100)	0x79 (121) 1 to (40) 0xE (14)	21014	uint RWE
Ent1 [Ent1]	*Step Type Parameters* **Event 1** When Step Type is not Unused Step, select whether Event Output 1 or 2 is on or off during this step.	oFF Off (62) on On (63)	Off	***Instance 1*** *Map 1* *Map 2* 2582 4512 Offset to next instance (*Map 1 equals +50, Map 2* equals +100)	0x79 (121) 1 to (40) 7	21007	uint RWE
Ent2 [Ent2]	*Step Type Parameters* **Event 2** When Step Type is not Unused Step, select whether Event Output 1 or 2 is on or off during this step.	oFF Off (62) on On (63)	Off	***Instance 1*** *Map 1* *Map 2* 2584 4514 Offset to next instance (*Map 1 equals +50, Map 2* equals +100)	0x79 (121) 1 to (40) 8	21008	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**

Display	Step Type Description	Parameters in Step Type
uStP [UStP]	*Step Types* **Unused Step** This is an empty step that can be used to plan for future steps to be inserted or temporarily deactivate a step in a profile. Change step type back when the step should be active again.	- - - -
t i [ti]	*Step Types* **Ramp Time** If Ramping Type in the Global Menu of the Setup Page is set for Ramp Time, the state of up to 2 event outputs may be set or maintained.	tSP1 Target Set Point Loop 1 hour Hours mn in Minutes SEC Seconds Ent1 Event 1 Ent2 Event 2
rAtE [rAtE]	*Step Types* **Ramp Rate** If Ramping Type in the Global Menu of the Setup Page is set for Ramp Rate, specify the rate of change in degrees or units per minute. The state of up to 2 event outputs may be set or maintained.	tSP1 Target Set Point Loop 1 rAtE Ramp Rate Ent1 Event 1 Ent2 Event 2
SoAh [SoAh]	*Step Types* **Soak** A Soak Step maintains the last Target Set Points for the designated time. The state of up to 2 event outputs may be set or maintained.	hour Hours mn in Minutes SEC Seconds Ent1 Event 1 Ent2 Event 2
CLoC [CLoC]	*Step Types* **Wait For Time** A Wait for Time Step is available with the real-time calendar clock feature. This allows the program to wait for a specified day and time before proceeding to the next step. Used to have the profile execute steps everyday or only weekdays. The state of up to 2 event outputs may be set or maintained.	hour Hours mn in Minutes SEC Seconds doW Day of Week Ent1 Event 1 Ent2 Event 2
W.E [W.E]	*Step Types* **Wait For Event** A Wait for Event Step will wait for the two Wait for Event states (1 to 2) to match the specified state. The state of up to 2 event outputs may be set or maintained.	WE.1 Wait Event 1 WE.2 Wait Event 2 Ent1 Event 1 Ent2 Event 2
W.Pr [W.Pr]	*Step Types* **Wait For Process** A Wait for Process Step will wait for Process Value 1 or 2 to match the Wait for Process Value. The state of up to 2 event outputs may be set or maintained.	WP i Wait for Process Instance WP1 Wait for Process 1 Value Ent1 Event 1 Ent2 Event 2
W.bo [W.bo]	*Step Types* **Wait For Both** A Wait For Process and Event Step will wait for Process Value 1 or 2 to match the Wait for Process 1 value, and/or the two Wait Event states to match the specified state. The state of up to 2 event outputs may be set or maintained.	WP i Wait for Process Instance WP1 Wait for Process 1 Value WE.1 Wait Event 1 WE.2 Wait Event 2 Ent1 Event 1 Ent2 Event 2
JL [JL]	*Step Types* **Jump** A Jump step will repeat previous steps a number of times designated in Jump Count. Jumps can be nested up to four deep. The state of up to 2 event outputs may be set or maintained. This step type not available in subroutine.	JS Jump Step JC Jump Count Ent1 Event 1 Ent2 Event 2
End [End]	*Step Types* **End** An End Step will end the profile and set the control modes and set points to match the End Type. The state of up to 2 event outputs may be set or maintained. The event outputs will not be set off unless specifically stated in this step. If a profile does not have an End Step, the profile continues until step 40, then stops and maintains the last set points and control modes.	End End Type Ent1 Event 1 Ent2 Event 2

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 Infinity keys for six seconds.

- Press the Advance Key to enter the menu of choice.
- If a submenu exists (more than one instance), press the Up or Down key to select and then press the Advance Key to enter.
- 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 infor mation in the Appendix for more information. If there is only one instance of a menu, no sub-menus will appear.

CUSt
FCty **Custom Setup Menu**
  1
  CUSt **Custom Setup (1 to 20)**
  PAr Parameter
    ,id Instance ID

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

ULoC
FCty **Security Setting Menu**
    CodE **Public Key**
    PASS **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**

CAL
FCty **Calibration Menu**
  1
  CAL **Calibration (1 to 2)**
    MMu **Electrical Measurement**
    EL .o **Electrical Input Offset**
    EL .S **Electrical Input Slope**
    ELo.o **Electrical Output Offset**
    ELo.S **Electrical Output Slope**
    Pn **Part Number**
    CodE **Public Key**

Factory Page								
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
CuSt Fcty **Custom Menu**								
PAr [Par]	*Custom* **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 . **Note:** Display Pairs affect the pairing of custom parameters on the Home page. For more information on Display Pairs see the section in this guide entitled "Modifying the Display Pairs"	nonE None Pro Process .CA Calibration Offset C_F Display Units USr.r Save Settings As A.Lo Low Set Point A.h i High Set Point A.hy Hysteresis CUSt Custom Menu StPt Set Point AC.Pu Active Process Value AC.SP Active Set Point oP Manual Power AUt Autotune C.Pn Control Mode h.Pr Heat Power C.Pr Cool Power t i Time Integral t d Time Derivative db Dead Band h.Pb Heat Proportional Band h.hy On/Off Heat Hysteresis C.Pb Cool Proportional Band C.hy On/Off Cool Hysteresis r.rt Ramp Rate t.tUn TRU-TUNE+® Enable idLE Idle Set Point P.Str Profile Start P.ACr Profile Action Request 9Sd1 Guaranteed Soak Deviation 1	See: Home Page	- - - -	- - - -	- - - -	14005	uint RWES
iid [iid]	*Custom (1 to 20)* **Instance ID** Select which instance of the parameter will be selected.	1 to 4	- - - -	- - - -	- - - -	- - - -	14003	uint RWES
LoC FCty **Security Setting Menu**								
LoC.o [LoC.o]	*Security Setting* **Operations Page** Change the security level of the Operations Page.	1 to 3	2	- - - -	- - - -	- - - -	3002	uint RWE
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces. **If there is only one instance of a menu, no submenus will appear.**								**R: Read** **W: Write** **E: EEPROM** **S: User Set**

Factory Page								
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
LoCP [LoC.P]	*Security Setting* **Profiling Page** Change the security level of the Profiling Page.	1 to 3	3	- - - -	- - - -	- - - -	3008	uint RWE
PASE [LoC.P]	*Security Setting* **Password Enable** Set to on to require a password for menu changes.	oFF Off on On	Off	- - - -	- - - -	- - - -	3009	uint RWE
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	- - - -	- - - -	- - - -	3010	uint RWE
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	- - - -	- - - -	- - - -	3011	uint RWE
LoCL [LoC.L]	*Security Setting* **Locked Access Level** Determines user level menu visibility when Password Enable is set to on. See Features section under Password Security.	1 to 5	5	- - - -	- - - -	- - - -	3016	uint RWE
roLL [roLL]	*Security Setting* **Rolling Password** When power is cycled a new Public Key will be displayed and User Password changes.	oFF Off on On	Off	- - - -	- - - -	- - - -	3019	uint RWE
PAS.u [PAS.u]	*Security Setting* **User Password** Used to acquire access to menus made available through the Locked Access Level setting.	10 to 999	63	- - - -	- - - -	- - - -	3017	uint RWE
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces. **If there is only one instance of a menu, no submenus will appear.**								**R: Read** **W: Write** **E: EEPROM** **S: User Set**

Factory Page								
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
PASA [PAS.A]	*Security Setting* **Administrator Password** Used to acquire full access to all menus including disabling or changing passwords.	10 to 999	156	- - - -	- - - -	- - - -	3018	uint RWE
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. The key can be used to gain access when the password is not known.	Customer Specific	0	- - - -	- - - -	- - - -	3020	uint R
PASS [PASS]	*Security Setting* **Password** Enter the User or Administrator password to gain access. Exit this menu and re-enter Factory Page, Security menu after valid password is supplied.	-1999 to 9999	0	- - - -	- - - -	- - - -	3022	int RW
diAG FCty **Diagnostics Menu**								
Pn [Pn]	*Diagnostics* **Part Number** Display this controller's part number.	15 characters	- - - -	- - - -	0x65 (101) 1 9	115	1009	string RWE
rEu [rEu]	*Diagnostics* **Software Revision** Display this controller's firmware revision number.	1 to 10	- - - -	- - - -	0x65 (101) 1 0x11 (17)	116	1003	string R
S.bLd [S.bLd]	*Diagnostics* **Software Build Number** Display the firmware build number.	0 to 2,147,483,647	- - - -	***Instance 1*** *Map 1* *Map 2* 8 8	0x65 (101) 1 5	- - - -	1005	dint R
Sn [Sn]	*Diagnostics* **Serial Number** Display the serial number.	0 to 2,147,483,647	- - - -	- - - -	0x65 (101) 1 0x20 (32)	- - - -	1032	string RWE
dAtE [dAtE]	*Diagnostics* **Date of Manufacture** Display the date code (YYWW). Where YY = year and WW= week..	0 to 2,147,483,647	- - - -	***Instance 1*** *Map 1* *Map 2* 14 14	0x65 (101) 1 8	- - - -	1008	dint RWE
No Display	*Diagnostics* **Hardware ID** Display the Hardware ID.	0 to 2,147,483,647	- - - -	***Instance 1*** *Map 1* *Map 2* 0 0	0x65 (101) 1 1	- - - -	1001	dint R
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces. **If there is only one instance of a menu, no submenus will appear.**								**R: Read** **W: Write** **E: EEPROM** **S: User Set**

Factory Page								
Display	**Parameter Name Description**	**Range**	**Default**	**Modbus Relative Address**	**CIP Class Instance Attribute hex (dec)**	**Profibus Index**	**Parameter ID**	**Data Type & Read/ Write**
No Display	*Diagnostics* **Firmware ID** Display the Firmware ID.	0 to 2,147,483,647	- - - -	***Instance 1*** *Map 1* *Map 2* 2 2	0x65 (101) 1 2	- - - -	1002	dint R
CAL FCty **Calibration Menu**								
Pnu [Mv]	*Calibration (1 to 2)* **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	- - - -	***Instance 1*** *Map 1* *Map 2* 400 400 ***Instance 2*** *Map 1* *Map 2* 480 490	0x68 (104) 1 to 2 0x15 (21)	- - - -	4021	float R
EL.io [ELi.o]	*Calibration (1 to 2)* **Electrical Input Offset** Change this value to calibrate the low end of the input range.	-1,999.000 to 9,999.000	0.0	***Instance 1*** *Map 1* *Map 2* 378 378 ***Instance 2*** *Map 1* *Map 2* 458 468	0x68 (104) 1 to 2 0xA (10)	- - - -	4010	float RWES
EL.iS [ELi.S]	*Calibration (1 to 2)* **Electrical Input Slope** Adjust this value to calibrate the slope of the input value.	-1,999.000 to 9,999.000	1.0	***Instance 1*** *Map 1* *Map 2* 380 380 ***Instance 2*** *Map 1* *Map 2* 460 470	0x68 (104) 1 to 2 0xB (11)	- - - -	4011	float RWES
ELo.o [ELo.o]	*Calibration (1 or 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	- - - -	- - - -	- - - -	18005	- - - -
ELo.S [ELo.S]	*Calibration (1 or 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	- - - -	- - - -	- - - -	18006	- - - -
Pn [Pn]	*Calibration (1 to 3)* **Part Number** Displays current setting for control model number.	FCty Factory USEr User	Factory	- - - -	- - - -	- - - -	- - - -	uint R
CodE [CodE]	*Calibration (1 to 3)* **Public Key** Changes the control to the user model number or back to the original model number as shown on the side of the control.	2501 User model number 606 Factory model number (User is either Express, if ordered as Standard, or Standard, if ordered as Express.)	4999	- - - -	- - - -	- - - -	- - - -	uint RWES
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces. **If there is only one instance of a menu, no submenus will appear.**								**R: Read** **W: Write** **E: EEPROM** **S: User Set**

9 Chapter 9: Features

Changing PM PID Model Number to PM User Mode

EZ-ZONE PM PID firmware revisions of 13 and above allow the user to switch between a PM PID control to a PM Express PID. Switching to a PM Express PID eliminates the complexity of the PM PID control by allowing the user to operate with a simplified menu structure.

Note:

When switching from a PID control to an Express version, optional PM hardware (even though installed) and firmware features not available in a PM Express will no longer work. To see exactly what is impacted by this change, compare the chart below to the ordering information page in this document.

Controller — PM _ _ _ _ _ - _ _ _ _ B _ _

EZ-ZONE® PID Controller **Changes to PM Express**
Red-green 7-segment displays

Package Size
No Change

Primary Function

C	PID Controller with Universal Input
R, T, B	**Changes to C**
J	PID Controller with Universal Input
N, E	**Changes to J**
S	Custom Firmware

Power Supply

1	100 to 240V ~ (ac)
2	**Changes to 1**
3	15 to 36V⎓ (dc) and 24V~ (ac)
4	**Changes to 3**

Output 1 and 2 Hardware Options

	Output 1	Output 2
CA	Switched dc/open collector	None
CH	Switched dc/open collector	NO-ARC 15 A power control
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
EH	Mechanical relay 5 A, form C	NO-ARC 15 A power control
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 (cannot use variable time base)
FJ	Universal process	Mechanical relay 5 A, form A (cannot use variable time base)
FK	Universal process	Solid-state relay 0.5 A, form A (cannot use variable time base)
AK	None	Solid-state relay 0.5 A, form A
KH	Solid-state relay 0.5 A, form A	NO-ARC 15 A power control
KK	Solid-state relay 0.5 A, form A	Solid-state relay 0.5 A, form A

Communications Options or Additional Digital I/O
None
- Standard Bus EIA-485 always included - all models

Future Options
None

Isolated Input Option

B	**Changes to Express**

Custom Options

AA	Standard EZ-ZONE face plate
12	Class 1, Div. 2 (Not available with Integrated Limit Controller or mechanical relay outputs)
AB	EZ-ZONE logo and no Watlow name
AC	No logo and no Watlow name
AG	Conformal coating
XX	Custom firmware, overlays, parameter settings

How to Change the PM Control Model Number to User Mode

1. Enter Factory Page FCty, Calibration Menu CAL via front panel by pressing the Infinity ∞ or Reset Key and the Advance Key ◉ together or using EZ-ZONE Configurator software.
2. Once there, use the Advance Key ◉ to navigate to the Part Number Pn prompt (green display). The red display will show factory FCty indicating the factory model number as shown on the decal located on the side of the control is currently in effect.
3. Push the Advance Key ◉, Public Key CodE prompt will be displayed in the green display and the number 4999 in the red display.
4. Using the up or down Arrow Keys enter 2501 and push the Advance Key ◉ to execute the change. The controller will reboot and the new controller model number is in effect. All previous settings are lost and the controller must be reprogrammed for the application. Be sure to label the controller with the new model number for future reference.

Note:

As noted above, when switching from a PM Standard to a PM Express version, optional hardware (even though installed) may no longer work, and all settings will default to those of the selected model.

How to Restore Original Factory Mode PM Model Number

1. Enter Factory Page FCty, Calibration Menu CAL via front panel by pressing the Infinity ∞ or Reset Key and the Advance Key ◉ together or using EZ-ZONE Configurator software.
2. Once there, use the Advance Key ◉ to navigate to the Part Number Pn prompt (green display). The red display will show user USEr indicating the user's selected model number is currently in effect.
3. Push the Advance Key ◉, Public Key CodE prompt will be displayed in the green display and the number 4999 in the red display.
4. Using the up or down arrow keys enter 606 and push the Advance Key ◉ to execute the change. The controller will reboot and the new controller model number is in effect. All previous settings are lost and the controller must be reprogrammed for the application. Be sure to label the controller with the new model number for future reference.

Note:

When switching from a PM Express back to the original model number all original optional hardware will again be enabled for use (assuming all original hardware is still installed). Also, when executing this step the controller will be factory defaulted back to the original model number (as shown on the side of the control) at zone address 1. This appropriate User's Guide would once again apply to this control.

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 Restore Settings From USr.S (Setup Page, Global 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 (Setup Page, Global 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.

Note:

When restoring factory defaults, I/O assemblies for Modbus, DeviceNet, Profibus and Ethernet along with the zone address will be overwritten when restoring factory defaults.

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).

Tuning the PID Parameters

Autotuning

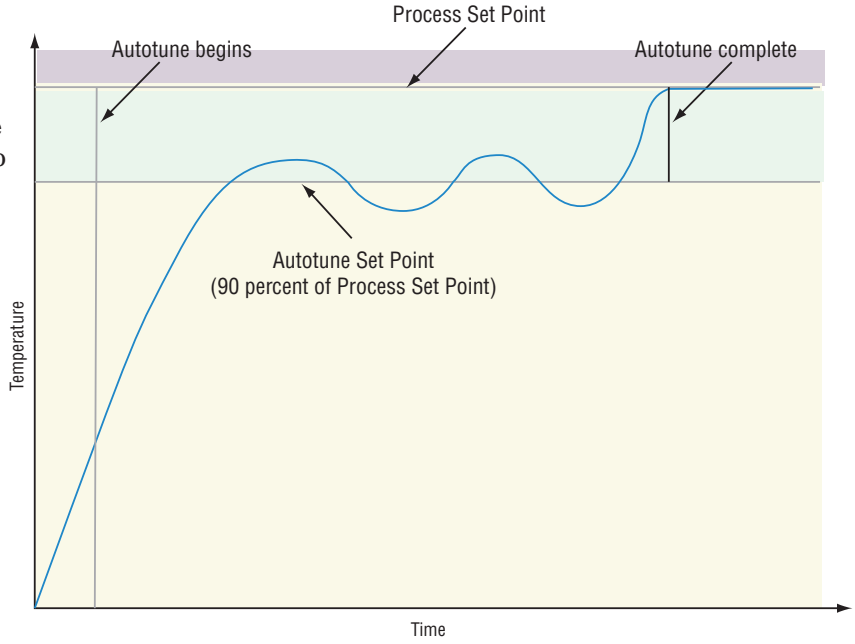
When an autotune is performed on the EZ-ZONE PM, the set point is used to calculate the tuning set point.

For example, if the active set point is 200° and Autotune Set Point AtSP (Operations Page, Loop Menu) is set to 90 percent, the autotune function utilizes 180° for tuning. This is also how autotuning works in previous Watlow Winona controllers. In addition, changing the active set point in previous controllers causes the autotune function to restart; where with the EZ-ZONE PM changing the set point after an autotune has been started has no affect.

A new feature in EZ-ZONE PM products will alMinimum Set Point changes while the control is autotuning, this includes while running a profile or ramping. When the auto tune is initially started it will use the current set point and will disregard all set point changes until the tuning process is complete. Once complete, the controller will then use the new set point.

This is why it is a good idea to enter the active set point before initiating an autotune.

Autotuning calculates the optimum heating and/or cooling PID parameter settings based on the system's response. Autotuning can be enabled whether or not TUNE-TUNE+® is enabled. The PID settings generated by the autotune will be used until the autotune feature is rerun, the PID values are manually adjusted or TRU-TUNE+® is enabled.



To initiate an autotune, set Autotune AUt (Operations Page, Loop Menu) to YES. You should not autotune while a profile is running. If the autotune cannot be completed in 60 minutes, the autotune will time-out and the original settings will take effect.

The lower display will flash between tUnE and the set point while the autotuning is underway. The temperature must cross the Autotune Set Point five times to complete the autotuning process. Once complete, the controller controls at the normal set point, using the new parameters.

Select a set point for the tune with Autotune Set Point. The Autotune Set Point is expressed as a percent of the Set Point.

If you need to adjust the tuning procedure's aggressiveness, use Autotune Aggressiveness tAGr (Setup Page, Loop Menu). Select under damped Undr to bring the process value to the set point quickly. Select over damped ouEr to bring the process value to the set point with minimal overshoot. Select critical damped Cr it to balance a rapid response with minimal overshoot.

Manual Tuning

In some applications, the autotune process may not provide PID parameters for the process characteristics you desire. If that is the case, you may want to tune the controller manually.

1. Apply power to the controller and establish a set point typically used in your process.
2. Go to the Operations Page, Loop Menu, and set Heat Proportional Band [h.Pb] and/or Cool Proportional Band [C.Pb] to 5. Set Time Integral [t.I] to 0. Set Time Derivative [t.d] to 0.
3. When the system stabilizes, watch the process value. If it fluctuates, increase the Heat Proportional Band or Cool Proportional Band value in 3 to 5° increments until it stabilizes, allowing time for the system to settle between adjustments.
4. When the process has stabilized, watch Heat Power [h.Pr] or Cool Power [C.Pr] (Operations Page, Monitor Menu). It should be stable ±2%. At this point, the process temperature should also be stable, but it will have stabilized before reaching the set point. The difference between the set point and actual process value can be eliminated with Integral.
5. Start with an Integral value of 6,000 and allow 10 minutes for the process temperature to reach the set point. If it has not, reduce the setting by half and wait another 10 minutes. Continue reducing the setting by half every 10 minutes until the process value equals the set point. If the process becomes unstable, the Integral value is too small. Increase the value until the process stabilizes.
6. Increase Derivative to 0.1. Then increase the set point by 11° to 17°C. Monitor the system's approach to the set point. If the process value overshoots the set point, increase Derivative to 0.2. Increase the set point by 11° to 17°C and watch the approach to the new set point. If you increase Derivative too much, the approach to the set point will be very sluggish. Repeat as necessary until the system rises to the new set point without overshoot or sluggishness.

For additional information about autotune and PID control, see related features in this chapter.

Autotuning with TRU-TUNE+®

The TRU-TUNE+® adaptive algorithm will optimize the controller's PID values to improve control of dynamic processes. TRU-TUNE+® monitors the process variable and adjusts the control parameters automatically to keep your process at set point during set point and load changes. When the controller is in the adaptive control mode, it determines the appropriate output signal and, over time, adjusts control parameters to optimize responsiveness and stability. The TRU-TUNE+® feature does not function for on-off control.

The preferred and quickest method for tuning a loop is to establish initial control settings and continue with the adaptive mode to fine tune the settings.

Setting a controller's control mode to tune starts this two-step tuning process. (See Autotuning in this chapter.) This predictive tune determines initial, rough settings for the PID parameters. Then the loop automatically switches to the adaptive mode which fine tunes the PID parameters.

Once the process variable has been at set point for a suitable period (about 30 minutes for a fast process to roughly two hours for a slower process) and if no further tuning of the PID parameters is desired or needed, TRU-TUNE+® may be turned off. However, keeping the controller in the adaptive mode allows it to automatically adjust to load changes and compensate for differing control characteristics at various set points for processes that are not entirely linear.

Once the PID parameters have been set by the TRU-TUNE+® adaptive algorithm, the process, if shut down for any reason, can be restarted in the adaptive control mode.

Turn TRU-TUNE+® on or off with TRU-TUNE+® Enable [tE.tUn] (Setup Page, Loop Menu).

Use TRU-TUNE+® Band [tE.bnd] (Setup Page, Loop Menu) to set the range above and below the set point in which adaptive tuning will be active. Adjust this parameter only in the unlikely event that the controller is unable to stabilize at the set point with TRU-TUNE+® Band set to auto (0). This may occur with very fast processes. In that case, set TRU-TUNE+™ Band to a large value, such as 100.

Use TRU-TUNE+® Gain [tE.gn] (Setup Page, Loop Menu) to adjust the responsiveness of the adaptive tuning calculations. Six settings range from 1, with the most aggressive response and most potential overshoot (highest gain), to 6, with the least aggressive response and least potential for overshoot (lowest gain). The default setting, 3, is recommended for loops with thermocouple feedback and moderate response and overshoot potential.

Before Tuning

Before autotuning, the controller hardware must be installed correctly, and these basic configuration parameters must be set:

- Sensor Type [SEn] (Setup Page, Analog Input Menu), and scaling, if required;
- Function [Fn] (Setup Page, Output Menu) and scaling, if required.

How to Autotune a Loop

1. Enter the desired set point or one that is in the middle of the expected range of set points that you want to tune for.
2. Disable TRU-TUNE+®.
3. Initiate an autotune. (See Autotuning in this chapter.)
4. Enable TRU-TUNE+® only after autotune is complete.

When autotuning is complete, the PID parameters should provide good control. As long as the loop is in the adaptive control mode, TRU-TUNE+® continuously tunes to provide the best possible PID control for the process.

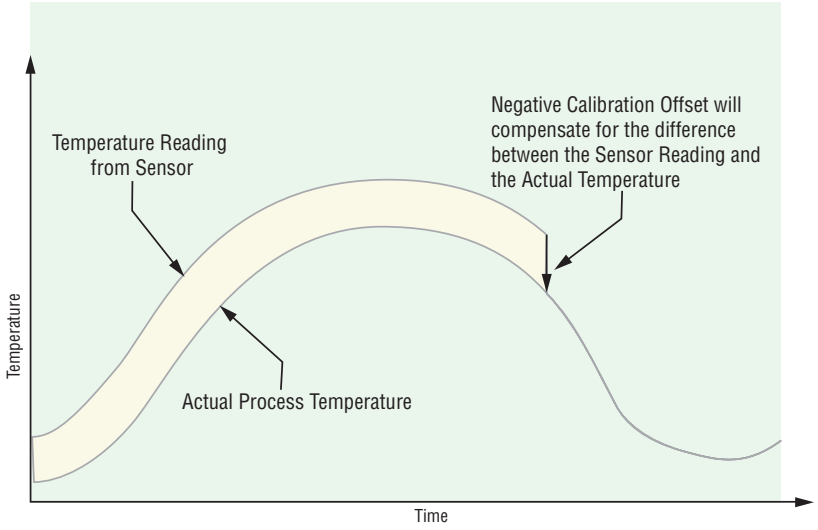
WARNING! During autotuning, the controller sets the output to 100 percent and attempts to drive the process variable toward the set point. Enter a set point and heat and cool power limits that are within the safe operating limits of your system.

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 [.CA] (Operations Page, Analog Input Menu).



Calibration

Before performing any calibration procedure, verify that the displayed readings are not within published specifications by inputting a known value from a precision source to the analog input. Next, subtract the displayed value with the known value and compare this difference to the published accuracy range specification for that type of input.

Use of the Calibration Offset [.CA] parameter found in the Operations Page [oPEr], Analog Input Menu [A1] shifts the readings across the entire displayed range by the offset value. Use this parameter to compensate for sensor error or sensor placement error. Typically this value is set to zero.

Equipment required while performing calibration: Obtain a precision source for millivolts, volts, mil-

liamperes or resistance depending on the sensor type to be calibrated. Use copper wire only to connect the precision source to the controller's input. Keep leads between the precision source and controller as short as possible to minimize error. Use a precision volt/ohm meter capable of reading values to 4 decimal places or better. Prior to calibration, connect this volt/ohm meter to the precision source to verify accuracy.

Actual input values do NOT have to be exactly the recommended values, but it IS critical that the actual value of the signal connected to the controller be accurately known to at least four digits.

Calibration of Analog Inputs:

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

Sensor Type	Precision Source Low	Precision Source High
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	350.0 Ω
1,000 Ω RTD	500.0 Ω	3,500 Ω
thermistor 5 kΩ	50.00	5,000
thermistor 10 kΩ	150.0	10,000
thermistor 20 kΩ	1,800	20,000
thermistor 40 kΩ	1,700	40,000
potentiometer	0.000	1,200

Note:

The user may only calibrate one sensor type. If the calibrator interferences with open thermocouple detection, set Sensor Type [SEn] in Setup Page [SEt], Analog Input Menu [Ai1] to millivolt [mV] instead of Thermocouple [tC] to avoid interference between the calibrator and open thermocouple detect circuit for the duration of the calibration process. Be sure to set sensor type back to the thermocouple type utilized.

1. Disconnect the sensor from the controller.
2. Record the Calibration Offset [1.CA] parameter value in the Operations Page [oPEr], Analog Input Menu [Ai1] then set value to zero.
3. Wire the precision source to the appropriate controller input terminals to be calibrated. Do not have any other wires connected to the input terminals. Please refer to the Install and Wiring section of this document for the appropriate connections.
4. Ensure the controller sensor type is programmed to the appropriate Sensor Type [SEn] to be utilized in the Setup Page [SEt], Analog Input Menu [Ai1].
5. Enter Factory Page [FCty], Calibration Menu [CAL] via RUI or EZ-ZONE Configurator Software.
6. Select the Calibration [CAL] input instance to be calibrated. This corresponds to the analog input to be calibrated.
7. Set Electrical Input Slope [EL 1.S] to 1.000 and Electrical Input Offset [EL 1.o] to 0.000 (this will cancel any prior user calibration values)
8. Input a Precision Source Low value. Read Electrical Measurement value [mV] of controller via EZ-Configurator or RUI. This will be referred to as Electrical Measured Low. Record low value _____
9. Input a Precision Source High value.
10. Read Electrical Measurement value [mV] of controller via EZ-Configurator or RUI. This will be referred to as Electrical Measured High. Record high value _____
11. Calculated Electrical Input Slope = (Precision High – Precision Low) / (Electrical Measured High - Electrical Measured Low). Calculated Slope value _____
12. Calculated Electrical Input Offset = Precision Low - (Electrical Input Slope * Measured Low). Calculated Offset value _____
13. Enter the calculated Electrical Input Slope [EL 1.S] and Electrical Input Offset [EL 1.o].
14. Exit calibration menu.

Calibration of Analog Inputs: (cont.)

15. Validate calibration process by utilizing a calibrator to the analog input.
16. Enter calibration offset as recorded in step 2 if required to compensate for sensor error.

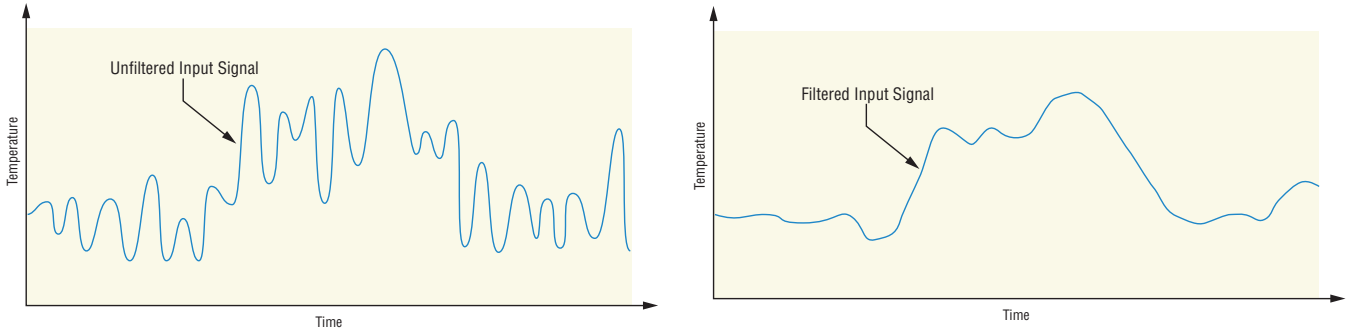
Setting Electrical Input Slope [EL.S] to 1.000 and Electrical Input Offset [EL.o] to 0.000, restores factory calibration as shipped from factory.

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 [FiL] (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

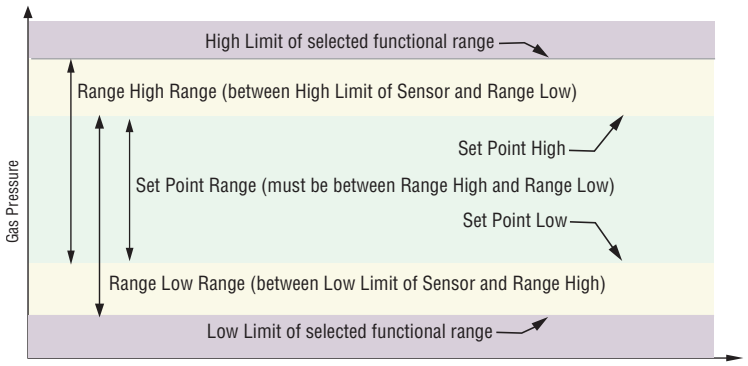
You need to configure the controller to match the input device, which is normally a thermocouple, RTD or process transmitter.

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

Set Point Low Limit and High Limit

The controller constrains the set point to a value between a Minimum Set Pont and a Maximum Set Pont.

Set the set point limits with Minimum Set Point [LSP] and Maximum Set Point [hSP] (Setup Page, Loop Menu).



Range Low and Range High

There are two sets of set point low and high limits: one for a Set Point, another for Manual Power.

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

Scale High and Scale Low (cont.)

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 [SLo] and Scale High [Sh1]. Select the displayed range with Range Low [rLo] and Range High [rh1] (Setup Page, Analog Input Menu).

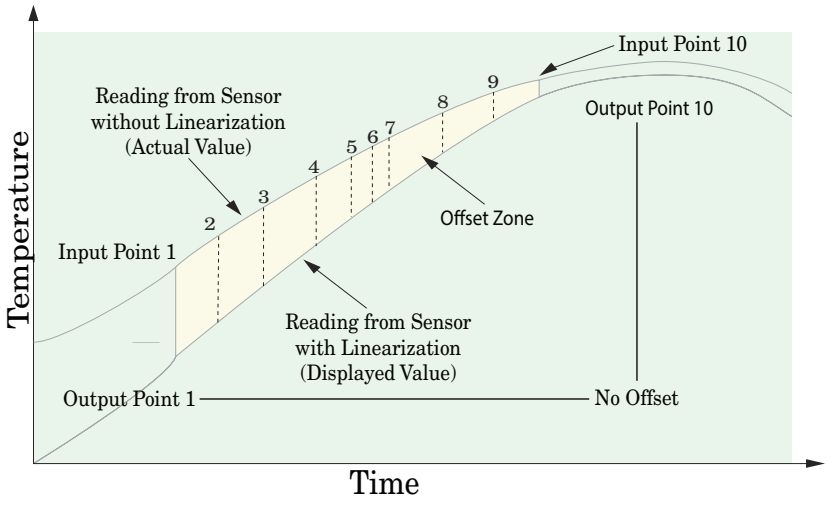
Range High and Range Low

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 [rLo] and Range High [rh1] (Setup Page, Analog Input Menu).

Ten Point Linearization

The linearization function allows a user to re-linearize a value read from an analog input. There are 10 data points used to compensate for differences between the sensor value read (input point) and the desired value (output point). Multiple data points enable compensation for non-linear differences between the sensor readings and target process values over the thermal or process system operating range. Sensor reading differences can be caused by sensor placement, tolerances, an inaccurate sensor or lead resistance.



The user specifies the unit of measurement and then each data point by entering an input point value and a corresponding output point value. Each data point must be incrementally higher than the previous point. The linerization function will interpolate data points linearly in between specified data points.

Note:

Output Point 1 will be the minimum value that can be displayed, and Output Point 10 will be the maximum value that can be displayed. Consider setting Output Point 1 to the minimum operating range, and Output Point 10 to the maximum operating range; for that sensor type.

Outputs

Duplex

Certain systems require that a single process output control both heating and cooling outputs. An EZ-ZONE PM controller with a process output can function as two separate outputs.

With a 4 to 20mA output the heating output will operate from 12 to 20mA (0 to +100 percent) and the cooling output will operate from 12 to 4mA (0 to -100 percent).

In some cases this type of output is required by the device that the EZ-ZONE PM controls, such as a three-way valve that opens one way with a 12 to 20mA signal and opens the other way with a 4 to 12mA signal. This feature reduces the overall system cost by using a single output to act as two outputs.

Duplex (cont.)

Outputs 1 and 3 can be ordered as process outputs. Select duplex [dUPL] as the Output Function [Fn] (Setup Page, Output Menu). Set the output to volts [volt] or milliamps [mA] with Output Type [oty]. Set the range of the process output with Scale Low [SLo] and Scale High [SHi].

NO-ARC Relay

A NO-ARC relay provides a significant improvement in the life of the output relay over conventional relays.

Conventional mechanical relays have an expected life of 100,000 cycles at the rated full-load current. The shorter life for conventional relays is due to the fact that when contacts open while current is flowing metal degradation occurs. This action produces unavoidable electrical arcing causing metal to transfer from one contact to the other. The arcing conditions continue on each subsequent contact opening until over time the resistance through the contacts increases causing the contacts to increase in temperature. Eventually, the contacts will weld together and the relay remains in the on state.

The Watlow NO-ARC relay is a hybrid relay. It uses a mechanical relay for the current load and a triac (solid-state switch) to carry the turn-on and turn-off currents. NO-ARC relays extend the life of the relay more than two million cycles at the rated full-load current.

Although a NO-ARC relay has significant life advantages, a few precautions must be followed for acceptable usage:

Do not use:

- hybrid relays for limit contactors. A limit or safety device must provide a positive mechanical break on all hot legs simultaneously;
- dc loads with hybrid relays. The triacs used for arc suppression will turn off only with ac line voltage;
- hybrid switches to drive any inductive loads, such as relay coils, transformers or solenoids;
- cycle times less than five seconds on hybrid switches;
- on loads that exceed 264V ac through relay;
- on loads that exceed 15 amperes load;
- on loads less than 100 mA;
- NO-ARC relays in series with other NO-ARC relays.

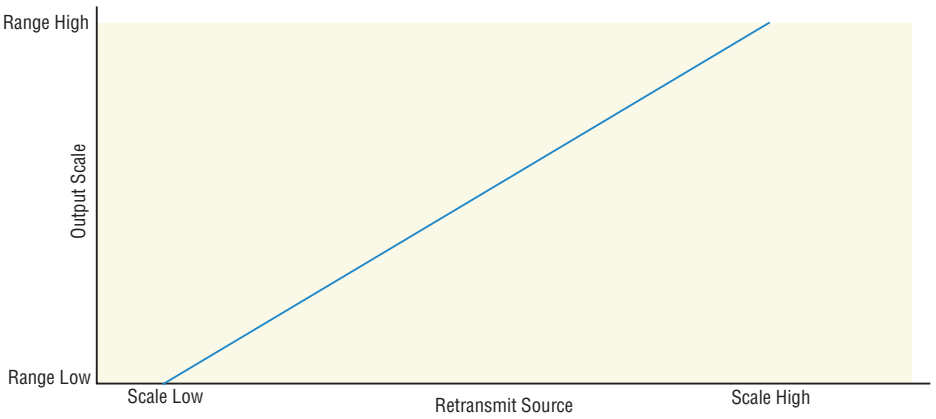
Retransmitting a Process Value or Set Point

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.

Output 1 can be ordered as process outputs. Select retransmit [rTMt] as the Output Function [Fn] (Setup Page, Output Menu). Set the output to volts [volt] or milliamps [mA] with Output Type [oty]. Select the signal to retransmit with Retransmit Source [rSr].



Retransmit

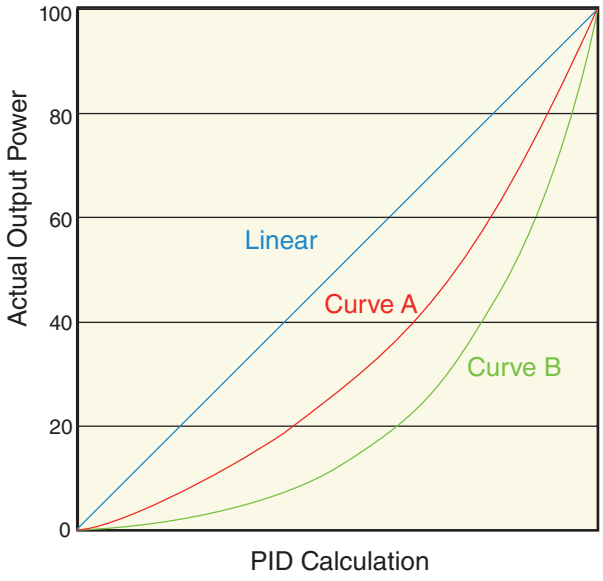
Set the range of the process output with Scale Low [SLo] and Scale High [SHi]. Scale the retransmit source to the process output with Range Low [rLo] and Range High [rHi]. When the retransmit source is at the Range Low value, the retransmit output will be at its Scale Low value. When the retransmit source is at the Range High value, the retransmit output will be at its Scale High value.

Cool Output Curve

A nonlinear output curve may improve performance when the response of the output device is nonlinear. If a cool output uses one of the nonlinear curves a PID calculation yields a lower actual output level than a linear output would provide.

These output curves are used in plastics extruder applications: curve A for oil-cooled extruders and curve B for water-cooled extruders.

Select a nonlinear cool output curve with Cool Output Curve [CCr] (Setup Menu, Loop Menu).



Control Methods

Output Configuration

Each controller output can be configured as a heat output, a cool output, an alarm output or deactivated. No dependency limitations have been placed on the available combinations. The outputs can be configured in any combination. For instance, all three could be set to cool.

Heat and cool outputs use the set point and Operations parameters to determine the output value. All heat and cool outputs use the same set point value. Heat and cool each have their own set of control parameters. All heat outputs use the same set of heat control parameters and all cool outputs use the same set of cool output parameters.

Each alarm output has its own set of configuration parameters and set points, allowing independent operation.

Auto (closed loop) and Manual (open loop) Control

The controller has two basic modes of operation, auto mode and manual mode. Auto mode allows the controller to decide whether to perform closed-loop control or to follow the settings of Input Error Power [FAIL] (Setup Page, Loop Menu). The manual mode only allows open-loop control. The EZ-ZONE PM controller is normally used in the auto mode. The manual mode is usually only used for specialty applications or for troubleshooting.

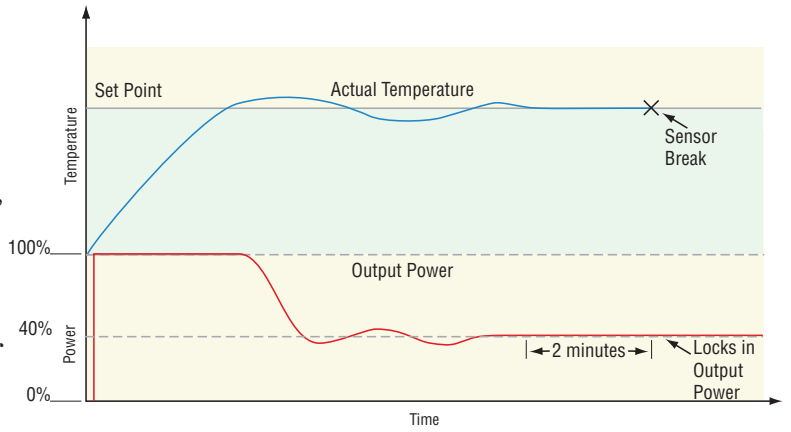
Manual mode is open-loop control that allows the user to directly set the power level to the controller's output load. No adjustments of the output power level occur based on temperature or set point in this mode.

In auto mode, the controller monitors the input to determine if closed-loop control is possible. The controller checks to make certain a functioning sensor is providing a valid input signal. If a valid input signal is present, the controller will perform closed-loop control. Closed-loop control uses a process sensor to determine the difference between the process value and the set point. Then the controller applies power to a control output load to reduce that difference.

If a valid input signal is not present, the controller will indicate an input error message in the upper display and [AtEn] in the lower display and respond to the failure according to the setting of Input Error Power [FAIL]. You can configure the controller to perform a "bumpless" transfer [bPLS], switch power to output a preset fixed level [MAn], or turn the output power off.

Auto (closed loop) and Manual (open loop) Control (cont.)

Bumpless transfer will allow the controller to transfer to the manual mode using the last power value calculated in the auto mode if the process had stabilized at a ±5 percent output power level for the time interval of Time Integral or 10 seconds, whichever is longer, (Operations Page, Loop) prior to sensor failure, and that power level is less than 75 percent.



Bumpless Transfer

Input Error Latching [.Er] (Setup Page, Analog Input Menu) determines the controller's response once a valid input signal returns to the controller. If latching is on, then the controller will continue to indicate an input error until the error is cleared. To clear a latched alarm, press the Advance Key then the Up Key.

If latching is off, the controller will automatically clear the input error and return to reading the temperature. If the controller was in the auto mode when the input error occurred, it will resume closed-loop control. If the controller was in the manual mode when the error occurred, the controller will remain in open-loop control.

The Manual Control Indicator Light % is on when the controller is operating in manual mode. You can easily switch between modes if the Control Mode [Cnf] parameter is selected to appear in the Home Page.

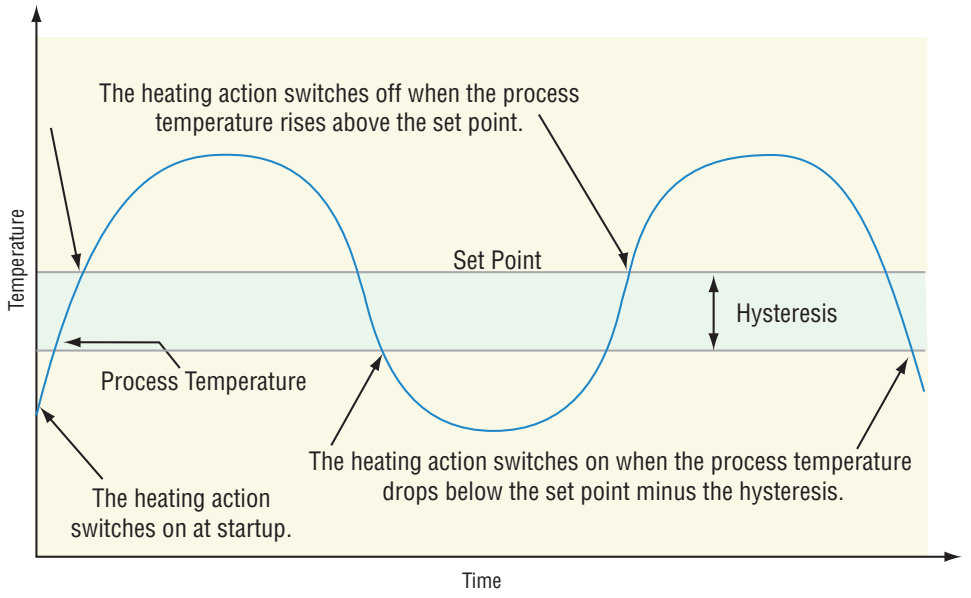
To transfer to manual mode from auto mode, press the Advance Key until [Cnf] appears in the lower display. The upper display will display [Auto] for auto mode. Use the Up or Down keys to select [mAn]. The manual set point value will be recalled from the last manual operation.

To transfer to auto mode from manual mode, press the Advance Key until [Cnf] appears in the lower display. The upper display will display [mAn] for manual mode. Use the Up or Down keys to select [Auto]. The automatic set point value will be recalled from the last automatic operation.

Changes take effect after three seconds or immediately upon pressing either the Advance Key or the Infinity Key.

On-Off Control

On-off control switches the output either full on or full off, depending on the input, set point and hysteresis values. The hysteresis value indicates the amount the process value must deviate from the set point to turn on the output. Increasing the value decreases the number of times the output will cycle. Decreasing hysteresis improves controllability. With hysteresis set to 0, the process value would stay closer to the set point, but the output would switch on and off more frequently, and may result in the output "chattering."



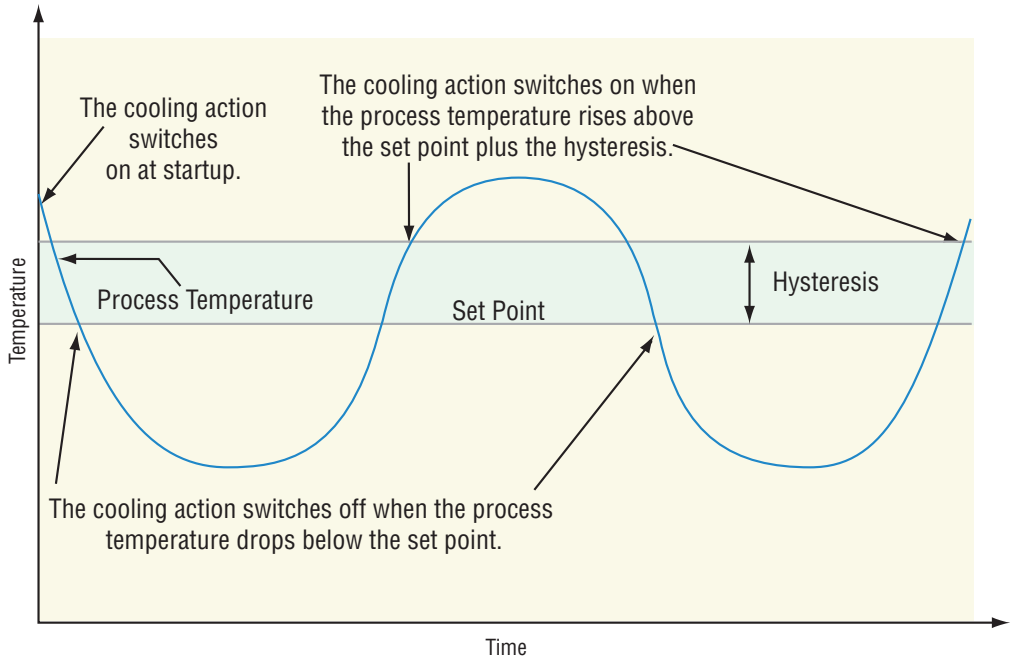
On-off control can be selected with Heat Algorithm [hAG] or Cool Algorithm [CAG] (Setup Page, Loop Menu).

On-off hysteresis can be set with On/Off Heat Hysteresis [hhy] or On/Off Cool Hysteresis [Chy] (Operations Page, Loop Menu).

On-Off Control (cont.)

Note:

Input Error Power Mode FAIL does not function in on-off control mode. The output goes off.



Proportional Control

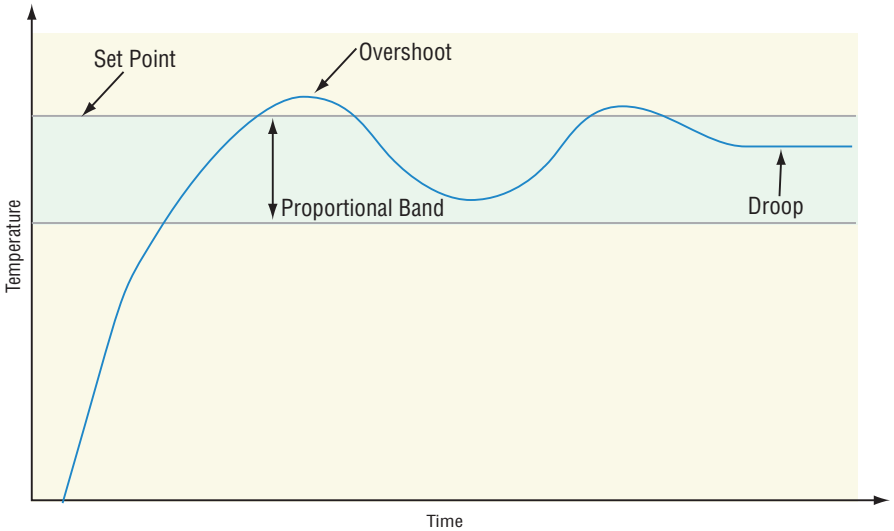
Some processes need to maintain a temperature or process value closer to the set point than on-off control can provide. Proportional control provides closer control by adjusting the output when the temperature or process value is within a proportional band. When the value is in the band, the controller adjusts the output based on how close the process value is to the set point.

The closer the process value is to the set point, the lower the output power. This is similar to backing off on the gas pedal of a car as you approach a stop sign. It keeps the temperature or process value from swinging as widely as it would with simple on-off control. However, when the system settles down, the temperature or process value tends to "droop" short of the set point.

With proportional control the output power level equals (set point minus process value) divided by the proportional band value.

In an application with one output assigned to heating and another assigned to cooling, each will have a separate proportional parameter. The heating parameter takes effect when the process temperature is lower than the set point, and the cooling parameter takes effect when the process temperature is higher than the set point.

Adjust the proportional band with Heat Proportional Band h.Pb or Cool Proportional Band C.Pb (Operations Page, Loop Menu).



Proportional Control

Proportional plus Integral (PI) Control

The droop caused by proportional control can be corrected by adding integral (reset) control. When the system settles down, the integral value is tuned to bring the temperature or process value closer to the set point. Integral determines the speed of the correction, but this may increase the overshoot at startup or when the set point is changed. Too much integral action will make the system unstable. Integral is cleared when the process value is outside of the proportional band.

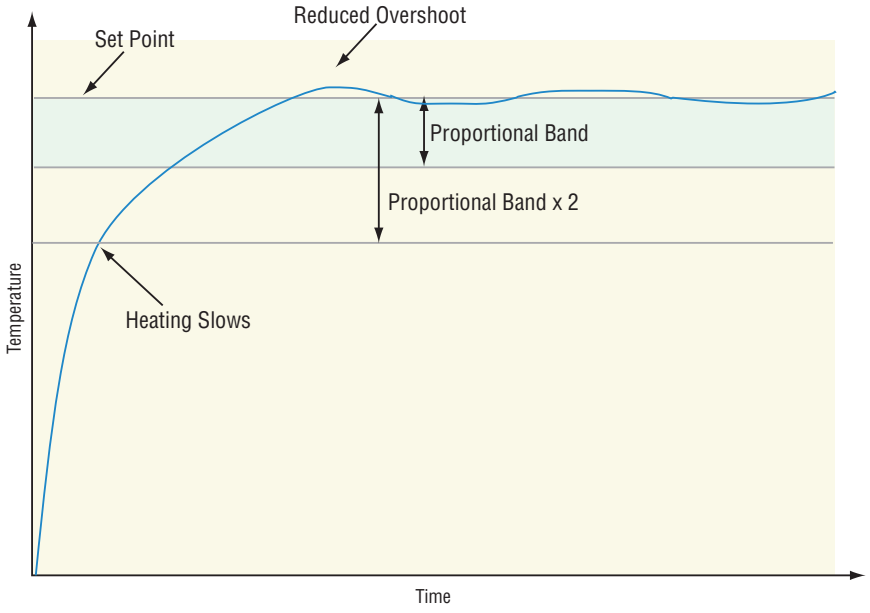
Adjust the integral with Time Integral [t i] (Operations Page, Loop Menu).

Proportional plus Integral plus Derivative (PID) Control

Use derivative (rate) control to minimize the overshoot in a PI-controlled system. Derivative (rate) adjusts the output based on the rate of change in the temperature or process value. Too much derivative (rate) will make the system sluggish.

Derivative action is active only when the process value is within twice the proportional value from the set point.

Adjust the derivative with Time Derivative [t d] (Operations Page, Loop Menu).



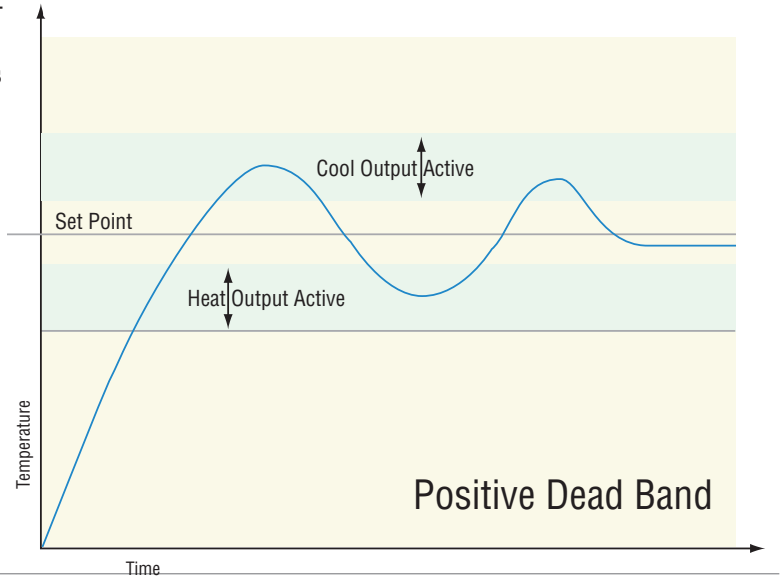
PID Control

Dead Band

In a PID application the dead bands above and below the set point can save an application's energy and wear by maintaining process temperature within acceptable ranges.

Proportional action ceases when the process value is within the dead band. Integral action continues to bring the process temperature to the set point.

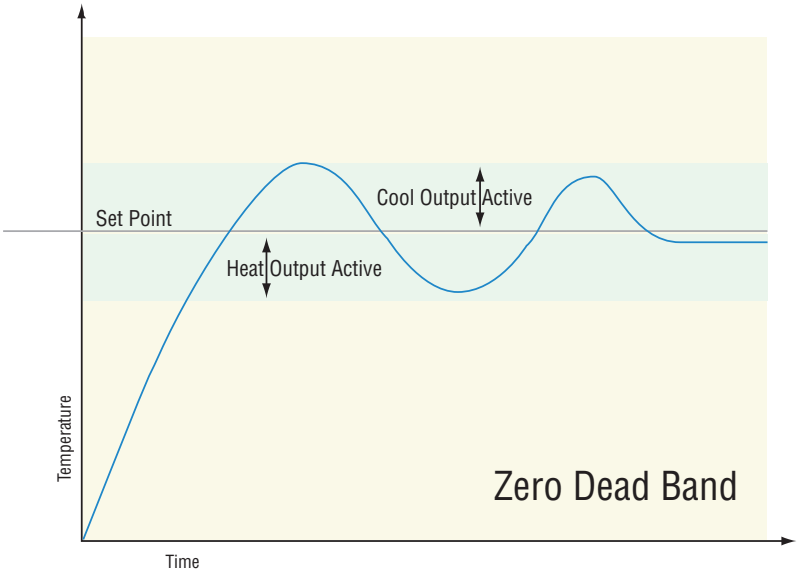
Using a **positive dead band value** keeps the two systems from fighting each other.



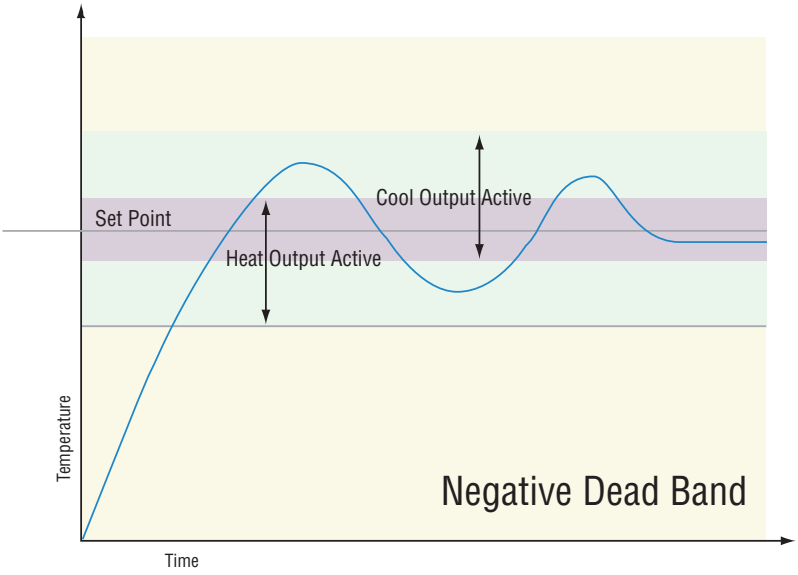
Positive Dead Band

Dead Band (cont.)

When the **dead band value is zero**, the heating output activates when the temperature drops below the set point, and the cooling output switches on when the temperature exceeds the set point.



When the **dead band value is a negative value,** both heating and cooling outputs are active when the temperature is near the set point.



Adjust the dead band with Dead Band db (Operations Page, Loop Menu).

Variable Time Base

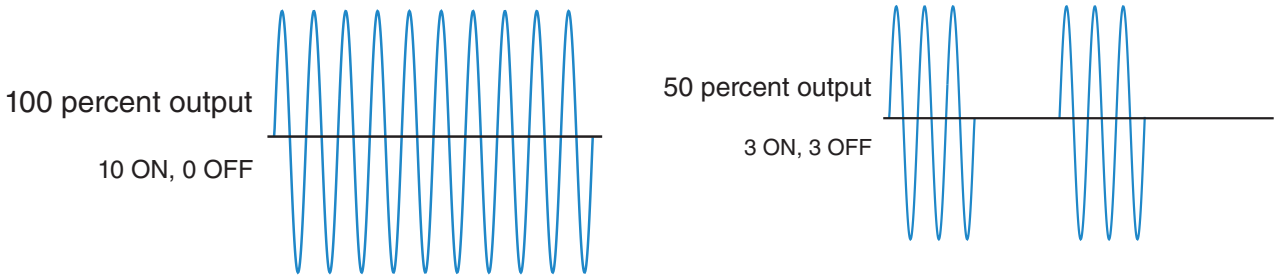
Variable time base is the preferred method for controlling a resistive load, providing a very short time base for longer heater life. Unlike phase-angle firing, variable-time-base switching does not limit the current and voltage applied to the heater.

With variable time base outputs, the PID algorithm calculates an output between 0 and 100%, but the output is distributed in groupings of three ac line cycles. For each group of three ac line cycles, the controller decides whether the power should be on or off. There is no fixed cycle time since the decision is made for each group of cycles. When used in conjunction with a zero cross (burst fire) device, such as a solid-state power controller, switching is done only at the zero cross of the ac line, which helps reduce electrical noise (RFI).

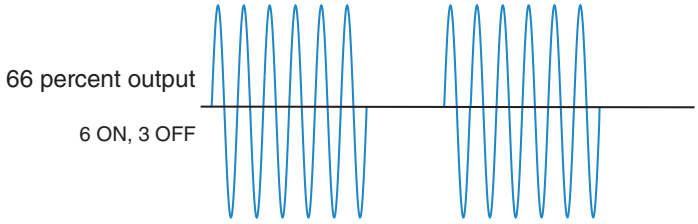
Variable time base should be used with solid-state power controllers, such as a solid-state relay (SSR) or silicon controlled rectifier (SCR) power controller. Do not use a variable time base output for controlling electromechanical relays, mercury displacement relays, inductive loads or heaters with unusual resistance characteristics.

Variable Time Base (cont.)

The combination of variable time base output and a solid-state relay can inexpensively approach the effect of analog, phase-angle fired control.



Select the AC Line Frequency [AC.LF] (Setup Page, Global Menu), 50 or 60 Hz.



Single Set Point Ramping

Ramping protects materials and systems that cannot tolerate rapid temperature changes. The value of the ramp rate is the maximum degrees per minute or hour that the system temperature can change.

Select Ramp Action [rP] (Setup Page, Loop Menu):

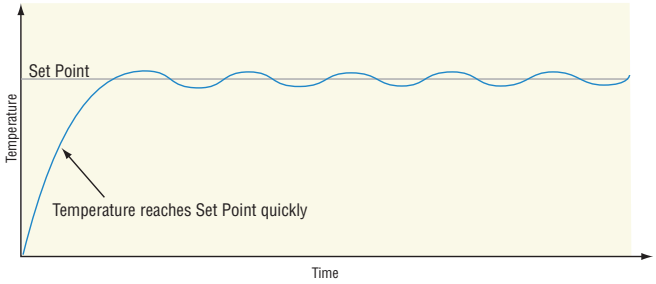
[oFF] ramping not active.

[Str] ramp at startup.

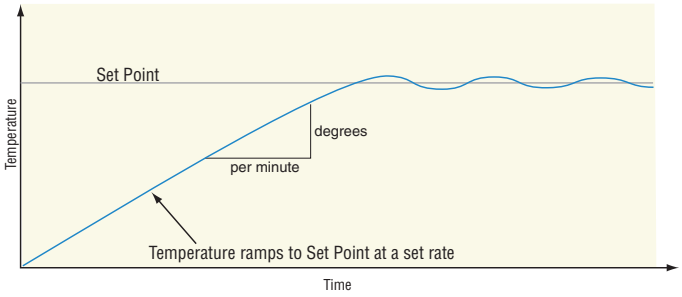
[StPt] ramp at a set point change.

[both] ramp at startup or when the set point changes.

Select whether the rate is in degrees per minute or degrees per hour with Ramp Scale [r.SC]. Set the ramping rate with Ramp Rate [r.rt] (Setup Page, Loop Menu).



Heating System without Ramping



Heating System with Ramping

Timer Function

1. When Timer Enable [t.En] is set to yes [YES] and the timer is started (you define which key combination this is), the controller will switch from Set Point [C.SP 1] to Closed Loop Timer Set Point [Ct.S 1]. If the timer is interrupted, the timer is terminated and the time remaining is reset to its initial value.
2. When Timer Start Method [t.St] is set to:
   a. Immediate [Imd], the timer starts as soon as the counter is initiated. When Time Remaining [t.r 1] equals zero, the set point changes from Closed Loop Timer Set Point [Ct.S 1] back to Set Point [C.SP 1]. A flashing colon [00:00] indicates that a countdown is in progress.

b. Ready Band rdy, the set point changes and when the temperature is within ready band, the ready band indicator lights up and the countdown timer starts and continues as long as the temperature is within the ready band. When Time Remaining tr 1 equals zero, the set point changes from Closed Loop Timer Set Point Ct.S 1 back to Set Point CSP 1. A flashing colon 00:00 indicates that a countdown is in progress.

c. Ready Acknowledge rdyA, the set point changes, and when the temperature is within the ready band, the ready band indicator lights up. The user must then acknowledge (you define which key combination for this) that the countdown timer should start and continue as long as the temperature is within the ready band. When Time Remaining tr 1 equals zero, the set point changes from Closed Loop Timer Set Point Ct.S 1 back to Set Point CSP 1. A flashing colon 00:00 indicates that a countdown is in progress.

d. Power PwJr, the timer starts when the controller is turned on. When Time Remaining tr 1 equals zero, the set point changes from Closed Loop Timer Set Point Ct.S 1 back to Set Point CSP 1. A flashing colon 00:00 indicates that a countdown is in progress.

3. In Setup Page, Output Menu, Output Function Fn can be assigned as Timer Event Output 1 tE.o 1, Timer Event Output 2 tE.o2 or Timer Event Output 3 tE.o3. Timer Event Output 1 is active during timing, Timer Event Output 2 is deactivated during timing and Timer Event Output 3 is active at the end of the countdown for a period in seconds specified by Signal Time St. This signal may be used to monitor that timing is occurring or signal that timing has completed. Process outputs may not be assigned to Timer Event Outputs.
4. The home display is customized in the Factory Page, Custom Menu. You may program the display to alternate between display pairs. See display pairs in the Setup Page, Global Menu. As an example, we could show the process temperature in the upper display and have the lower display alternate between the countdown time remaining and the active set point.

Note: The timer feature is only available for control loop 1 of two-loop controllers. Time is entered in hours, minutes and seconds. Countdown time will use the entered time but display the time remaining in either hh:mm or mm:ss format, based on your settings. The colon pulses in one-second intervals during a countdown, to indicate that timing is underway. Parameters that appear in the Home page have the number 1 at the end of the displayed parameter. As an example, hour in the Setup Page, Timer Menu will be displayed as hou 1 in the Home Page.

Setting up the timer function

1. Press and hold up and down arrow keys for 6 seconds to enter into the Setup Page SEt.
2. Up arrow to Timer Menu tMr.
3. Advance to Timer Enable t 1.En to make selection using the up and down arrow keys to select from the options below:
   - yES Yes
   - no No
4. Advance to Timer Start Method t 1.St to select the method that will start the timer.
5. Use the up arrow to select from the options below:
   - Imd Immediate
   - rdy Ready Band
   - rdyA Ready Ack
   - PwJr Power
6. Advance to Source Function A SFn.A to select which input will start/terminate the timer. Use the up arrow to select from the options below:
   - nonE None
   - d io Digital I/O
   - Fun Function Key
7. Advance to Source Instance A and use the up arrow to make a selection below:

   If Source Function A of previous step is set to None nonE:
   - 1 Does not matter which number is here
   - S 1.A Source Instance A

   If Source Function A of previous step is set to Digital I/O d io:
   - 5 Select 5 to 12
   - S 1.A Source Instance A

If Source Function A of previous step is set to Function Key [FUn]:

- [1] EZ1 Key
- [2] EZ2 Key
- [6] Hold infinity key for 2 seconds
- [7] Infinity ∞ and Down arrow ▼
- [8] Infinity ∞ and Up arrow ▲
- [S.iA] Source Instance A

8. Advance ◉ to Source Function C [SFn.C] to select the analog source for the ready band. Use the up arrow ▲ to select from the options below:

   - [Pu] Process Value
   - [nonE] None
   - [Ai] Analog Input
   - [Lnr] Linearization

9. Advance ◉ and use the up arrow ▲ to make a selection below:

   [1] 1 or ([2] 2, if second instance of Source Function C)

10. Advance ◉ to Source Function D [SFn.d] to select which input will acknowledge the ready band. Use the up arrow ▲ to select from the options below:

    - [nonE] None
    - [dio] Digital I/O
    - [FUn] Function Key

11. Advance ◉ to Source Instance D and use the up arrow ▲ to make a selection below:

    If Source Function D of previous step is set to None [nonE]:

    - [1] Does not matter which number is here
    - [S.id] Source Instance D

    If Source Function D of previous step is set to Digital I/O [dio]:

    - [5] Select 5 to 12
    - [S.id] Source Instance D

    If Source Function D of previous step is set to Function Key [FUn]:

    - [1] EZ1 Key
    - [2] EZ2 Key
    - [6] Hold infinity key for 2 seconds
    - [7] Infinity ∞ and Down arrow ▼
    - [8] Infinity ∞ and Up arrow ▲
    - [S.id] Source Instance D

12. Advance ◉ to Time Remaining [t.r], read only, display in hh:mm or mm:ss.
13. Advance ◉ to Ready Band State [r.bS], read only, displayed as yes [YES] or no [no].
14. Advance ◉ to Ready Band [rdY] to enter the value for Ready Band using Up ▲ or Down arrow ▼.
15. Advance ◉ to Time Format [t.For] to select the time format. Use the up arrow ▲ to make selection below:

    - [thrn] Time Hours:Minutes
    - [trnS] Time Minutes:Seconds

16. Advance ◉ to Countdown Time to enter hours, minutes and seconds using the Up ▲ or Down arrow ▼.

    - [hour] Hours, then Advance ◉
    - [rnin] Minutes, then Advance ◉
    - [SEC] Seconds

17. Advance ◉ to Closed Loop Timer Set Point [Ct.SP] to enter the temperature during counting using the Up ▲ or Down arrow ▼.
18. Advance ◉ to Signal Time [St] to enter time in seconds for Timer Event Output 3 [tE.o3] to be active at end of countdown time.
19. Press and hold the Infinity ∞ or Reset key for more than 2 seconds to go to Home Page.
20. See programming custom home page in factory page, custom menu to change the display parameters such as active process value, closed loop set point time, closed loop timer set point and time remaining as appropriate for the application.

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 and Deviation Alarms

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

A deviation alarm uses one or two set points that are defined relative to the control set point. High and low alarm set points are calculated by adding or subtracting offset values from the control set point. If the set point changes, the window defined by the alarm set points automatically moves with it.

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

Alarm Set Points

The High Set Point defines the process value or temperature that will trigger a high side alarm. It must be higher than the Low Set Point and lower than the high limit of the sensor range.

The Low Set Point defines the temperature that will trigger a low side alarm. It must be lower than the High Set Point and higher than the low limit of the sensor range.

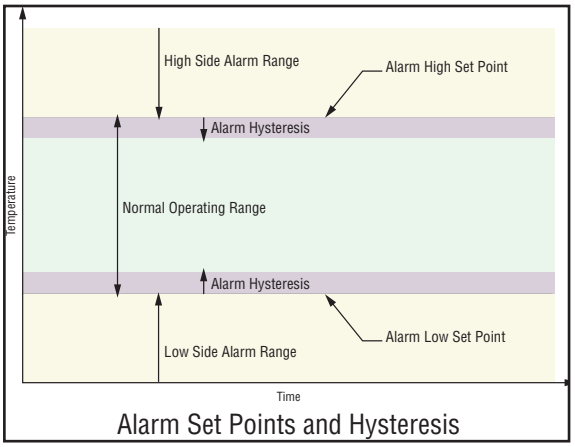
View or change alarm set points with Low Set Point [A.Lo] and High Set Point [A.h1] (Operations Page, Alarm Menu).

Alarm Hysteresis

An alarm state is triggered when the process value reaches the alarm high or Low Set Point. Hysteresis defines how far the process must return into the normal operating range before the alarm can be cleared.

Hysteresis is a zone inside each alarm set point. This zone is defined by adding the hysteresis value to the Low Set Point or subtracting the hysteresis value from the High Set Point.

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



Alarm Set Points and Hysteresis

Alarm Latching

A latched alarm will remain active after the alarm condition has passed. It can only be deactivated by the user.

An active message, such as an alarm message, will cause the display to toggle between the normal settings and the active message in the upper display and [Atn] in the lower display.

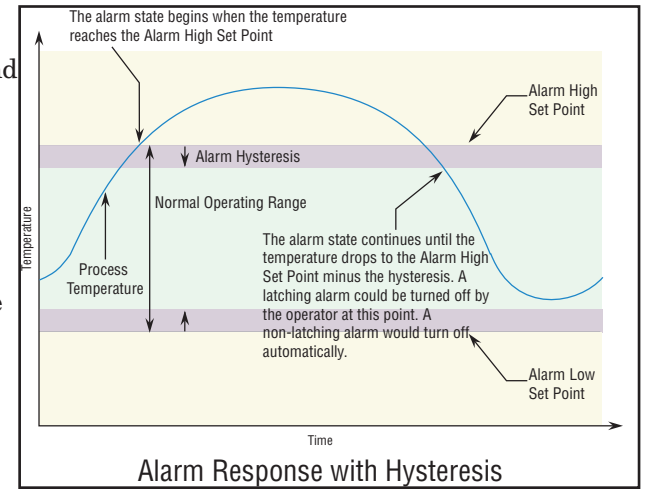
Push the Advance Key to display [1Snr] in the upper display and the message source in the lower display.

Use the Up ▲ and Down ▼ keys to scroll through possible responses, such as Clear [CLr] or Silence [S1L]. Then push the Advance ◉ or Infinity ∞ key to execute the action.

See the Keys and Displays chapter and the Home Page chapter for more details.

An alarm that is not latched (self-clearing) will deactivate automatically when the alarm condition has passed.

Turn Latching on or off with Latching [A.LA] (Setup



Alarm Response with Hysteresis

Page, Alarm Menu).

Alarm Silencing

If Silencing is on the operator can 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.

An active message, such as an alarm message, will cause the display to toggle between the normal settings and the active message in the upper display and [AtAn] in the lower display.

Push the Advance Key to display [iSnr] in the upper display and the message source in the lower display.

Use the Up ▲ and Down ▼ keys to scroll through possible responses, such as Clear [CLr] or Silence [SiL]. Then push the Advance ◉ or Infinity ∞ key to execute the action.

See the Keys and Displays chapter and the Home Page chapter for more details.

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

Alarm Blocking

Blocking allows a system to warm up after it has been started up. With Blocking on, an alarm is not triggered when the process temperature is initially lower than the Low Set Point or higher than the High Set Point. The process temperature has to enter the normal operating range beyond the hysteresis zone to activate the alarm function.

If the EZ-ZONE PM has an output that is functioning as a deviation alarm, the alarm is blocked when the set point is changed, until the process value re-enters the normal operating range.

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

Open Loop Detection

When Open Loop Detection is enabled [L.dE], the controller will look for the power output to be at 100%. Once there, the control will then begin to monitor the Open Loop Detect Deviation [L.dd] as it relates to the value entered for the Open Loop Detect Time [L.dt]. If the specified time period expires and the deviation does not occur, an Open Loop Error will be triggered. Once the Open Loop Error condition exists the control mode will go off.

Note:

All prompts identified in this section can be found in the Loop Menu of the Setup Page.

Programming the EZ Key/s

You can program the EZ Key either in the Setup Menu or with configuration software, such as EZ-ZONE Configurator, using a personal computer.

The following examples show how to program the EZ Key to start and stop a profile.

Using keys and display:

1. 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.
2. Press the Up Key ▲ until [Fun] appears in the upper display and [SEt] will appear in the lower display.
3. Press the Advance Key ◉ until Digital Input Level [LEu] appears in the lower display. Use an arrow key to specify the state of the key (high or low) when the controller is powered up. Functions will toggle with each press of the EZ Key, such as Profile Start/Stop.
4. Press the Advance Key ◉. The lower display will show Digital Function [Fn]. Press the Up ▲ or Down ▼ key to scroll through the functions that can be assigned to the EZ Key
   When Profile Start/Stop [P.StS] appears in the upper display and [Fn] appears in the lower display, press the Advance Key ◉ once to select that function and move to the Function Instance [FS] parameter.
5. Press the Up ▲ or Down ▼ key to scroll to the profile that you want the EZ Key to control.
6. The instance tells the controller which of the numbered functions should be acted upon. For profiles, there are 4 instances. Press the Infinity Key ∞ once to return to the submenu, twice to return to the main menu or three times to return to the Home Page.

Using Lockout and Password Security

If unintentional changes to parameter settings might raise safety concerns or lead to downtime, you can use the lockout feature to make them more secure. There are two methods of lockout that can be deployed, both of which are accessible from the Factory Page.

Method 1- Change the value of the Read Lock [rLoc] (1 to 5) and Set Lock [SLoc] (0 to 5) prompts where the higher the value or setting for each translates to a higher security clearance (greater access).

Method 2- Enable Password Security [PASS.E] and then modify the Lock Level [LoC.L] value which ranges from 1 to 5. See the section entitled Using Lockout Method 2 for more detail.

Using Lockout Method 1 (Read and Set Lock)

All Pages have security levels assigned where two of those cannot be changed (Home and Setup). Defaults (factory settings) for each are shown below:

- Home Page = 1
- Operations Page = 2 (changeable to 1, 2 or 3)
- Setup Page = 4
- Profiling Page = 3 (changeable to 1, 2 or 3)
- Factory Page = 5*

* The Factory Page is always visible where all menus within it may or may not be visible/writable. For further detail see table "Factory Page Menus".

The table below represents the various levels of lockout for the Set Lockout Security prompt [SLoC] and the Read Lockout Security prompt [rLoC]. Looking at the table, "Y" equates to yes (can write/read) where "N" equates to no (cannot write/read). The colored cells simply differentiate one level from the next while also showing the level where read/write is enabled. As stated previously, the Set Lockout has 6 levels (0 to 5) of security where the Read Lockout has 5 (1 to 5). Therefore, level "0" applies to Set Lockout only.

Lockout Security [SLoC] & [rLoC]

Pages	Security Level					
	0	1	2	3	4	5
Home Page (cannot be changed)	N	Y	Y	Y	Y	Y
Operations Page	N	N	Y	Y	Y	Y
Setup Page (cannot be changed)	N	N	N	N	Y	Y
Profile Page	N	N	N	Y	Y	Y
Factory Page	Y	Y	Y	Y	Y	Y

Being able to change the page security level for the Operations and Profile pages allows a user to give access to the Profile Page while locking out the Operations Page. The following example shows how the Lockout feature may be used to accomplish this:

1. Press and hold the Advance and Infinity keys for approximately 6 seconds to enter the Factory Page
2. Navigate to the [LoC] Menu using the Up or Down arrow keys
3. Using the green Advance key navigate to the Lock Operations prompt [LoC.o] and change it (push the Up arrow) from the default value of 2 to 3
4. Push the Advance key again and change the Lock Profiling prompt [LoC.P] from the default of 3 to 2
5. Change Read Lockout Security [rLoC] to 2 and the Set Lockout [SLoC] to 2 or higher

With the above settings, the Home Page and the Profiling Page can be accessed, and all writable parameters can be written to. Due to the Read lock setting of 2 all pages with security levels greater than 2 will be locked out (inaccessible).

Another example of Method 1 lockout usage could be that an operator wants read access to all pages while allowing read/write access to the Home Page and the Lockout Menu only.

1. Press and hold the Advance and Infinity keys for approximately 6 seconds to enter the Factory Page
2. Navigate to the [LoC] Menu using the Up or Down arrow keys
3. Using the green Advance key navigate to the Read Lockout Security [rLoC] and change it to 5
4. Push the green Advance key and navigate to the and Set Lockout Security [SLoC] changing it to 1

Although the Factory Page is always visible, some menus within it can be restricted.

Lockout Security SLoC & rLoC						
Factory Page Menus						
Menus	**Security Level**					
	0	1	2	3	4	5
Custom Menu	N	N	N	N	N	Y
Lockout Menu*	Y	Y	Y	Y	Y	Y
Diagnostic Menu**	N	Y	Y	Y	Y	Y
Calibration Menu	N	N	N	N	N	Y

* Using lockout Method 1 with SLoC set to 0, all writable parameters within the control will be inhibited (not writable) with two exceptions, SLoC and rLoC. As shown below, both of these parameters can always be seen and modified.

** Diagnostic Menu and all associated prompts are always visible and never writable

Lockout Security SLoC & rLoC						
Factory Page Menu Parameters						
Parameters	**Security Level**					
	0	1	2	3	4	5
LoC.0	N	Y	Y	Y	Y	Y
LoC.P	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

Note:

Using Method 1 Lockout all settings can be modified by anyone who knows how to find their way to the SLoC and rLoC parameters

Using Lockout Method 2 (Password Enable)

It is sometimes desirable to apply a higher level of security to the control where a password would be required to access the control. 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. Without the appropriate password, specified menus will remain inaccessible. Page and Menu access is 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

Follow the steps below:

1. Go to the Factory Page by holding down the Infinity key and the Advance key for approximately six seconds.

2. 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.

3. 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. In other words the Lock Menu LoC is not available to a User. 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 Infinity 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 On) is enabled the two prompts mentioned below in the first step will not be visible. If the password is 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 Infinity 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 play by using the Up and Down arrow keys or use EZ-ZONE Confgurator Software.
6. Exit the Factory Page by pushing and holding the Infinity 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

- User **without** a password is restricted by the Locked Access Level [LoC.L].
- A User **with** a password is restricted by the Read Lockout Security [rLoC] never having access to the Lock Menu [LoC].
- 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.

Modbus - Using Programmable Memory Blocks

When using the Modbus protocol, the PM control features a block of addresses that can be configured by the user to provide direct access to a list of 40 user configured parameters. This allows the user easy access to this customized list by reading from or writing to a contiguous block of registers.

To acquire a better understanding of the tables found in the back of this document (See Appendix: (Modbus Programmable Memory Blocks) please read through the text below which defines the column headers used.

Assembly Definition Addresses

- Fixed addresses used to define the parameter that will be stored in the "Working Addresses", which may also be referred to as a pointer. The value stored in these addresses will reflect (point to) the Modbus address of a parameter within the PM controller.

Assembly Working Addresses

- Fixed addresses directly related to their associated "Assembly Definition Addresses" (i.e., Assembly Working Addresses 200 & 201 will assume the parameter pointed to by Assembly Definition Addresses 40 & 41).

When the Modbus address of a target parameter is stored in an "Assembly Definition Address" its corresponding working address will return that parameter's actual value. If it's a writable parameter, writing to its working register will change the parameter's actual value.

As an example, Modbus register 360 contains the Analog Input 1 Process Value (See Operations Page, Analog Input Menu). If the value 360 is loaded into Assembly Definition Address 91, the process value sensed by analog input 1 will also be stored in Modbus registers 250 and 251. Note that by default this parameter is also stored in working registers 240 and 241 as well.

The table (See Appendix: Modbus Programmable Memory Blocks) identified as "Assembly Definition Addresses and Assembly Working Addresses" reflects the assemblies and their associated addresses.

Software Configuration

Using EZ-ZONE® Configurator Software

To enable a user to configure the PM control using a personal computer (PC), Watlow has provided free software for your use. If you have not yet obtained a copy of this software insert the CD (Controller Support Tools) into your CD drive and install the software. Alternatively, if you are viewing this document electronically and have a connection to the internet simply click on the link below and download the software from the Watlow web site free of charge.

http://www.watlow.com/products/software/zone_config.cfm

Once the software is installed double click on the EZ-ZONE Configurator icon placed on your desktop during the installation process. If you cannot find the icon follow the steps below to run the software:

1. Move your mouse to the "Start" button
2. Place the mouse over "All Programs"
3. Navigate to the "Watlow" folder and then the subfolder "EZ-ZONE Configurator"
4. Click on EZ-ZONE Configurator to run.

The first screen that will appear is shown on the right.If the PC is already physically connected to the EZ-ZONE PM control click the next button to go on-line.

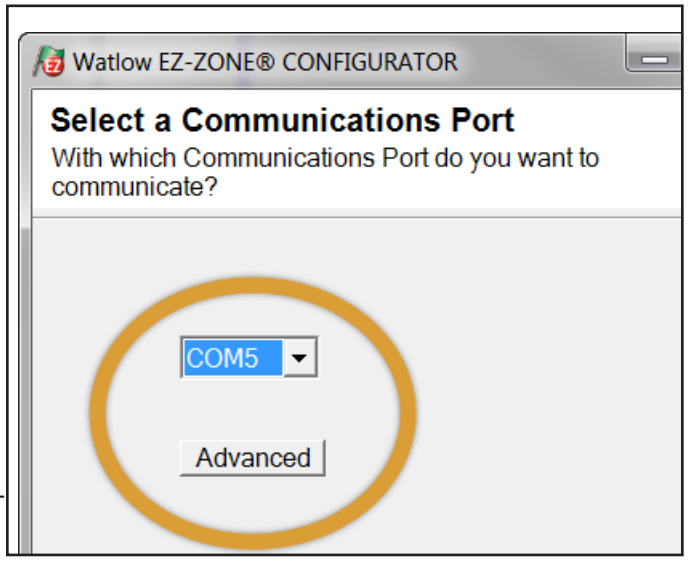
Note:

When establishing communications from PC to the EZ-ZONE PM control an interface converter will be required. The Standard Bus network uses EIA-485 as the interface. Most PCs today would require a USB to EIA-485 converter. However, some PCs may still be equipped with EIA-232 ports, therefore an EIA-232 to EIA-485 converter would be required.

As can be seen in the above screen shot the software provides the user with the option of downloading a previously saved configuration as well as the ability to create a configuration off-line to download later. The screen shots that follow will take the user on-line.

After clicking the next button above it is necessary to define the communications port that will be used on the PC as shown below. Clicking on the drop down will allow the user to select the appropriate communications port. This will be the port assigned to the EIA-485 to USB converter when it was connected to the PC.

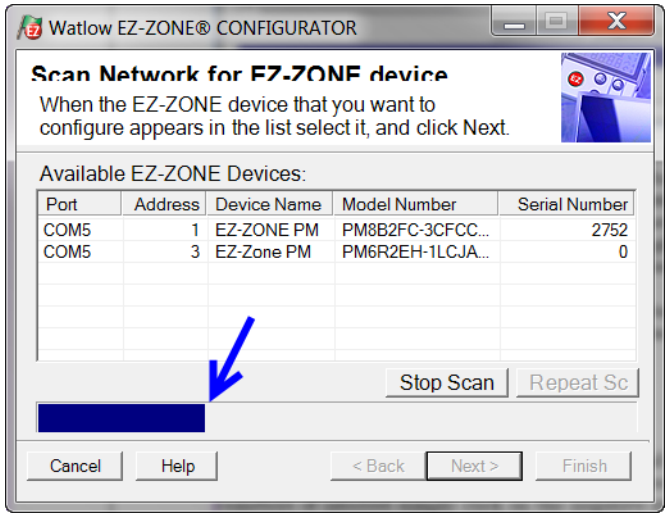
The "Advanced" button allows the user to determine how many devices to look for on the network (1 to 17).



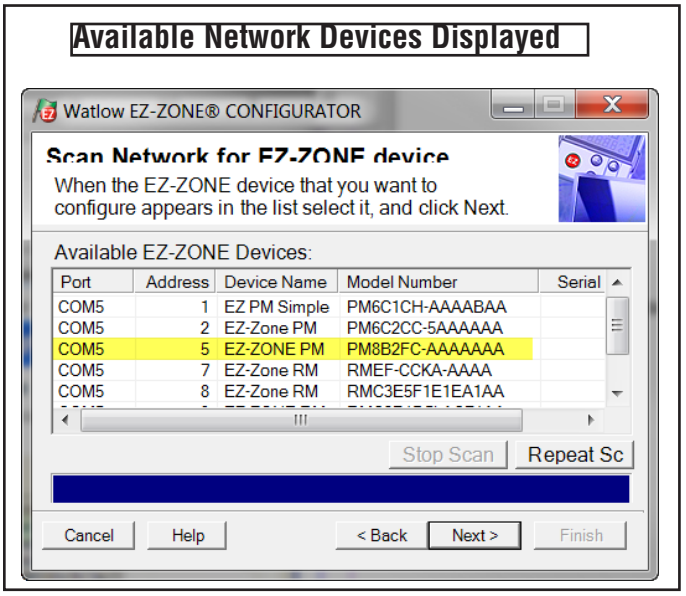
After clicking on the "Next" button, the software will scan the network for the zone addresses specified while showing the progress made (as shown in the graphic below. When complete the software will display all of the available devices found on the network as shown below.

The PM8 is shown highlighted to bring greater clarity to the control in focus. Any EZ-ZONE device on the network will appear in this window and would be available for the purpose of configuration or monitoring; simply click on the control of choice. After doing so, the screen below will appear. In the screen shot below notice that the device part number is clearly displayed at the top of the page (yellow highlight added for emphasis). When multiple EZ-ZONE devices are on the network it is important that the part number be noted prior to configuring so as to avoid making unwanted configuration changes to another control. Looking closely at the left hand column (Parameter Menus) notice that it displays all of the available menus and associated parameters within the control. The menu structure as laid out within this software follows:
- Setup - Operations - Factory - Profile

Searching Network for Devices

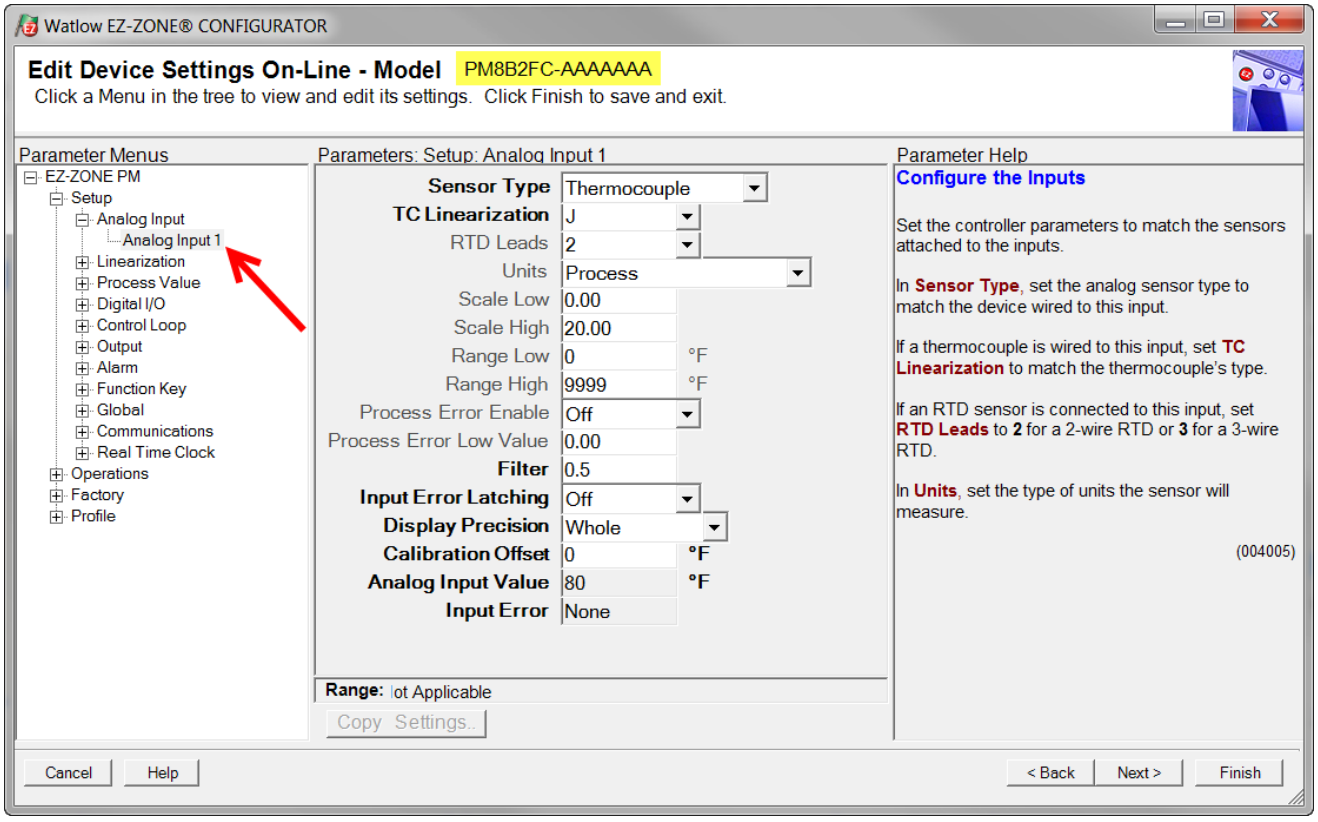


Available Network Devices Displayed



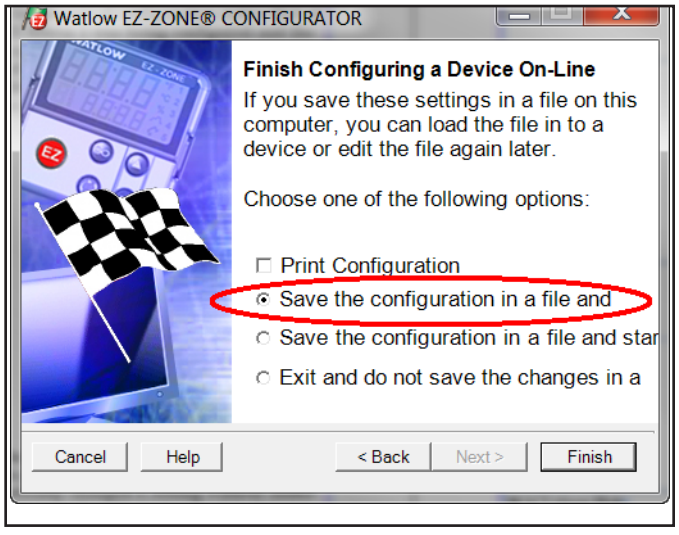
Navigating from one menu to the next is easy and clearly visible. Simply slide the scroll bar up or down to display the menu and parameter of choice. If there is a need to bring greater focus and clarity to the parameters of interest simply click on the negative symbol next to any of the Menu items. As an example if it is desired to work within the Operations page click the negative sign next to Setup where the Setup Page will then collapse. Now click the plus sign next to Operations to find the menu items of choice without viewing unwanted menus and parameters. Once the focus is brought to an individual parameter (single click of mouse) as is the case for Analog Input 1 in the left column; all that can be setup related to that parameter will appear in the center column. The grayed out fields in the center column simply mean that this does not apply for the type of sensor selected. As an example, notice that when a thermocouple is selected, RTD Leads does not apply and is therefore grayed out. To speed up the process of configuration notice that at the bottom of the center column there is an option to copy settings. If Analog Input 1 and 2 are the same type of sensor click on "Copy Settings" where a copy dialog box will appear allowing for quick duplication of all settings. Notice too, that by clicking on any of those items in the center column that context sensitive help will appear for that particular item in the right hand column.

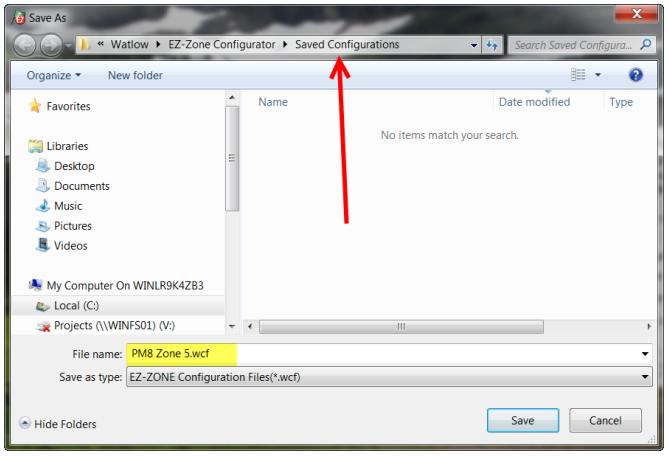
Lastly, when the configuration is complete click the "Finish" button at the bottom right of the previous screen shot. The screen that follows this action can be seen below.



Although the PM control now contains the configuration (because the previous discussion focused on doing the configuration on-line) it is suggested that after the configuration process is completed that the user save this file on the PC for future use. If for some reason someone inadvertently changed a setting without understanding the impact, it would be easy and perhaps faster to download a saved configuration back to the control versus trying to figure out what was changed. Of course, there is an option to exit without saving a copy to the local hard drive. After selecting Save above, click the "Finish" button once again. The screen below will than appear. When saving the configuration, note the location where the file will be placed (saved in) and enter the file name (File name) as well. The default path for saved files follows: Users\"Username"\My Documents\Watlow\EZ-Zone Configurator\Saved Configurations

The user can save the file to any folder of choice.





Chapter 10: Appendix

Troubleshooting Alarms, Errors and Control Issues

Indication	Description	Possible Causes	Corrective Action
Alarm won't clear or reset	Alarm will not clear or reset with keypad or digital input	• 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 alarm to correct type: process, deviation or power • Set digital input function and source instance
Alarm won't occur	Alarm will not activate output	• Silencing is active • 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 Silencing, if required • Disable 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 • Set alarm to correct type: process, deviation or power
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
Er.Ab Ambient Error	Cold-junction compensation circuitry is not working.	• Cold-junction compensation circuitry is not working.	• Return controller to factory.

Troubleshooting Alarms, Errors and Control Issues (cont.)

Indication	Description	Possible Causes	Corrective Action
LP.o 1 Loop Open Error	Open Loop Detect is active and the process value did not deviate by a user-selected value in a user specified period.	• Setting of Open Loop Detect Time incorrect • Setting of Open Loop Detect Deviation incorrect • Thermal loop is open • Open Loop Detect function not required but activated	• Set correct Open Loop Detect Time for application • Set correct Open Loop Deviation value for application • Determine cause of open thermal loop: misplaced sensors, load failure, loss of power to load, etc. • Deactivate Open Loop Detect feature
LP.r 1 Loop Reversed Error	Open Loop Detect is active and the process value is headed in the wrong direction when the output is activated based on deviation value and user-selected value.	• Setting of Open Loop Detect Time incorrect • Setting of Open Loop Detect Deviation incorrect • Output programmed for incorrect function • Thermocouple sensor wired in reverse polarity	• Set correct Open Loop Detect Time for application • Set correct Open Loop Deviation value for application • Set output function correctly • Wire thermocouple correctly, (red wire is negative)
rP 1 Ramping 1	Controller is ramping to new set point	• Ramping feature is activated	• Disable ramping feature if not required
tUn 1 Autotuning 1	Controller is autotuning the control loop	• User started the autotune function • Digital input is set to start autotune	• Wait until autotune completes or disable autotune feature • Set digital input to function other than autotune, if desired
No heat/cool action	Output does not activate load	• Output function is incorrectly set • Control mode is incorrectly set • Output is incorrectly wired • Load, power or fuse is open • Control set point is incorrect • Incorrect controller model for application	• Set output function correctly • Set control mode appropriately (Open vs Closed Loop) • Correct output wiring • Correct fault in system • Set control set point in appropriate control mode and check source of set point: remote, idle, profile, closed loop, open loop • Obtain correct controller model for application
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

Troubleshooting Alarms, Errors and Control Issues (cont.)

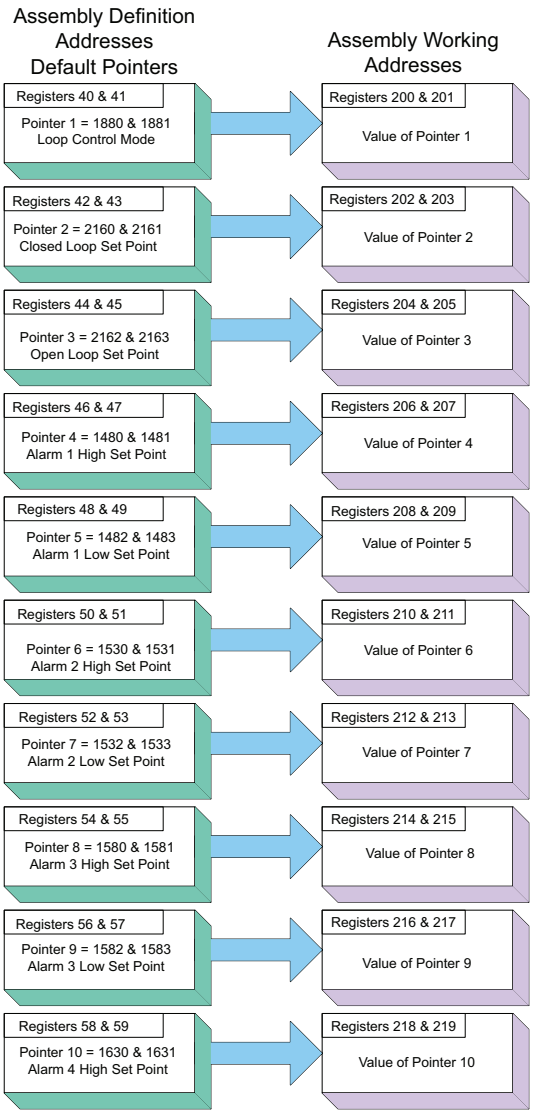
Indication	Description	Possible Causes	Corrective Action
Process doesn't control to set point	Process is unstable or never reaches set point	• Controller not tuned correctly • Control mode is incorrectly set • Control set point is incorrect	• Perform autotune or manually tune system • Set control mode appropriately (Open vs Closed Loop) • Set control set point in appropriate control mode and check source of set point: remote, idle, profile, closed loop, open loop
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	• 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 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

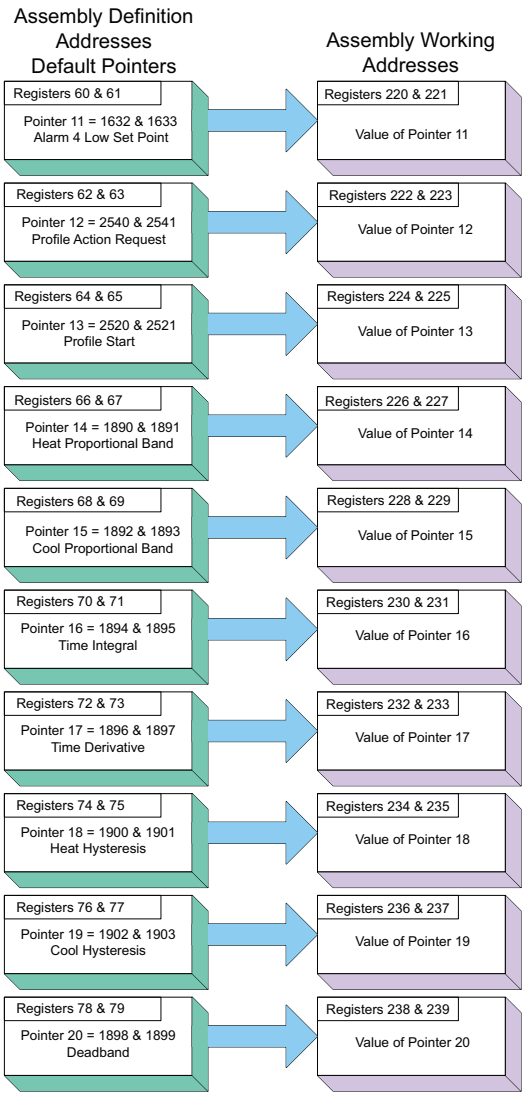
Detection of and Rules Around Abnormal Sensor Conditions	
Inputs	**Detection of Abnormal Conditions**
Thermocouple	
Shorted	No direct detection, Open loop firmware detection.
Open	Yes, Parasitic pull-up
Reversed	Yes, firmware detection
Current Source	
Shorted	Range limiting only
Open	Range limiting only
Reversed	Range limiting only
Voltage Source	
Open	Range limiting only
Shorted	Range limiting only
Reversed	Range limiting only
RTD	
S1 open	Yes, pulled up.
S2 open	Not implemented.
S3 open	Yes, pulled up.
S1 short to S2	Yes, pulled up
S1 short to S3	Yes, pulled down to under range.
S2 shorted to S3	Not implemented, Possible, monitor S2 voltage.
S1 and S2 open	Yes, pulled down to under range.
S1 and S3 open	Yes, S1 pulled up.
S2 and S3 open	Yes pulled up.
Thermistor	
S1 open	Yes, pulled up to sensor over range.
S3 open	Yes, pulled up to sensor over range.
S1 short to S3	Yes, pulled down to sensor under range.
S1 and S3 open	Yes, S1 pulled up to sensor over range.

Modbus - Programmable Memory Blocks

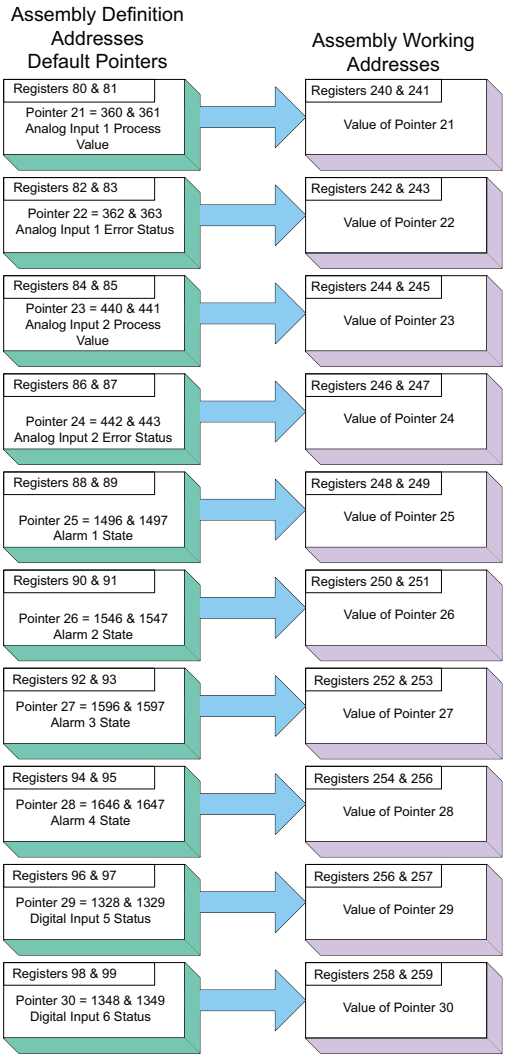
Assembly Definition Addresses and Assembly Working Addresses

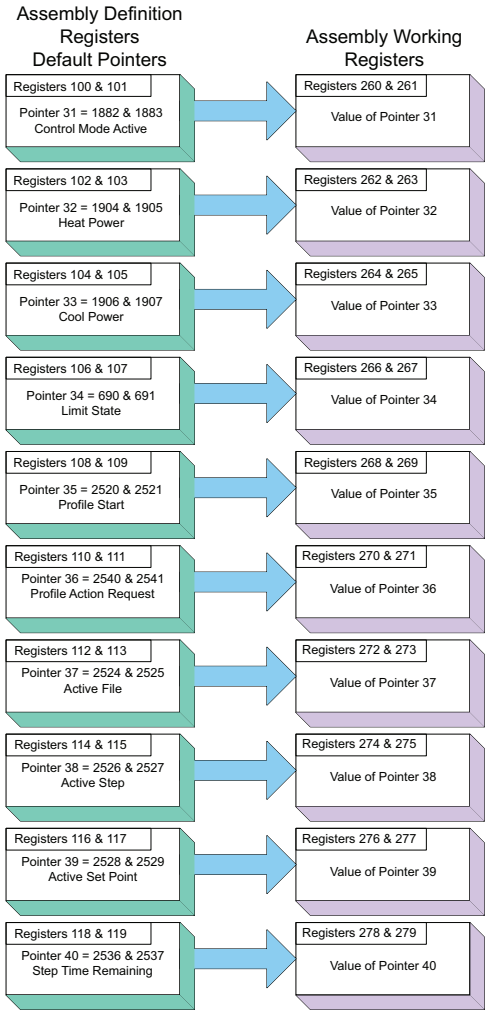
Assembly Definition Addresses	Assembly Working Addresses	Assembly Definition Addresses	Assembly Working Addresses
40 & 41	200 & 201	80 & 81	240 & 241
42 & 43	202 & 203	82 & 83	242 & 243
44 & 45	204 & 205	84 & 85	244 & 245
46 & 47	206 & 207	86 & 87	246 & 247
48 & 49	208 & 209	88 & 89	248 & 249
50 & 51	210 & 211	90 & 91	250 & 251
52 & 53	212 & 213	92 & 93	252 & 253
54 & 55	214 & 215	94 & 95	254 & 255
56 & 57	216 & 217	96 & 97	256 & 257
58 & 59	218 & 219	98 & 99	256 & 259
60 & 61	220 & 221	100 & 101	260 & 261
62 & 63	222 & 223	102 & 103	262 & 263
64 & 65	224 & 225	104 & 105	264 & 265
66 & 67	226 & 227	106 & 107	266 & 267
68 & 69	228 & 229	108 & 109	268 & 269
70 & 71	230 & 231	110 & 111	270 & 271
72 & 73	232 & 233	112 & 113	272 & 273
74 & 75	234 & 235	114 & 115	274 & 275
76 & 77	236 & 237	116 & 117	276 & 277
78 & 79	238 & 239	118 & 119	278 & 279





Modbus Default Assembly Structure 80-119





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 (PM4, 8 & 9)
- 10VAmaximum power consumption (PM3 & 6)
- Data retention upon power failure via nonvolatile 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 (-40 to 85°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 maximum

Agency Approvals

- UL® Listed to UL® 61010-1 File E185611
- UL® Reviewed to CSA C22.2 No.61010-1-04
- UL® 50 Type 4X, NEMA 4X indoor locations, IP65 front panel seal (indoor use only)
- FM Class 3545 File 3029084 temperature limit switches
- CE-See Declaration of Conformity RoHS and W.E.E.E.compliaint
- This equipment is suitable for use in Class 1, Div.2, Groups A, B, C and D or non-hazardous locations only. Temperature Code T4A
- UL® Listed to ANSI/ISA 12.12.01-2007 File E184390
- All models, CSA C22.2 No. 24 File 158031 Class 4813-02, CSA Approved
- UL® reviewed to Standard No. CSA C22.2 No.213-M1987, Canadain Hazardous locations

Controller

- User selectable heat/cool, on-off, P, PI, PD, PID or alarm action
- Auto-tune with TRU-TUNE®+ adaptive control algorithm
- Control sampling rates: input = 10Hz, outputs = 10Hz

Profile Ramp/Soak - Real Time Clock and Battery Back-up

- Accuracy (typical): ±30PPM at 77°F (25°C)
- +30/-100 PPM at -4 to 149°F (-20 to 65°C)
- Battery type: Rayovac 3V BR1225 lithium (recycle properly), only installed in models with a real-time clock
- Battery typical life: three cumulative years of unpowered life at 77°F (25°C)

Isolated Serial Communications

- EIA232/485, Modbus® RTU

Wiring Termination—Touch-Safe Terminals

- Input, power and controller output terminals are touch safe re movable 3.30 to 0.0507 mm² (12 to 22 AWG)
- Wire strip length 7.6 mm (0.30 in.)
- Torque 0.56 Nm (5.0 lb.-in.)

Universal Input

- Thermocouple, grounded or ungrounded sensors
- >20MΩ input impedance
- 3µA open sensor detection
- Max. of 2KΩ 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

Voltage Input Ranges

- Accuracy ±10mV ±1 LSD at standard conditions
- Temperature stability ±100 PPM/°C maximum

Milliamp Input Ranges

- Accuracy ±20µA ±1 LSD at standard conditions
- Temperature stability ±100 PPM/°C maximum

Resolution Input Ranges

- 0 to 10V: 200 µV nominal
- 0 to 20 mA: 0.5 mA nominal

- 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 (-200 to 350)	±1.55	0	350	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	0	50	mV
Volts	±0.01	0	10	Volts
mAdc	±0.02	0	20	mAmps DC
mAac	±5	-50	50	mAmps AC
Potentiometer, 1K range	±1	0	1000	Ohms
Thermistor, 5K range	±5	0	5000	Ohms
Thermistor, 10K range	±10	0	10000	Ohms
Thermistor, Thermistor	±20	0	20000	Ohms
Thermistor, 40K range	±40	0	40000	Ohms

Operating Range		
Input Type	**Range Low**	**Range High**
J	-210 °C	1200 °C
K	-270 °C	1371 °C
T	-270 °C	400 °C
N	-270 °C	1300 °C
E	-270 °C	1000 °C
R	-50 °C	1767 °C

Operating Range		
S	-50 °C	1767 °C
B	-50 °C	1816 °C
C	0 °C	2315 °C
D	0 °C	2315 °C
F (PTII)	0 °C	1343 °C
RTD (100 ohm)	-200 °C	800 °C
RTD (1000 ohm)	-200 °C	800 °C
mV	-50 °C	50 °C
Volts	0 °C	10 °C
mAdc	0 °C	20 °C
mAac	-50 °C	50 °C
Potentiometer, 1K range	0 °C	1200 °C
Resistance, 5K range	0 °C	5000 °C
Resistance, 10K range	0 °C	10000 °C
Resistance, 20K range	0 °C	20000 °C
Resistance, 40K range	0 °C	40000 °C

Thermistor Input

- 0 to 40KΩ, 0 to 20KΩ, 0 to 10KΩ, 0 to 5KΩ
- 2.252KΩ and 10KΩ 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 @ 3mA
    - Min. high state 3V at 0.25mA
    - Max. low state 2V
  - Dry contact
    - Min. open resistance 10KΩ
    - Max. closed resistance 50Ω
    - Max. short circuit 20mA
- Digital output rate 10 Hz
  - SSR drive signal
  - Maximum open circuit voltage is 22 to 25V⎓ (dc)
  - PNP transistor source
  - Typical drive; 21mA @ 4.5V for DO5, 11mA @ 4.5V for DO6
  - Current limit 24mA for Output 5 and 12mA Output 6
  - Output 5 capable of driving one 3-pole DIN-A-MITE
  - Output 6 capable of driving one 1-pole DIN-A-MITE

Output Hardware

- Switched DC
  - Maximum open circuit voltage is 22 to 25V⎓ (dc)
  - 30mA max. per single output / 40mA max. total per paired outputs (1 & 2, 3 & 4)
  - Typical drive; 4.5V⎓ (dc) @ 30 mA
  - Short circuit limited to <50 mA
  - NPN transistor sink
  - Use dc- and dc+ to drive external solid-state relay
  - 1-pole DIN-A-MITE: up to 4 in parallel or 4 in series
  - 2-pole DIN-A-MITE: up to 2 in parallel or 2 in series
  - 3-pole DIN-A-MITE: up to 2 in series
- Switched dc/open collector = 30V⎓ (dc) max. @ 100mA max. current sink
- Solid state relay (SSR), FormA, 0.5A @ 24V~ (ac) min., 264V ~ (ac) max., opto-isolated, without contact suppression, 20 VA 120/240V~ (ac) pilot duty
- Electromechanical relay, FormC, 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, FormA, 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)
- NO-ARC relay, FormA, 15A, 24 to 240V~ (ac), noV⎓ (dc), resistive load, 2 million cycles at rated load
- Universal process/retransmit, Output range selectable:
  - 0 to 10V ⎓(dc) into a min. 1,000Ω load
  - 0 to 20mA into max. 800Ω load

  Resolution
  - dc ranges: 2.5mV nominal
  - mA ranges: 5 µA nominal

  Calibration Accuracy
  - dc ranges: ±15 mV
  - mA ranges: ±30 µA

  Temperature Stability
  - 100 ppm/°C

Operator Interface

- Dual 4 digit, 7 segment LED displays
- Advance, infinity, 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				
Size	**Behind Panel (max.)**	**Width**	**Height**	**Display Character Height**
1/32	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)
1/4	100.8 mm (3.97 in)	100.3 mm (3.95 in)	100.3 mm (3.95 in)	up: 11.43 mm (0.450 in) middle: 9.53 mm (0.375 in) low: 7.62 mm (0.300 in)
1/16	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 (H)	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 (V)	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.)	**1/8 DIN (PM8&9)** • Controller: 284 g (10 oz.)
1/16 DIN (PM6) • Controller: 186 g (6.6 oz.)	**1/4 DIN (PM4)** • Controller: 331 g (11.7 oz.)
User's Guide • 221.81 g (7.82 oz)	

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

Ordering Information for PID Controller Models

PM _ _ _ _ _ - _ A A A _ _ _

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

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
4 Panel Mount 1/4 DIN Horizontal

Primary Function
C PID Controller with Universal Input
R PID Controller with Universal Input and Profiling Ramp and Soak
T PID Controller with Universal Input and Timer
B PID Controller with Universal Input and Profiling Ramp and Soak and Battery Backup with Real Time Clock
J PID Controller with Thermistor Input
N PID Controller with Thermistor Input and Profiling Ramp and Soak
E PID Controller with Thermistor Input and Profiling Ramp and Soak and Battery Backup with Real Time Clock
S Custom Firmware
- Options B and E are not available with PM3 or PM6

Power Supply, Digital Input/Output
1 100 to 240V~ (ac)
2 100 to 240V~ (ac) plus 2 Digital I/O points
3 15 to 36V⎓ (dc) and 24V~ (ac)
4 15 to 36V⎓ (dc) and 24V~ (ac), plus 2 Digital I/O points

Output 1 and 2 Hardware Options

	Output 1	Output 2
CA	Switched dc/open collector	None
CH	Switched dc/open collector	NO-ARC 15 A power control
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
EH	Mechanical relay 5 A, form C	NO-ARC 15 A power control
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 (cannot use variable time base)
FJ	Universal process	Mechanical relay 5 A, form A (cannot use variable time base)
FK	Universal process	Solid-State Relay 0.5 A, form A (cannot use variable time base)
AK	None	Solid-State Relay 0.5 A, form A
KH	Solid-State Relay 0.5 A, form A	NO-ARC 15 A power control
KK	Solid-State Relay 0.5 A, form A	Solid-state relay 0.5 A, form A

- Options CH, EH and KH are not available with PM3 (1/32 DIN)

Communications Options
A None
1 EIA 485 Modbus RTU®
- Standard Bus EIA-485 always included - all models

Future Options
AAA None

Isolated Input Option
A None
D Isolated Input 1

Custom Options
AA Standard EZ-ZONE face plate
12 Class 1, Div. 2 (Not available with mechanical relay output types E, H, J)
AB EZ-ZONE logo and no Watlow name
AC No logo and no Watlow name
AG Conformal coating
XX Custom firmware, overlays, parameter settings

Index

Symbols

A

B

C

X

Y

Z

Declaration of Conformity

Series EZ-ZONE® PM

CE

WATLOW Electric Manufacturing Company ISO 9001since 1996.
1241 Bundy Blvd.
Winona, MN 55987 USA

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, IP65
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	**2013**	**Electrical equipment for measurement, control and laboratory use – EMC requirements (Industrial Immunity, Class B Emissions).**
EN 61000-4-2	2009	Electrostatic Discharge Immunity
EN 61000-4-3	2010	Radiated Field Immunity 10V/M 80–1000 MHz, 3 V/M 1.4–2.7 GHz
EN 61000-4-4	2012	Electrical Fast-Transient / Burst Immunity
EN 61000-4-5	2006	Surge Immunity (Also compliant with IEC 61000-4-5 2014)
EN 61000-4-6	2014	Conducted Immunity
EN 61000-4-11	2004	Voltage Dips, Short Interruptions and Voltage Variations Immunity
EN 61000-3-2	2009	Harmonic Current Emissions (Also compliant with IEC 61000-3-2 2014)
EN 61000-3-3[1]	2013	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

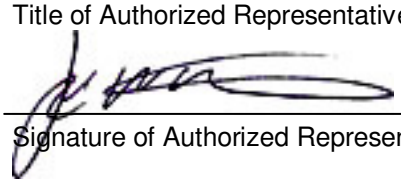
EN 61010-1	**2011[2]**	**Safety Requirements of electrical equipment for measurement, control and laboratory use. Part 1: General requirements**

[2] Compliance with 3rd Edition requirements with use of external surge suppressor installed on 230 Vac~ power line units. Recommend minimum 1000 V peak to maximum 2000 V peak, 70 joules or better part be used.

Compliant with 2011/65/EU RoHS2 Directive

Per 2012/19/EU W.E.E.E Directive  ***Please Recycle Properly.***

Joe Millanes	Winona, Minnesota, USA
Name of Authorized Representative	Place of Issue
Director of Operations	September 2014
Title of Authorized Representative	Date of Issue



Signature of Authorized Representative

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