EZ-ZONE® PM

User’s Manual

PID Controller Models

WATLOW

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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.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Exclamation Mark" /></td>
<td>CAUTION – Warning or Hazard that needs further explanation than label on unit can provide. Consult users manual for further information.</td>
</tr>
<tr>
<td><img src="image2" alt="Arrowhead" /></td>
<td>ESD Sensitive product, use proper grounding and handling techniques when installing or servicing product.</td>
</tr>
<tr>
<td><img src="image3" alt="Box" /></td>
<td>Unit protected by double/reinforced insulation for shock hazard prevention.</td>
</tr>
<tr>
<td><img src="image4" alt="Trash Can" /></td>
<td>Do not throw in trash, use proper recycling techniques or consult manufacturer for proper disposal.</td>
</tr>
<tr>
<td><img src="image5" alt="Flame" /></td>
<td>Enclosure made of Polycarbonate material. Use proper recycling techniques or consult manufacturer for proper disposal.</td>
</tr>
<tr>
<td><img src="image6" alt="Alternating Current" /></td>
<td>Unit can be powered with either alternating current (ac) voltage or direct current (dc) voltage.</td>
</tr>
<tr>
<td><img src="image7" alt="UL Listed" /></td>
<td>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 QUXX, QUYX. See: <a href="http://www.ul.com">www.ul.com</a></td>
</tr>
<tr>
<td><img src="image8" alt="CE" /></td>
<td>Unit is compliant with European Union directives. See Declaration of Conformity for further details on Directives and Standards used for Compliance.</td>
</tr>
<tr>
<td><img src="image9" alt="FM Approved" /></td>
<td>Unit has been reviewed and approved by Factory Mutual as a Temperature Limit Device per FM Class 3545 standard. See: <a href="http://www.fmglobal.com">www.fmglobal.com</a></td>
</tr>
<tr>
<td><img src="image10" alt="CSA" /></td>
<td>Unit has been reviewed and approved by CSA International for use as Temperature Indicating-Regulating Equipment per CSA C22.2 No. 24. See: <a href="http://www.csa-international.org">www.csa-international.org</a></td>
</tr>
<tr>
<td><img src="image11" alt="DeviceNet" /></td>
<td>Unit has been reviewed and approved by ODVA for compliance with DeviceNet communications protocol. See: <a href="http://www.odva.org">www.odva.org</a></td>
</tr>
<tr>
<td><img src="image12" alt="EtherNet/IP" /></td>
<td>Unit has been reviewed and approved by ODVA for compliance with Ethernet/IP communications protocol. See: <a href="http://www.odva.org">www.odva.org</a></td>
</tr>
</tbody>
</table>

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
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 mis-use, we will provide repair costs and request a purchase order to proceed with the repair work.

5. To return products that are not defective, goods must be in new condition, in the original boxes and they must be returned within 120 days of receipt. A 20 percent restocking charge is applied for all returned stock controls and accessories.

6. If the unit is unrepairable, you will receive a letter of explanation and be given the option to have the unit returned to you at your expense or to have us scrap the unit.

7. Watlow reserves the right to charge for no trouble found (NTF) returns.

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EZ-ZONE® PM is covered by U.S. Patent No. 6,005,577 and Patents Pending
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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 tuning 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 IP66 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-Keys
- 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.

<table>
<thead>
<tr>
<th>Setup Page</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setup Page</td>
<td>Push and hold the up and down keys ( <code>$</code> <code>®</code>) for 6 seconds to enter. (See the Setup Page for further information)</td>
</tr>
<tr>
<td>Operations Page</td>
<td>After setting up the control to reflect your equipment, the Operations Page would be used to monitor or change runtime settings. As an example, the user may want to see how much time is left in a profile step or perhaps change the autotune set point.</td>
</tr>
<tr>
<td>Operations Page</td>
<td>Push and hold the up and down keys ( <code>$</code> <code>®</code>) for 3 seconds to enter. (See the Operations Page for further information)</td>
</tr>
<tr>
<td>Factory Page</td>
<td>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.</td>
</tr>
<tr>
<td>Factory Page</td>
<td>Push and hold the Infinity and the green Advance keys ( <code>∞</code> <code>®</code>) for 6 seconds to enter. (See the Factory Page for further information)</td>
</tr>
<tr>
<td>Home Page</td>
<td>Pushing the green Advance key <code>®</code> will allow the user to see and change such parameters as the control mode, enable autotune and idle set point to name a few.</td>
</tr>
<tr>
<td>Home Page</td>
<td>The control is at the Home Page when initially powered up.</td>
</tr>
<tr>
<td>Profile Page</td>
<td>If equipped with this feature a user would want to go here to configure a profile.</td>
</tr>
<tr>
<td>Profile Page</td>
<td>Push and hold the the green Advance key <code>®</code> for 6 seconds to enter. (See the Profile Page for further information)</td>
</tr>
</tbody>
</table>

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

Input Functions

- Input sensor
- None
- Profile start/stop
- Profile start
- Profile hold/resume
- Profile disable
- TRU-TUNE® disable
- Control outputs off
- Manual/auto mode
- Tune
- Idle set point
- Force alarm
- Loop & alarms off
- Silence alarm
- Alarm reset
- Lock keypad
- Restore user settings

Network
- remote user interface, personal computer, programmable logic controller, human-machine interface

Analog Input 1
- none, Thermocouple, RTD (100Ω, 1kΩ), Thermistor 5kΩ, 10kΩ, 20kΩ, 40kΩ) Process (V, mV, mA) or 1k Potentiometer

PID Controller Board
- Slot A ramp-soak with 4 files (optional)

Output Functions

- Output 1
  - none, switched dc/open collector, form C mechanical (5 A) relay, form A solid-state (0.5 A) relay, process (V, mA)
  - off, heat, cool, duplex, alarm, retransmit, event

- Output 2
  - none, switched dc, NO-ARC power control (15 A), form A mechanical (5 A) or Solid-State Relay (0.5 A)
  - off, heat, cool, alarm, event

Supervisory & Power Board
- Slot C

Digital Input (or Output) 5 & 6
- (optional) none, switch, volts dc

EZ Key/s (PM4,6,8, and 9 only)
- programmable event

EIA 485 Communications
- Standard Bus, Modbus RTU (optional)

Digital Output (or Input) 5 & 6
- (optional) none, switched dc

Output Status

- Zone Address
- Indicates Zone Address
- Indicates I/O Status
Chapter 2: Install and Wire

Dimensions

1/32 DIN

Side

Top

Recommended panel spacing

Panel thickness 1.53 to 9.52 mm
(0.060 to 0.375)

21.6 mm (0.85 in)

22.4 mm (0.88 in)

45.2 mm (1.78 in)

53.3 mm (2.10 in)

101.6 mm (4.00 in)

31.2 mm (1.23 in)

30.9 mm (1.22 in)

15.9 mm (0.63 in)
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

Panel thickness (0.060 in) 1.53 mm to (0.375 in) 9.52 mm

Panel thickness (0.060 in) 1.53 mm to (0.375 in) 9.52 mm
1/4 DIN (PM4) Recommended Panel Spacing

Panel thickness .060 (1.53) to .375 (9.52)
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.

3. For a NEMA 4X (UL50, IP66) seal, alternately place and push the blade of a screwdriver against each of 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.

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

<table>
<thead>
<tr>
<th>Slot A</th>
<th>Terminal Definitions for Slot A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>Terminal Function</td>
</tr>
<tr>
<td>1</td>
<td>X1 common (Any switched dc output can use this common.)</td>
</tr>
<tr>
<td></td>
<td>W1 dc- open collector</td>
</tr>
<tr>
<td></td>
<td>Y1 dc+</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Input 1: S2 (RTD) or current + S3 (RTD), thermocouple -, current -, volts - or potentiometer wiper, thermistor input 1: all configurations</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Terminal Definitions for Slot C

<table>
<thead>
<tr>
<th>Slot C</th>
<th>Terminal Definitions for Slot C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Configuration</td>
</tr>
<tr>
<td>98</td>
<td>power input: ac or dc+</td>
</tr>
<tr>
<td>99</td>
<td>power input: ac or dc-</td>
</tr>
<tr>
<td>CC</td>
<td>Standard Bus or Modbus RTU EIA-485 common</td>
</tr>
<tr>
<td>CA</td>
<td>Standard Bus or Modbus RTU EIA-485 T-/R-</td>
</tr>
<tr>
<td>CB</td>
<td>Standard Bus or Modbus RTU EIA-485 T+/R+</td>
</tr>
<tr>
<td>CF</td>
<td>Standard Bus EIA-485 common</td>
</tr>
<tr>
<td>CD</td>
<td>Standard Bus EIA-485 T-/R-</td>
</tr>
<tr>
<td>CE</td>
<td>Standard Bus EIA-485 T+/R+</td>
</tr>
<tr>
<td>B5</td>
<td>digital input-output common</td>
</tr>
<tr>
<td>D6</td>
<td>digital input or output 6</td>
</tr>
<tr>
<td>D5</td>
<td>digital input or output 5</td>
</tr>
</tbody>
</table>

---

**Back View**

**Slot Orientation**

1/16 DIN PM6

---

**Back View**

**Slot Orientation**

1/32 DIN PM3

---

**Watlow EZ-ZONE® PM PID Controller**

Chapter 2 Install and Wire
Controller Power Supply
12 to 40V\(^{\text{dc}}\)
20 to 28V\(^{\text{ac}}\)
100 to 240V\(^{\text{ac}}\)

Mechanical Relay,
Solid-State Relay,
NO-ARC Relay
Outputs

Low-voltage Isolation: 42V peak
Safety Isolation: 2300V\(^{\text{ac}}\)

Back View
Slot Orientation
1/8 DIN Vertical PM8

Back View
Slot Orientation
1/4 DIN Horizontal PM4

Back View
Slot Orientation
1/8 DIN Horizontal PM9

EZ-ZONE PM Isolation Blocks

Controller Low Voltage Power Bus

Safety Isolation

No Isolation

Digital Inputs & Outputs 5-6

Switched DC, Open Collector,
Process outputs

Analog Input 1

Communications Ports

Safety Isolation
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)
• 0.8 Nm (7.0 lb.-in.) torque

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

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

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

Low Power

High Power

Digital Input 5, 6

Voltage Input

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

Note:
Maximum wire size termination and torque rating:
- 0.0507 to 3.30 mm² (30 to 12 AWG) single-wire termination or two 1.31 mm² (16 AWG)
- 0.8 Nm (7.0 lb.-in.) torque

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

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

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

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

Input 1 Thermocouple
- 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.

Input 1 RTD
- platinum, 100 and 1,000 Ω @ 0°C
- calibration to DIN curve (0.00385 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.

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

Input 1 Potentiometer
- Use a 1 kΩ potentiometer.
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)
- 0.8 Nm (7.0 lb.-in.) torque

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

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

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

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

Input 1 Thermistor

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

Input 1: PM \( [J,N,E^*] \ldots \) (S1/R1)

\(^*\)PM4,8 & 9 only
**Warning:**
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

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

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

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

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

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

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

---

### Digital Output 5, 6

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

#### Switched DC Wiring Example Using DO 5 and 6

![Switched DC Wiring Example Diagram]
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)
- 0.8 Nm (7.0 lb.-in.) torque

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

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

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

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

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

Output 1 Switched DC/Open Collector

- 30 mA dc maximum supply current
- short circuit limited to <50 mA
- 22 to 32V= (dc) open circuit voltage

Use dc- and dc+ to drive external solid-state relay.
- DIN-A-MITE compatible
- single-pole: up to 4 in parallel or 4 in series
- 2-pole: up to 2 in parallel or 2 in series
- 3-pole: up to 2 in series

Open Collector
- 100 mA maximum output current sink
- 30V= (dc) maximum supply voltage

Any switched dc output can use the common terminal.
Use an external power supply to control a dc load, with the load positive to the positive of the power supply, the load negative to the open collector and common to the power supply negative.

See Quencharc note.

Output 1 Mechanical Relay, Form C

- 5 A at 240V= (ac) or 30V= (dc) maximum resistive load
- 20 mA at 24 V 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.

Output 1 Universal Process

- 0 to 20 mA into 800 Ω maximum load
- 0 to 10V= (dc) into voltage 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.

See Quencharc note.
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)
- 0.8 Nm (7.0 lb.-in.) torque

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

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.

Output 2 Switched DC

- 10 mA dc maximum supply current
- short circuit limited to <50 mA
- 22 to 32V= (dc) open circuit voltage
- use dc- and dc+ to drive external solid-state relay
- DIN-A-MITE compatible
- single-pole: up to 2 in series, none in parallel

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.
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)
- 0.8 Nm (7.0 lb.-in.) torque

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

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

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

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

### Output 2 NO-ARC Relay, Form A

<table>
<thead>
<tr>
<th>Slot A</th>
<th>L2</th>
<th>K2</th>
</tr>
</thead>
</table>

- 15 A at 85 to 264V~ (ac) resistive load only
- 1/16 DIN models 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 __

### Output 2 Mechanical Relay, Form A

<table>
<thead>
<tr>
<th>Slot A</th>
<th>L2</th>
<th>K2</th>
</tr>
</thead>
</table>

- 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 Quenchcare note.

PM __ [J] __ AAAA __

### Output 2 Solid-state Relay, Form A

<table>
<thead>
<tr>
<th>Slot A</th>
<th>L1</th>
<th>K1</th>
<th>J1</th>
<th>L2</th>
<th>K2</th>
</tr>
</thead>
</table>

- 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 Quenchcare note.

PM __ [K] __ 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)
- 0.8 Nm (7.0 lb.-in.) torque

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

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

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

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

**Note:**
Avoid continuous writes within loops. Excessive writes to EEPROM will cause premature EEPROM failure. The EEPROM is rated for 1,000,000 writes.

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

![Quencharc Wiring Diagram]

### Standard Bus EIA-485 Communications

<table>
<thead>
<tr>
<th>Slot C</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>98</td>
<td>99</td>
<td>CF</td>
<td>common</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CD</td>
<td>T-/R-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CE</td>
<td>T+/R+</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DB5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DD6</td>
<td></td>
</tr>
</tbody>
</table>

- 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

### Modbus RTU or Standard Bus EIA-485 Communications

<table>
<thead>
<tr>
<th>Slot C</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>98</td>
<td>99</td>
<td>CA or CD</td>
<td>T-/R-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CB or CE</td>
<td>T+/R+</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CC or CF</td>
<td>common</td>
</tr>
</tbody>
</table>

- 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

### 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.

<table>
<thead>
<tr>
<th>Modbus-IDA Terminal</th>
<th>EIA/TIA-485 Name</th>
<th>Watlow Terminal Label</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>DO</td>
<td>A</td>
<td>CA or CD</td>
<td>T-/R-</td>
</tr>
<tr>
<td>D1</td>
<td>B</td>
<td>CB or CE</td>
<td>T+/R+</td>
</tr>
<tr>
<td>common</td>
<td>common</td>
<td>CC or CF</td>
<td>common</td>
</tr>
</tbody>
</table>

Watlow EZ-ZONE® PM PID Controller

Chapter 2 Install and Wire
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)
- 0.8 Nm (7.0 lb.-in.) torque

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

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

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

Note:
The control output common terminal and the digital common terminal are referenced to different voltages and must remain isolated.
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)
- 0.8 Nm (7.0 lb.-in.) torque

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

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

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

Note:
The control output common terminal and the digital common terminal are referenced to different voltages and must remain isolated.
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  E = zone 14
b = zone 11  F = zone 15
C = zone 12  h = zone 16
d = zone 13

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

Channel Display:
Indicates the channel for any given EZ-ZONE module.
- Available with the PM4, 8 and PM9 only.

Infinity Key Ø
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 Ø
Advances through parameter prompts.

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 Keys:
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 Ø Ø
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.
### 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 \[\text{Attention}\] 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 \(\circ\) key. Alternatively, use the method below to view all and then clear.

Push the Advance Key to display \(\text{ignr}\) in the upper display and the message source (such as \(\text{al;h1}\)) in the lower display. Use the Up \(\uparrow\) or Down \(\downarrow\) keys to scroll through possible responses, such as Clear \(\text{CLR}\) or Silence \(\text{SiL}\). Then push the Advance \(\bullet\) or Infinity \(\circ\) key to execute the action. See the Home Page for further information on the Attention Codes.

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Appears If</th>
</tr>
</thead>
<tbody>
<tr>
<td>[\text{Attention}]</td>
<td>Attention</td>
<td>(\text{AL;l1}) (\text{AL;l2}) (\text{AL;l3}) (\text{AL;l4}) (\text{AL;h1}) (\text{AL;h2}) (\text{AL;h3}) (\text{AL;h4}) (\text{AL;E1}) (\text{AL;E2}) (\text{AL;E3}) (\text{AL;E4}) (\text{Er;i1}) (\text{Er;i2}) (\text{Er;i3}) (\text{Er;i4}) (\text{tUn1}) (\text{rP1}) (\text{LP;o1}) (\text{LP;r1})</td>
<td>(\text{AL;l1}) (\text{AL;l2}) (\text{AL;l3}) (\text{AL;l4}) (\text{AL;h1}) (\text{AL;h2}) (\text{AL;h3}) (\text{AL;h4}) (\text{AL;E1}) (\text{AL;E2}) (\text{AL;E3}) (\text{AL;E4}) (\text{Er;i1}) (\text{Er;i2}) (\text{Er;i3}) (\text{Er;i4}) (\text{tUn1}) (\text{rP1}) (\text{LP;o1}) (\text{LP;r1})</td>
</tr>
</tbody>
</table>
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 [Attn] parameter appears only if there is an active message. An example of an active message could be an Input Error [er;i1], 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.

If Control Mode is set to Auto, the Process Value is in the upper display and the Closed Loop 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.

Modifying the Home Page

To modify the Home Page proceed to the Factory Menu by pushing and holding the Advance [‰] key and the Infinity [ˆ] key for approximately six seconds.

Upon entering the Factory Page the first menu will be the Custom Menu [Cust]. Once there push the Advance [‰] key where the lower display will show [Cust] and the upper display will show [1]. Again, push the Advance [‰] button where the prompt for the Active Process Value [ACP] will be displayed on top and Parameter [PR] in the bottom. Using the Up [¿] or Down [¯] arrow keys will allow for a customized selection of choice. There are twenty positions available that can be customized.

Modifying the Display Pairs

The Home Page, being a customized list of as many as 20 parameters can be configured in pairs of up to 10 via the Display Pairs [dprs] prompt found in the Diagnostic Menu [diag] (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 [Cpr1] will not appear unless the Cool algorithm [Cag] is turned on in the Setup Page under the Loop menu. The Display Pairs [dprs] prompt will default to 1, therefore the upper display will reflect the Active Process Value [ACP] and the lower display will reflect the Active Set Point [CSP] 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.

The display can be configured to scroll by going to the Factory Page under the Diagnostic Menu and changing the Display Time [d;ti] 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 [dprs] is set to 1 the Display Time [d;ti] prompt will have no effect on the display.
<table>
<thead>
<tr>
<th>Home Page Defaults</th>
<th>Home Page Display</th>
<th>Parameter Page and Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All Models</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Active Process Value (1)</td>
<td>Numerical value</td>
<td>Operations Page, Monitor Menu</td>
</tr>
<tr>
<td>2 Active Set Point (1)</td>
<td>Numerical value</td>
<td>Operations Page, Monitor Menu</td>
</tr>
<tr>
<td>3 User Control Mode (1)</td>
<td>( C; M1 )</td>
<td>Operations Page, Monitor Menu</td>
</tr>
<tr>
<td>4 Heat Power (1)</td>
<td>( h; pr1 )</td>
<td>Operations Page, Monitor Menu</td>
</tr>
<tr>
<td>5 Cool Power (1)</td>
<td>( C; pr1 )</td>
<td>Operations Page, Monitor Menu</td>
</tr>
<tr>
<td>6 Autotune (1)</td>
<td>( aut1 )</td>
<td>Operations Page, Loop Menu</td>
</tr>
<tr>
<td>7 Idle (1)</td>
<td>( id; s1 )</td>
<td>Operations Page, Loop Menu</td>
</tr>
<tr>
<td>8 * Start Profile</td>
<td>( p; st1 )</td>
<td></td>
</tr>
<tr>
<td>9 * Action Request</td>
<td>( p; ac1 )</td>
<td></td>
</tr>
<tr>
<td>10 None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 None</td>
<td></td>
<td></td>
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<tr>
<td>13 None</td>
<td></td>
<td></td>
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<tr>
<td>14 None</td>
<td></td>
<td></td>
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<tr>
<td>15 None</td>
<td></td>
<td></td>
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<tr>
<td>16 None</td>
<td></td>
<td></td>
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<tr>
<td>17 None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Header Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>Visually displayed information from the control.</td>
</tr>
<tr>
<td>Parameter Name</td>
<td>Describes the function of the given parameter.</td>
</tr>
<tr>
<td>Range</td>
<td>Defines options available for this prompt, i.e., min/max values (numerical), yes/no, etc... (further explanation below).</td>
</tr>
<tr>
<td>Default</td>
<td>Values as delivered from the factory.</td>
</tr>
<tr>
<td>Modbus Relative Address</td>
<td>Identifies unique parameters using either the Modbus RTU or Modbus TCP protocols (further explanation below).</td>
</tr>
<tr>
<td>CIP (Common Industrial Protocol)</td>
<td>Identifies unique parameters using either the DeviceNet or EtherNet/IP protocol (further explanation below).</td>
</tr>
<tr>
<td>Profibus Index</td>
<td>Identifies unique parameters using Profibus DP protocol (further explanation below).</td>
</tr>
<tr>
<td>Parameter ID</td>
<td>Identifies unique parameters used with other software such as, LabVIEW.</td>
</tr>
</tbody>
</table>

Data Type R/W

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>uint</td>
<td>Unsigned 16 bit integer</td>
</tr>
<tr>
<td>dint</td>
<td>long, 32-bit</td>
</tr>
<tr>
<td>string</td>
<td>ASCII (8 bits per character)</td>
</tr>
<tr>
<td>float</td>
<td>IEEE 754 32-bit</td>
</tr>
<tr>
<td>RWES</td>
<td>Readable, Writable, EEPROM (saved), User Set (saved)</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Digit</th>
<th>Character</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>b</td>
</tr>
<tr>
<td>4</td>
<td>c</td>
</tr>
<tr>
<td>5</td>
<td>d</td>
</tr>
<tr>
<td>6</td>
<td>e</td>
</tr>
<tr>
<td>7</td>
<td>f</td>
</tr>
<tr>
<td>8</td>
<td>g</td>
</tr>
<tr>
<td>9</td>
<td>h</td>
</tr>
</tbody>
</table>

Range

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

Modbus RTU 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, [Com] Menu) from the default low/high [lo hi] to high/low [hi lo].

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 Mod-
bus 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 registers. The Data Map for Modbus registers can be changed in the Setup Page under the 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](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](http://www.watlow.com/literature/pti_search.cfm)
Chapter 5: Operations Page

Navigating the Operations Page

To go to the Operations Page from the Home Page, press both the Up \( \uparrow \) and Down \( \downarrow \) keys for three seconds. \[ Ai \] will appear in the upper display and \[ oPEr \] will appear in the lower display.

- Press the Up \( \uparrow \) or Down \( \downarrow \) key to view available menus. On the following pages top level menus are identified with a yellow background color.
- Press the Advance Key \( \uparrow \) to enter the menu of choice.
- If a submenu exists (more than one instance), press the Up \( \uparrow \) or Down \( \downarrow \) key to select and then press the Advance Key \( \uparrow \) to enter.
- Press the Up \( \uparrow \) or Down \( \downarrow \) key to move through available menu prompts.
- Press the Infinity Key \( \uparrow \) to move backwards through the levels: parameter to submenu; submenu to menu; menu to Home Page.
- Press and hold the Infinity Key \( \uparrow \) for two seconds to return to the Home Page.

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

Operations Page

| \[ Ai \] | Analog Input Menu |
| \[ oPEr \] | Process Value |
| \[ oPEr \] | Error Status |
| \[ oPEr \] | Calibration Offset |

| \[ Lnc \] | Linearization Menu |
| \[ oPEr \] | Source Value A |
| \[ oPEr \] | Offset |
| \[ oPEr \] | Output Value |

| \[ Pu \] | Process Value Menu |
| \[ oPEr \] | Source Value A |
| \[ oPEr \] | Offset |
| \[ oPEr \] | Output Value |

| \[ d.io\] | Digital Input/Output Menu |
| \[ d.io\] | Digital Input/Output |
| \[ d.io\] | Output State |
| \[ d.io\] | Event State |
| \[ d.io\] | Input State |

| \[ Mon\] | Monitor Menu |
| \[ oPEr \] | Control Mode Active |
| \[ oPEr \] | Heat Power |
| \[ oPEr \] | Cool Power |
| \[ oPEr \] | Closed Loop Working Set Point |
| \[ oPEr \] | Process Value Active |

| \[ Loop\] | Loop Menu |
| \[ oPEr \] | Remote Enable |
| \[ oPEr \] | Control Mode |

| \[ RSP\] | Autotune Set Point |
| \[ RUE\] | Autotune Request |
| \[ CSP\] | Closed Loop Set Point |
| \[ hPl\] | Heat Proportional Band |
| \[ hHy\] | Heat Hysteresis |
| \[ CPb\] | Cool Proportional Band |
| \[ Chy\] | Cool Hysteresis |
| \[ tI\] | Time Integral |
| \[ tD\] | Time Derivative |
| \[ db\] | Dead Band |
| \[ oSP\] | Open Loop Set Point |

| \[ RLn\] | Alarm Menu |
| \[ 1\] to \[ 4\] | Alarm 1 |
| \[ Ra\] | Low Set Point |
| \[ Rn\] | High Set Point |

| \[ PSt\] | Profile Status Menu |
| \[ 1\] to \[ 4\] | Profile Status |
| \[ PSt\] | Profile Start |
| \[ PRe\] | Action Request |
| \[ SEp\] | Active Step |
| \[ SEY\] | Active Step Type |
| \[ RSP1\] | Target Set Point Loop 1 |
| \[ RSP\] | Produced Set Point 1 |
| \[ hour\] | Hours Remaining |
| \[ min\] | Minutes Remaining |
| \[ seC\] | Seconds Remaining |
| \[ En1\] | Active Event Output 1 |
| \[ En2\] | Active Event Output 2 |
| \[ JC\] | Jump Count Remaining |

* Available with PM4, PM8 and PM9 models only
<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Attribute hex (dec)</th>
<th>Pro-bus Index</th>
<th>Paqram-eter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Analog Input Menu</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td><strong>Display</strong></td>
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<td></td>
</tr>
<tr>
<td></td>
<td><strong>Parameter Name</strong></td>
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<td></td>
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<tr>
<td></td>
<td><strong>Description</strong></td>
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</tr>
<tr>
<td></td>
<td><strong>Range</strong></td>
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<tr>
<td></td>
<td><strong>Default</strong></td>
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<td></td>
</tr>
<tr>
<td></td>
<td><strong>Modbus Relative Address</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>CIP Class</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Attribute</strong></td>
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<td></td>
</tr>
<tr>
<td></td>
<td><strong>hex (dec)</strong></td>
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<td></td>
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</tr>
<tr>
<td></td>
<td><strong>Pro-bus Index</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Pqaram-eter ID</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Data Type &amp; Read/Write</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Analog Input Menu**

**Analog Input (1) Process Value**
- View the process value.
  - Range: -1,999.000 to 9,999.000°F or units
  - Default: -1,128.000 to 5,537.000°C
  - Modbus Relative Address: -
  - CIP Class: -
  - Instance: -
  - Attribute: -
  - hex (dec): -
  - Pro-bus Index: -
  - Parameter ID: -
  - Data Type: float
  - Read/Write: R

**Analog Input (1) Error Status**
- View the cause of the most recent error.
- If the status message is [Error] or [Error, Error], this parameter will display the cause of the input error.
  - Range: None (61)
  - Default: Open (65)
  - Modbus Relative Address: -
  - CIP Class: -
  - Instance: -
  - Attribute: -
  - hex (dec): 0x68 (104)
  - Pro-bus Index: 1
  - Parameter ID: 4001
  - Data Type: uint
  - Read/Write: R

**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.
  - Range: -1,999.000 to 9,999.000°F or units
  - Default: -1,110.555 to 5,555.000°C
  - Modbus Relative Address: 0.0
  - CIP Class: -
  - Instance: -
  - Attribute: -
  - hex (dec): 0x68 (104)
  - Pro-bus Index: 1
  - Parameter ID: 4002
  - Data Type: float
  - Read/Write: RWES

**Linearization Menu**

**Linearization (1) Source Value A**
- View the value of Source A.
  - Range: -1,999.000 to 9,999.000°F or units
  - Default: -1,128.000 to 5,537.000°C
  - Modbus Relative Address: -
  - CIP Class: -
  - Instance: -
  - Attribute: -
  - hex (dec): -
  - Pro-bus Index: 3566
  - Parameter ID: 34004
  - Data Type: float
  - Read/Write: R

**Linearization (1) Offset**
- Set an offset to be applied to this function's output.
  - Range: -1,999.000 to 9,999.000°F or units
  - Default: -1,128.000 to 5,537.000°C
  - Modbus Relative Address: 0
  - CIP Class: -
  - Instance: -
  - Attribute: -
  - hex (dec): 0x68 (134)
  - Pro-bus Index: 1
  - Parameter ID: 34006
  - Data Type: float
  - Read/Write: RWES

**Linearization (1) Output Value**
- View the value of this function's output.
  - Range: -1,999.000 to 9,999.000°F or units
  - Default: -1,128.000 to 5,537.000°C
  - Modbus Relative Address: -
  - CIP Class: -
  - Instance: -
  - Attribute: -
  - hex (dec): -
  - Pro-bus Index: 3572
  - Parameter ID: 34007
  - Data Type: float
  - Read/Write: R

**Note:**
- Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.
- Available with PM4, PM8 and PM9 models only
<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Attribute hex (dec)</th>
<th>Pro- fibus Index</th>
<th>Paqram- eter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Display</td>
<td><strong>Linearization (1)</strong> Output Error</td>
<td>View reported cause for Linearization output malfunction.</td>
<td>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)</td>
<td>- - -</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x86 (134) 1 0x1C (28)</td>
<td>- - -</td>
<td>34028</td>
</tr>
</tbody>
</table>

### Process Value Menu

| SxR      | 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 | 0x7E (126) 1 0x10 (16) | - - - | 26016  | float R |

| 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 | 0x7E (126) 1 0x17 (23) | - - - | 26023  | float RWES |

| nV       | 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 | 0x7E (126) 1 0x16 (22) | - - - | 26022  | float R |

No Display | **Process Value (1) Output Error** | View reported cause for Process 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 | 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.

* Available with PM4, PM8 and PM9 models only
## Operations Page

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Attribute (dec)</th>
<th>Modbus Index</th>
<th>Paqrameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Input/Output Menu</td>
<td>Digital Output (5 to 6) Output State View the state of this output.</td>
<td></td>
<td></td>
<td></td>
<td>Instance 1 Map 1 Map 2 1012 1132 Offset to next instance equals +30</td>
<td>0x6A (106)</td>
<td>1 to 2</td>
<td>R: Read W: Write E: EE PROM S: User Set</td>
</tr>
<tr>
<td></td>
<td>Digital Input (5 to 6) Event Status View this event input state.</td>
<td></td>
<td>Instance 1 Map 1 Map 2 1328 1568 Offset to next instance equals +20</td>
<td>0x6E (110)</td>
<td>1 to 2</td>
<td>R: Read W: Write E: EE PROM S: User Set</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EZ-Key/s (1 to 2) Event Status View this event input state.</td>
<td></td>
<td></td>
<td>0x6E (110)</td>
<td>3 to 4</td>
<td>R: Read W: Write E: EE PROM S: User Set</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor Menu</td>
<td>Monitor (1) Control Mode Active View the current control mode.</td>
<td></td>
<td>Off</td>
<td>Instance 1 Map 1 Map 2 1882 2362</td>
<td>0x97 (151)</td>
<td>1</td>
<td>R: Read W: Write E: EE PROM S: User Set</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Auto (10)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Manual (54)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitor (1) Heat Power View the current heat output level.</td>
<td>0.0 to 100.0%</td>
<td>0.0</td>
<td>Instance 1 Map 1 Map 2 1904 2384</td>
<td>0x97 (151)</td>
<td>1</td>
<td>R: Read W: Write E: EE PROM S: User Set</td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitor (1) Cool Power View the current cool output level.</td>
<td>-100.0 to 0.0%</td>
<td>0.0</td>
<td>Instance 1 Map 1 Map 2 1906 2386</td>
<td>0x97 (151)</td>
<td>1</td>
<td>R: Read W: Write E: EE PROM S: User Set</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitor (1) Closed Loop Working Set Point View the set point currently in effect.</td>
<td>-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C</td>
<td></td>
<td>Instance 1 Map 1 Map 2 2172 2652</td>
<td>0x6B (107)</td>
<td>1</td>
<td>R: Read W: Write E: EE PROM S: User Set</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitor (1) Process Value Active View the current filtered process value using the control input.</td>
<td>-1,999.000 to 9,999.000°C or units -1,128.000 to 5,537.000°C</td>
<td></td>
<td>Instance 1 Map 1 Map 2 402</td>
<td>0x68 (104)</td>
<td>1</td>
<td>R: Read W: Write E: EE PROM S: User Set</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Display</td>
<td>Monitor (1) Set Point Active Read the current active set point.</td>
<td>-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C</td>
<td></td>
<td>Instance 1 Map 1 Map 2 2172</td>
<td>0x6B (107)</td>
<td>1</td>
<td>R: Read W: Write E: EE PROM S: User Set</td>
<td></td>
</tr>
</tbody>
</table>

*Note:* Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.

* Available with PM4, PM8 and PM9 models only
## Operations Page

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute hex (dec)</th>
<th>Profinbus Index</th>
<th>Paqrameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Loop</strong>&lt;br&gt;<strong>Op</strong>er <strong>r</strong>:n</td>
<td>Control Loop (1) Remote Enable</td>
<td>Enable this loop to switch control to the remote set point.</td>
<td>Yes</td>
<td>Instance 1&lt;br&gt;Map 1&lt;br&gt;Map 2&lt;br&gt;2200&lt;br&gt;2680</td>
<td>0x6B (107)&lt;br&gt;1&lt;br&gt;0x15 (21)</td>
<td>48</td>
<td>7021</td>
<td>uint RWES</td>
</tr>
<tr>
<td><strong>r</strong>:n</td>
<td>Control Loop (1) Remote Set Point Type</td>
<td>Enable this loop to switch control to the remote set point.</td>
<td>Auto</td>
<td>Instance 1&lt;br&gt;Map 1&lt;br&gt;Map 2&lt;br&gt;2202&lt;br&gt;2682</td>
<td>0x6B (107)&lt;br&gt;1&lt;br&gt;0x16 (22)</td>
<td>- - -</td>
<td>7022</td>
<td>uint RWES</td>
</tr>
<tr>
<td><strong>r</strong>:t</td>
<td>Control Loop (1) Control Mode</td>
<td>Select the method that this loop will use to control.</td>
<td>Auto</td>
<td>Instance 1&lt;br&gt;Map 1&lt;br&gt;Map 2&lt;br&gt;1880&lt;br&gt;2360</td>
<td>0x97 (151)&lt;br&gt;1&lt;br&gt;1</td>
<td>63</td>
<td>8001</td>
<td>uint RWES</td>
</tr>
<tr>
<td><strong>R</strong>:t</td>
<td>Control Loop (1) Autotune Set Point</td>
<td>Set the set point that the autotune will use, as a percentage of the current set point.</td>
<td>90.0</td>
<td>Instance 1&lt;br&gt;Map 1&lt;br&gt;Map 2&lt;br&gt;1998&lt;br&gt;2398</td>
<td>0x97 (151)&lt;br&gt;1&lt;br&gt;0x14 (20)</td>
<td>- - -</td>
<td>8025</td>
<td>float RWES</td>
</tr>
<tr>
<td><strong>R</strong>:t</td>
<td>Control Loop (1) Autotune Request</td>
<td>Start an autotune. While the autotune is active, the Home Page will display <code>R</code>e<code>n</code></td>
<td>No</td>
<td>Instance 1&lt;br&gt;Map 1&lt;br&gt;Map 2&lt;br&gt;1920&lt;br&gt;2400</td>
<td>0x97 (151)&lt;br&gt;1&lt;br&gt;0x15 (21)</td>
<td>64</td>
<td>8026</td>
<td>uint RW</td>
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<td><strong>C</strong>:p</td>
<td>Control Loop (1) Closed Loop Set Point</td>
<td>Set the set point that the controller will automatically control to.</td>
<td></td>
<td>Instance 1&lt;br&gt;Map 1&lt;br&gt;Map 2&lt;br&gt;2160&lt;br&gt;2640</td>
<td>0x6B (107)&lt;br&gt;1&lt;br&gt;1</td>
<td>49</td>
<td>7001</td>
<td>float RWES</td>
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<tr>
<td><strong>t</strong>:d</td>
<td>Control Loop (1) Idle Set Point</td>
<td>Set a closed loop set point that can be triggered by an event state.</td>
<td></td>
<td>Instance 1&lt;br&gt;Map 1&lt;br&gt;Map 2&lt;br&gt;2176&lt;br&gt;2656</td>
<td>0x6B (107)&lt;br&gt;1&lt;br&gt;9</td>
<td>50</td>
<td>7009</td>
<td>float RWES</td>
</tr>
<tr>
<td><strong>h</strong>:P</td>
<td>Control Loop (1) Heat Proportional Band</td>
<td>Set the PID proportional band for the heat outputs.</td>
<td>0.001 to 9,999.000°F or units -1,110.555 to 5,555.000°C</td>
<td>Instance 1&lt;br&gt;Map 1&lt;br&gt;Map 2&lt;br&gt;1890&lt;br&gt;2370</td>
<td>0x97 (151)&lt;br&gt;1&lt;br&gt;6</td>
<td>65</td>
<td>8009</td>
<td>float RWES</td>
</tr>
<tr>
<td><strong>h</strong>:y</td>
<td>Control Loop (1) Heat Hysteresis</td>
<td>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.</td>
<td>0.001 to 9,999.000°F or units -1,110.555 to 5,555.000°C</td>
<td>Instance 1&lt;br&gt;Map 1&lt;br&gt;Map 2&lt;br&gt;1900&lt;br&gt;2380</td>
<td>0x97 (151)&lt;br&gt;1&lt;br&gt;0xB (11)</td>
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<td>8010</td>
<td>float RWES</td>
</tr>
</tbody>
</table>

**Note:**
Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.

* Available with PM4, PM8 and PM9 models only

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Watlow EZ-ZONE® PM PID Controller • 37 • Chapter 5 Operations Page
### Operations Page

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute hex (dec)</th>
<th>Pro-fibus Index</th>
<th>Param-eter ID</th>
<th>Data Type &amp; Read/Write</th>
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<tbody>
<tr>
<td>CPb</td>
<td>Cool Proportional Band</td>
<td>0.001 to 9,999.000°F or units -1,110.555 to 5,555.000°C</td>
<td>25.0°F or units 14.0°C</td>
<td>Instance 1 Map 1 Map 2 1892 2370</td>
<td>0x97 (151) 1 7</td>
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<td>8012</td>
<td>float RWES</td>
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<tr>
<td>C.hy</td>
<td>Cool Hysteresis</td>
<td>0.001 to 9,999.000°F or units -1,110.555 to 5,555.000°C</td>
<td>3.0°F or units 2.0°C</td>
<td>Instance 1 Map 1 Map 2 1902 2382</td>
<td>0x97 (151) 1 0xC (12)</td>
<td>68</td>
<td>8013</td>
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<tr>
<td>ti</td>
<td>Time Integral</td>
<td>0 to 9,999 seconds per repeat</td>
<td>180.0 seconds per repeat</td>
<td>Instance 1 Map 1 Map 2 1894 2374</td>
<td>0x97 (151) 1 8</td>
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<td>td</td>
<td>Time Derivative</td>
<td>0 to 9,999 seconds</td>
<td>0.0 seconds</td>
<td>Instance 1 Map 1 Map 2 1896 2376</td>
<td>0x97 (151) 1 9</td>
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<td>db</td>
<td>Dead Band</td>
<td>-1,000.0 to 1,000.0°F or units -556 to 556°C</td>
<td>0.0</td>
<td>Instance 1 Map 1 Map 2 1898 2378</td>
<td>0x97 (151) 1 0xA (10)</td>
<td>71</td>
<td>8008</td>
<td>float RWES</td>
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<td>o.SP</td>
<td>Open Loop Set Point</td>
<td>-100 to 100% (heat and cool) 0 to 100% (heat only) -100 to 0% (cool only)</td>
<td>0.0</td>
<td>Instance 1 Map 1 Map 2 2162 2642</td>
<td>0x6B (107) 1 2</td>
<td>51</td>
<td>7002</td>
<td>float RWES</td>
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<tr>
<td>No Display</td>
<td>Control Loop (1) Loop Error</td>
<td>None (61) Open Loop (1274) Reversed Sensor (1275)</td>
<td>- - -</td>
<td>Instance 1 Map 1 Map 2 1798</td>
<td>0x6C (108) 1 0x30 (48)</td>
<td>- - -</td>
<td>8030</td>
<td>uint R</td>
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<tr>
<td>No Display</td>
<td>Control Loop (1) Clear Loop Error</td>
<td>Clear (129) Ignore (204)</td>
<td>- - -</td>
<td>Instance 1 Map 1 Map 2 1800</td>
<td>0x6C (108) 1 0x31 (49)</td>
<td>- - -</td>
<td>8031</td>
<td>uint W</td>
</tr>
</tbody>
</table>

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* Available with PM4, PM8 and PM9 models only
### Alarm Menu

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute</th>
<th>Profibus Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
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</thead>
<tbody>
<tr>
<td><img src="A.Lo" alt="RL,a" /></td>
<td>Alarm (1 to 4) Low Set Point</td>
<td>-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C</td>
<td>32.0°F or 0.0°C</td>
<td>Instance 1 Map 1 Map 2 1482 1882 0x6D (109) 1 to 4 2 18 9002 float RWES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>![RH,i](A hi)</td>
<td>Alarm (1 to 4) High Set Point</td>
<td>-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C</td>
<td>300.0°F or 150.0°C</td>
<td>Instance 1 Map 1 Map 2 1480 1880 0x6D (109) 1 to 4 1 19 9001 float RWES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>![No Display](A Lo)</td>
<td>Alarm (1 to 4) Alarm State</td>
<td>Startup (88) None (61) Blocked (12) Alarm low (8) Alarm high (7) Error (28)</td>
<td>None</td>
<td>Instance 1 Map 1 Map 2 1496 1896 0x6D (109) 1 to 4 9 - - - - 9009 uint R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>![No Display](A Lo)</td>
<td>Alarm (1 to 4) Alarm Clearable</td>
<td>No (59) Yea (106)</td>
<td>- - - -</td>
<td>Instance 1 Map 1 Map 2 1502 1902 0x6D (109) 1 to 4 0xC (12) - - - - 9012 uint R</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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* Available with PM4, PM8 and PM9 models only
## Display Parameter Name Description

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Displayed</td>
<td>Alarm (1 to 4)</td>
<td>Write to this register to clear an alarm</td>
</tr>
<tr>
<td>No Displayed</td>
<td>Alarm Silence Request</td>
<td>Silence (1010)</td>
</tr>
<tr>
<td>No Displayed</td>
<td>Alarm Silenced</td>
<td>Write to this register to silence an alarm</td>
</tr>
<tr>
<td>No Displayed</td>
<td>Alarm Latched</td>
<td>Write to this register to silence an alarm</td>
</tr>
</tbody>
</table>

### 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.

### Chart

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Displayed</td>
<td>Alarm (1 to 4)</td>
<td>Write to this register to clear an alarm</td>
</tr>
<tr>
<td>No Displayed</td>
<td>Alarm Silence Request</td>
<td>Silence (1010)</td>
</tr>
<tr>
<td>No Displayed</td>
<td>Alarm Silenced</td>
<td>Write to this register to silence an alarm</td>
</tr>
<tr>
<td>No Displayed</td>
<td>Alarm Latched</td>
<td>Write to this register to silence an alarm</td>
</tr>
</tbody>
</table>

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* Available with PM4, PM8 and PM9 models only

* Available with PM8/9 only
<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Attribute hex (dec)</th>
<th>Profinbus Index</th>
<th>Paframeter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Pc\text{r}$ [PACr] $\text{Profile Status}$ $\text{Action Request}$</td>
<td>None (61)</td>
<td>None</td>
<td>Instance 1 Map 1 Map 2 2540 4360</td>
<td>0x7A (122) 1 0xB (11)</td>
<td>205</td>
<td>22011</td>
<td>uint RW</td>
<td></td>
</tr>
<tr>
<td>$Sp$ [StP] $\text{Profile Status}$ $\text{Active Step}$</td>
<td>View the currently running step.</td>
<td>1 to 40</td>
<td>0 (none)</td>
<td>Instance 1 Map 1 Map 2 2526 4346</td>
<td>0x7A (122) 1 4</td>
<td>- - -</td>
<td>22004</td>
<td>uint R</td>
</tr>
<tr>
<td>$S\text{typ}$ [$S\text{typ}$] $\text{Profile Status}$ $\text{Active Step Type}$</td>
<td>View the currently running step type.</td>
<td>- - -</td>
<td>- - -</td>
<td>Instance 1 Map 1 Map 2 2544 4364</td>
<td>0x7A (122) 1 0xD (13)</td>
<td>- - -</td>
<td>22013</td>
<td>uint R</td>
</tr>
<tr>
<td>$L\text{Sp}1$ [$tgSP$] $\text{Profile Status}$ $\text{Target Set Point Loop 1}$</td>
<td>View or change the target set point of the current step.</td>
<td>0.0°F or units -18.0°C</td>
<td>Instance 1 Map 1 Map 2 2542 4502</td>
<td>0x7A (122) 1 0xC (12)</td>
<td>- - -</td>
<td>22012</td>
<td>uint RW</td>
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<tr>
<td>$R\text{Sp}1$ [$AC.SP$] $\text{Profile Status}$ $\text{Produced Set Point 1}$</td>
<td>Display the current set point, even if the profile is ramping.</td>
<td>0.0°F or units -18.0°C</td>
<td>Instance 1 Map 1 Map 2 - - -</td>
<td>- - -</td>
<td>- - -</td>
<td>22005</td>
<td>float R</td>
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<tr>
<td>$h\text{our}$ [$hoUr$] $\text{Profile Status}$ $\text{Hours}$</td>
<td>Step time remaing in hours.</td>
<td>0 to 99</td>
<td>0</td>
<td>Instance 1 Map 1 Map 2 - - -</td>
<td>0x7A (122) 1 0xE (78)</td>
<td>- - -</td>
<td>22078</td>
<td>uint RW</td>
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<tr>
<td>$\text{Min}$ [$Min$] $\text{Profile Status}$ $\text{Minutes}$</td>
<td>Step time remaing in minutes.</td>
<td>0 to 59</td>
<td>0</td>
<td>Instance 1 Map 1 Map 2 - - -</td>
<td>0x7A (122) 1 0x4D (77)</td>
<td>- - -</td>
<td>22077</td>
<td>uint RW</td>
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<td>$\text{Sec}$ [$SEC$] $\text{Profile Status}$ $\text{Seconds}$</td>
<td>Step time remaing in seconds.</td>
<td>0 to 59</td>
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<td>Instance 1 Map 1 Map 2 - - -</td>
<td>0x7A (122) 1 0x4C (76)</td>
<td>- - -</td>
<td>22076</td>
<td>uint RW</td>
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<tr>
<td>$E\text{n}1$ [$Ent1$] $\text{Profile Status}$ $\text{Active Event Output 1}$</td>
<td>View or change the event output states.</td>
<td>Off (62)</td>
<td>Off</td>
<td>Instance 1 Map 1 Map 2 2540 4512</td>
<td>0x7A (122) 1 0xE (14)</td>
<td>- - -</td>
<td>22014</td>
<td>uint RW</td>
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</tbody>
</table>

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R: Read  W: Write  E: EE-PROM  S: User Set
## Display Parameter Name Description

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
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<td><strong>Active Event Output 2</strong></td>
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<td>View or change the event output states.</td>
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<td><img src="map" alt="Map 2" /> Map 2</td>
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</table>

### Note:

Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.

* Available with PM4, PM8 and PM9 models only
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. [/*] will appear in the upper display and [/*] 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.

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 submenu will appear.

Note:

Watlow EZ-ZONE® PM PID Controller

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

**Digital Input Function**

**Instance**

**Global Menu**
- **Display Units**
- **AC Line Frequency**
- **Ramping Type**
- **Profile type**
- **Guaranteed Soak Enable**
- **Guaranteed Soak Deviation 1**
- **Source instance A**
- **Source instance B**
- **Power Out Time**
- **Communications LED Action**
- **Zone Action**
- **Channel Action**
- **Display Pairs**
- **Menu Display Timer**
- **User Save**
- **User Restore**

**Communications Menu**
- **Protocol**
- **Standard Bus Address**
- **Modbus Address**
- **Baud Rate**
- **Parity**
- **Modbus Word Order**
- **Data Map**
- **Display Units**
- **Non-volatile Save**

**Real Time Clock Menu**
- **Hour**
- **Minute**
- **Day of Week**

*Available with PM8 and PM9 models only*
## Setup Page

### Analog Input Menu

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute hex (dec)</th>
<th>Profinbus Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
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<td><strong>Analog Input (1)</strong></td>
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<tr>
<td>SEn</td>
<td><strong>Sensor Type</strong></td>
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<tr>
<td></td>
<td>Set the analog sensor type to match the device wired to this input.</td>
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<tr>
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<td><strong>Note:</strong></td>
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<tr>
<td></td>
<td>There is no open-sensor detection for process inputs.</td>
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<td><strong>Analog Input (1)</strong></td>
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<tr>
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<td><strong>Linearization</strong></td>
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<tr>
<td></td>
<td>Set the linearization to match the thermocouple wired to this input.</td>
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<td><strong>Analog Input (1)</strong></td>
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<td><strong>RTD Leads</strong></td>
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<tr>
<td></td>
<td>Set to match the number of leads on the RTD wired to this input.</td>
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<td><strong>Analog Input (1)</strong></td>
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<tr>
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<td><strong>Units</strong></td>
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<td>Set the type of units the sensor will measure.</td>
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<td><strong>Analog Input (1)</strong></td>
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<td></td>
<td><strong>Scale Low</strong></td>
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<tr>
<td></td>
<td>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.</td>
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<td><strong>Analog Input (1)</strong></td>
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<td><strong>Scale High</strong></td>
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<tr>
<td></td>
<td>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.</td>
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<td><strong>Analog Input (1)</strong></td>
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<tr>
<td></td>
<td><strong>Range Low</strong></td>
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<tr>
<td></td>
<td>Set the low range for this function block's output.</td>
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</tbody>
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* Available with PM4, PM8 and PM9 models only.
## Setup Page

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute (hex dec)</th>
<th>Proﬁbus Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>r.hi</td>
<td>Analog Input (1) Range High</td>
<td>-1,999.000 to 9,999.000</td>
<td>9,999</td>
<td>Instance 1 Map 1 Map 2 394 394</td>
<td>0x68 (104) 1 0x12 (18)</td>
<td>9</td>
<td>4018</td>
<td>float RWES</td>
</tr>
<tr>
<td>P.EE</td>
<td>Analog Input (1) Process Error Enable</td>
<td>Off (62) Low (53)</td>
<td>Off</td>
<td>Instance 1 Map 1 Map 2 418 388</td>
<td>0x68 (104) 1 0x1E (31)</td>
<td>10</td>
<td>4030</td>
<td>uint RWES</td>
</tr>
<tr>
<td>P.EI</td>
<td>Analog Input (1) Process Error Low</td>
<td>-100.0 to 1,000.0</td>
<td>0.0</td>
<td>Instance 1 Map 1 Map 2 420 420</td>
<td>0x68 (104) 1 0x1F (31)</td>
<td>11</td>
<td>4031</td>
<td>float RWES</td>
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<td>t.C</td>
<td>Analog Input (1) Thermistor Curve</td>
<td>Curve A (1451) Curve B (1452) Curve C (1453) Custom (180)</td>
<td>Curve A</td>
<td>Instance 1 Map 1 Map 2 434 434</td>
<td>0x68 (104) 1 20x6 (38)</td>
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<td>r.r</td>
<td>Analog Input (1) Resistance Range</td>
<td>5K (1448) 10K (1360) 20K (1361) 40K (1449)</td>
<td>40K</td>
<td>Instance 1 Map 1 Map 2 432 432</td>
<td>0x68 (104) 1 0x25 (37)</td>
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<td>F.iL</td>
<td>Analog Input (1) Filter</td>
<td>0.0 to 60.0 seconds</td>
<td>0.5</td>
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<td>0x68 (104) 1 0x14 (14)</td>
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<td>4014</td>
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<td>i.Er</td>
<td>Analog Input (1) Error Latching</td>
<td>Off (62) On (63)</td>
<td>Off</td>
<td>Instance 1 Map 1 Map 2 414 414</td>
<td>0x68 (104) 1 0x1C (28)</td>
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<td>uint RWES</td>
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<td>d.EC</td>
<td>Analog Input (1) Display Precision</td>
<td>Whole (105) Tenths (94) Hundredths (40) Thousandths (96)</td>
<td>Whole</td>
<td>Instance 1 Map 1 Map 2 398 398</td>
<td>0x68 (104) 1 0x14 (20)</td>
<td>- - -</td>
<td>4020</td>
<td>uint RWES</td>
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### Linearization Menu

<table>
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<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute (hex dec)</th>
<th>Proﬁbus Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
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</thead>
<tbody>
<tr>
<td>F.n</td>
<td>Linearization (1) Function</td>
<td>Off (62) Interpolated (1482)</td>
<td>Off</td>
<td>Instance 1 Map 1 Map 2 3568</td>
<td>0x86 (134) 1 5</td>
<td>155</td>
<td>34005</td>
<td>uint RWES</td>
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</table>

**Note:**

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* Available with PM4, PM8 and PM9 models only

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Watlow EZ-ZONE® PM PID Controller  •  46  •  Chapter 6 Setup Page
<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute hex (dec)</th>
<th>Profidbus Index</th>
<th>Parammeter ID</th>
<th>Data Type &amp; Read/Write</th>
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<tr>
<td>Units</td>
<td>Linearization (1) Units</td>
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<tr>
<td></td>
<td>Set the units of Source A which is Analog Input 1.</td>
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<tr>
<td>ip.1</td>
<td>Input Point 1</td>
<td>-1,999.000 to 9,999.000</td>
<td>0.0</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x86 (134) 1 0x29 (41)</td>
<td>156</td>
<td>34029</td>
<td>uint RWES</td>
</tr>
<tr>
<td>op.1</td>
<td>Output Point 1</td>
<td>-1,999.000 to 9,999.000</td>
<td>0.0</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x86 (134) 1 0x12 (18)</td>
<td>158</td>
<td>34018</td>
<td>float RWES</td>
</tr>
<tr>
<td>ip.2</td>
<td>Input Point 2</td>
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<td>1.0</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x86 (134) 1 0x13 (19)</td>
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<td>34009</td>
<td>float RWES</td>
</tr>
<tr>
<td>op.2</td>
<td>Output Point 2</td>
<td>-1,999.000 to 9,999.000</td>
<td>1.0</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x86 (134) 1 0xA (10)</td>
<td>160</td>
<td>34019</td>
<td>float RWES</td>
</tr>
<tr>
<td>ip.3</td>
<td>Input Point 3</td>
<td>-1,999.000 to 9,999.000</td>
<td>2.0</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x86 (134) 1 0x14 (20)</td>
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<td>34010</td>
<td>float RWES</td>
</tr>
<tr>
<td>op.3</td>
<td>Output Point 3</td>
<td>-1,999.000 to 9,999.000</td>
<td>2.0</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x86 (134) 1 0xB (11)</td>
<td>163</td>
<td>34011</td>
<td>float RWES</td>
</tr>
<tr>
<td>ip.4</td>
<td>Input Point 4</td>
<td>-1,999.000 to 9,999.000</td>
<td>3.0</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x86 (134) 1 0xC (12)</td>
<td>164</td>
<td>34021</td>
<td>float RWES</td>
</tr>
<tr>
<td>op.4</td>
<td>Output Point 4</td>
<td>-1,999.000 to 9,999.000</td>
<td>3.0</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x86 (134) 1 0x16 (22)</td>
<td>166</td>
<td>34012</td>
<td>float RWES</td>
</tr>
</tbody>
</table>

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><code>iP;6</code></td>
<td>Linearization (1) Input Point 6 Set the value that will be mapped to output 6.</td>
<td>-1,999.000 to 9,999.000</td>
<td>5.0</td>
<td>Instance 1 Map 1 Map 2 - - - - 3584</td>
<td>0x86 (134) 1</td>
<td>0xF (15)</td>
<td>173</td>
<td>float RWES</td>
</tr>
<tr>
<td><code>oP;6</code></td>
<td>Linearization (1) Output Point 6 Set the value that will be mapped to input 6.</td>
<td>-1,999.000 to 9,999.000</td>
<td>5.0</td>
<td>Instance 1 Map 1 Map 2 - - - - 3604</td>
<td>0x86 (134) 1</td>
<td>0x17 (23)</td>
<td>168</td>
<td>float RWES</td>
</tr>
<tr>
<td><code>iP;7</code></td>
<td>Linearization (1) Input Point 7 Set the value that will be mapped to output 7.</td>
<td>-1,999.000 to 9,999.000</td>
<td>6.0</td>
<td>Instance 1 Map 1 Map 2 - - - - 3586</td>
<td>0x86 (134) 1</td>
<td>0xE (14)</td>
<td>169</td>
<td>float RWES</td>
</tr>
<tr>
<td><code>oP;7</code></td>
<td>Linearization (1) Output Point 7 Set the value that will be mapped to input 7.</td>
<td>-1,999.000 to 9,999.000</td>
<td>6.0</td>
<td>Instance 1 Map 1 Map 2 - - - - 3606</td>
<td>0x86 (134) 1</td>
<td>0x18 (24)</td>
<td>170</td>
<td>float RWES</td>
</tr>
<tr>
<td><code>iP;8</code></td>
<td>Linearization (1) Input Point 8 Set the value that will be mapped to output 8.</td>
<td>-1,999.000 to 9,999.000</td>
<td>7.0</td>
<td>Instance 1 Map 1 Map 2 - - - - 3588</td>
<td>0x86 (134) 1</td>
<td>0xF (15)</td>
<td>171</td>
<td>float RWES</td>
</tr>
<tr>
<td><code>oP;8</code></td>
<td>Linearization (1) Output Point 8 Set the value that will be mapped to input 8.</td>
<td>-1,999.000 to 9,999.000</td>
<td>7.0</td>
<td>Instance 1 Map 1 Map 2 - - - - 3608</td>
<td>0x86 (134) 1</td>
<td>0x19 (25)</td>
<td>172</td>
<td>float RWES</td>
</tr>
<tr>
<td><code>iP;9</code></td>
<td>Linearization (1) Input Point 9 Set the value that will be mapped to output 9.</td>
<td>-1,999.000 to 9,999.000</td>
<td>8.0</td>
<td>Instance 1 Map 1 Map 2 - - - - 3590</td>
<td>0x86 (134) 1</td>
<td>0x10 (16)</td>
<td>173</td>
<td>float RWES</td>
</tr>
<tr>
<td><code>oP;9</code></td>
<td>Linearization (1) Output Point 9 Set the value that will be mapped to input 9.</td>
<td>-1,999.000 to 9,999.000</td>
<td>8.0</td>
<td>Instance 1 Map 1 Map 2 - - - - 3610</td>
<td>0x86 (134) 1</td>
<td>0x1A (26)</td>
<td>174</td>
<td>float RWES</td>
</tr>
<tr>
<td><code>iP;10</code></td>
<td>Linearization (1) Input Point 10 Set the value that will be mapped to output 10.</td>
<td>-1,999.000 to 9,999.000</td>
<td>9.0</td>
<td>Instance 1 Map 1 Map 2 - - - - 3592</td>
<td>0x86 (134) 1</td>
<td>0x11 (17)</td>
<td>175</td>
<td>float RWES</td>
</tr>
<tr>
<td><code>oP;10</code></td>
<td>Linearization (1) Output Point 10 Set the value that will be mapped to input 10.</td>
<td>-1,999.000 to 9,999.000</td>
<td>9.0</td>
<td>Instance 1 Map 1 Map 2 - - - - 3612</td>
<td>0x86 (134) 1</td>
<td>0x1B (27)</td>
<td>176</td>
<td>float RWES</td>
</tr>
</tbody>
</table>

### Process Value Menu

**Process Value (1) Function**

- Off (62)
- Pressure to Altitude (1649)

<table>
<thead>
<tr>
<th>Display</th>
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<tbody>
<tr>
<td><code>Fn</code></td>
<td>Off (62)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><code>FL</code></td>
<td>Pressure to Altitude (1649)</td>
<td></td>
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</thead>
<tbody>
<tr>
<td>P.unt</td>
<td>Process Value (1) Pressure Units* Set the units that will be applied to the source.</td>
<td></td>
<td></td>
<td>PSI</td>
<td>Instance 1 Map 1 Map 2 - - - - 3334</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.unt</td>
<td>Process Value (1) Altitude Units* Set the units that will be applied to the source.</td>
<td></td>
<td></td>
<td>HFt</td>
<td>Instance 1 Map 1 Map 2 - - - - 3336</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F.IL</td>
<td>Process Value (1) Filter Filtering smooths out the output signal of this function block. Increase the time to increase filtering.</td>
<td>0.0 to 60.0 seconds</td>
<td>0.0</td>
<td>Instance 1 Map 1 Map 2 - - - - 3330</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Digital Input/Output Menu

| dir  | Digital Input/Output (5 to 6) Direction Set this function to operate as an input or output. | Output | Instance 1 Map 1 Map 2 - - - - 1000 1120 |  |  |  |  |
| dir  | Digital Input/Output (6) | Output Dry Contact (44) | Input Voltage (193) |  |  |  |  |
| Fn    | Digital Output (5 to 6) Action Function Select what function will drive this output. | Off | Instance 1 Map 1 Map 2 - - - - 1008 1128 |  |  |  |  |
| Fn    | Digital Output (1532) Special Function Output 1 Special Function Output 1 (532) | Off | Instance 1 Map 1 Map 2 - - - - 1532 |  |  |  |  |
|     | Digital Output (1533) Special Function Output 2 Special Function Output 2 (533) | Off | Instance 1 Map 1 Map 2 - - - - 1533 |  |  |  |  |

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*R: Read  W: Write  E: EE-PROM  S: User Set

* Pressure Altitude calculation is based on the International Standard Atmosphere, 1976
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<th>CIP Class</th>
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<tr>
<td></td>
<td><strong>Digital Output (5 to 6)</strong></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Function Instance</td>
<td>Set the instance of the function selected above.</td>
<td>1 to 4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Digital Output (5 to 6)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>Set the output control type. This parameter is only used with PID control, but can be set anytime.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Digital Output (5 to 6)</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time Base</td>
<td>Set the time base for fixed-time-base control.</td>
<td>[0.1 for Fast and Bi-Directional outputs, 5.0 for Slow outputs] to 60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low Power Scale</td>
<td>The power output will never be less than the value specified and will represent the value at which output scaling begins.</td>
<td>0.0 to 100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>High Power Scale</td>
<td>The power output will never be greater than the value specified and will represent the value at which output scaling stops.</td>
<td>0.0 to 100.0</td>
<td>100.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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R: Read
W: Write
E: EE-PROM
S: User Set
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<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
</table>
| LEu     | Digital Input (5 to 6) Level | High (37) | High | Instance 1
Map 1 | 0x6E (110) | 137 | 10001 | uint |
|         |                             | Low (53) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             |         |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |

<table>
<thead>
<tr>
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<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
</table>
| Fn      | Digital Input (5 to 6) Action Function | None (61) | None | Instance 1
Map 1 | 0x6E (110) | 138 | 10003 | uint |
|         |                             | Profile Start Step (1077) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             | Profile Start/Stop, level triggered (208) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             | Profile Start Number, edge triggered (196) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             | Profile Hold/Resume, level triggered (207) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             | Profile Disable, level triggered (206) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             | TRU-TUNE+® Disable, level triggered (219) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             | Control Outputs Off, level triggered (90) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             | Manual/Auto Mode, level triggered (54) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             | Tune, edge triggered (98) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             | Idle Set Point Enable, level triggered (107) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             | Force Alarm, level triggered (218) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             | Alarm Outputs & Control Loop Off, level triggered (220) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             | Silence Alarms, edge triggered (108) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             | Alarm Reset, edge triggered (6) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             | Lock Keypad, level triggered (217) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             | Restore User Settings, edge triggered (227) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |
|         |                             | Limit Reset, edge triggered (82) |       |                          | Offset to next instance (Map 1 & Map 2) equals +20 |

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**Watlow EZ-ZONE® PM PID Controller**

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**Chapter 6 Setup Page**
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<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Digital Input (3 to 7) Function Instance</td>
<td>0 to 4</td>
<td>0</td>
<td>Instance 1 Map 1 1326 1566</td>
<td>0x6E (110) 5 to 7 4</td>
<td>139</td>
<td>10004</td>
<td>uint RWES</td>
</tr>
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</table>

### Control Loop Menu

<table>
<thead>
<tr>
<th>Display</th>
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<th>CIP Class Instance Attribute hex (dec)</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control Loop (1) Heat Algorithm</td>
<td></td>
<td></td>
<td>PID Instance 1 Map 1 1884 2364</td>
<td>0x97 (151) 1 3</td>
<td>72</td>
<td>8003</td>
<td>uint RWES</td>
</tr>
<tr>
<td></td>
<td>Control Loop (1) Cool Algorithm</td>
<td></td>
<td></td>
<td>Off Instance 1 Map 1 1886 2366</td>
<td>0x97 (151) 1 4</td>
<td>73</td>
<td>8004</td>
<td>uint RWES</td>
</tr>
<tr>
<td></td>
<td>Control Loop (1) Cool Output Curve</td>
<td></td>
<td></td>
<td>Off Instance 1 Map 1 1888 2368</td>
<td>0x97 (151) 1 5</td>
<td>- - - -</td>
<td>8038</td>
<td>uint RWES</td>
</tr>
<tr>
<td></td>
<td>Control Loop (1) TRU-TUNE+™ Enable</td>
<td></td>
<td>No</td>
<td>Instance 1 Map 1 1910 2390</td>
<td>0x97 (151) 1 0x10 (16)</td>
<td>- - - -</td>
<td>8022</td>
<td>uint RWES</td>
</tr>
<tr>
<td></td>
<td>Control Loop (1) TRU-TUNE+™ Band</td>
<td>0 to 100</td>
<td>0</td>
<td>Instance 1 Map 1 1912 2392</td>
<td>0x97 (151) 1 0x12 (18)</td>
<td>- - - -</td>
<td>8034</td>
<td>uint RWES</td>
</tr>
<tr>
<td></td>
<td>Control Loop (1) TRU-TUNE+™ Gain</td>
<td>1 to 6</td>
<td>3</td>
<td>Instance 1 Map 1 1914 2394</td>
<td>0x97 (151) 1 0x13 (19)</td>
<td>- - - -</td>
<td>8024</td>
<td>uint RWES</td>
</tr>
<tr>
<td></td>
<td>Control Loop (1) Autotune Aggressiveness</td>
<td></td>
<td></td>
<td>Critical Instance 1 Map 1 1916 2396</td>
<td>0x97 (151) 1</td>
<td>- - - -</td>
<td>8024</td>
<td>uint RWES</td>
</tr>
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<tbody>
<tr>
<td>P.dL</td>
<td><strong>Control Loop (1)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td><strong>Peltier Delay</strong></td>
<td>0.0 to 5.0</td>
<td>0.0</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x97 (151) 1 0x1C (28)</td>
<td></td>
<td>8051</td>
<td>float RWES</td>
</tr>
<tr>
<td></td>
<td>Set a value that will cause a delay when switching from heat mode to cool mode.</td>
<td></td>
<td></td>
<td></td>
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<tbody>
<tr>
<td>U.FA</td>
<td><strong>Control Loop (1)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>User Failure Action</strong></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>Select what the controller outputs will do when the user switches control to manual mode.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td><strong>aFF</strong>: Off, sets output power to 0% (62)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>bPL</strong>: Bumpless, maintains same output power, if it was less than 75% and stable, otherwise 0% (14)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td><strong>MAn</strong>: Manual Fixed, sets output power to Manual Power setting (33)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>USE</strong>: User, sets output power to last open-loop set point the user entered (100)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>User</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x6B (107) 1 0xC (12)</td>
<td></td>
<td>7012</td>
<td>uint RWES</td>
<td></td>
<td></td>
</tr>
</tbody>
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<th>CIP Class Instance Attribute hex (dec)</th>
<th>Profinet Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
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</thead>
<tbody>
<tr>
<td>F.A.iL</td>
<td><strong>Control Loop (1)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td><strong>Input Error Failure</strong></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Select what the controller outputs will do when an input error switches control to manual mode.</td>
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</tr>
<tr>
<td></td>
<td><strong>aFF</strong>: Off, sets output power to 0% (62)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td><strong>bPL</strong>: Bumpless, maintains same output power, if it was less than 75% and stable, otherwise 0% (14)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td><strong>MAn</strong>: Manual Fixed, sets output power to Manual Power setting (33)</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td></td>
<td><strong>USE</strong>: User, sets output power to last open-loop set point the user entered (100)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>User</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x6B (107) 1 0xD (13)</td>
<td></td>
<td>7013</td>
<td>uint RWES</td>
<td></td>
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<table>
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<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute hex (dec)</th>
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<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
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<tr>
<td>M.An</td>
<td><strong>Control Loop (1)</strong></td>
<td></td>
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<tr>
<td></td>
<td><strong>Manual Power</strong></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Set the manual output power level that will take effect if an input error failure occurs while User Failure Action is set to Manual Fixed.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Set Point Open Loop Limit Low to Set Point Open Loop Limit High (Setup Page)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x6B (107) 1 0xB (11)</td>
<td></td>
<td>7011</td>
<td>float RWES</td>
<td></td>
<td></td>
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<table>
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<tr>
<th>Display</th>
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<th>CIP Class Instance Attribute hex (dec)</th>
<th>Profinet Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
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<tbody>
<tr>
<td>L.d.E.</td>
<td><strong>Control Loop (1)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td><strong>Open Loop Detect Enable</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Turn on the open-loop detect feature to monitor a closed-loop operation for the appropriate response.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td><strong>aFF</strong>: No (59)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td><strong>YES</strong>: Yes (106)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>No</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x97 (151) 1 0x16 (22)</td>
<td></td>
<td>8039</td>
<td>uint RWES</td>
<td></td>
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<table>
<thead>
<tr>
<th>Display</th>
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<th>CIP Class Instance Attribute hex (dec)</th>
<th>Profinet Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
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<tbody>
<tr>
<td>L.d.t.</td>
<td><strong>Control Loop (1)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td><strong>Open Loop Detect Time</strong></td>
<td>0 to 3,600 seconds</td>
<td>240</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x97 (151) 1 0x17 (23)</td>
<td></td>
<td>8040</td>
<td>uint RWES</td>
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<tr>
<td></td>
<td>The Open Loop Detect Deviation value must occur for this time period to trigger an open-loop error.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<th>Data Type &amp; Read/Write</th>
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<tbody>
<tr>
<td>L.d.d</td>
<td>Control Loop (1) Open Loop Detect Deviation</td>
<td>-1,999.000 to 9,999.000°F or units -1,110.555 to 5,555.000°C</td>
<td>10.0°F or units 6.0°C</td>
<td>Instance 1 Map 1 Map 2 1926 2406</td>
<td>0x97 (151) 1 0x18 (24)</td>
<td>76</td>
<td>8041</td>
<td>float RWES</td>
</tr>
<tr>
<td>r.P</td>
<td>Control Loop (1) Ramp Action</td>
<td>Off</td>
<td>Instance 1 Map 1 Map 2 2186 2666</td>
<td>0x6B (107) 1 0xE (14)</td>
<td>56</td>
<td>7014</td>
<td>uint RWES</td>
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<tr>
<td>r.SC</td>
<td>Control Loop (1) Ramp Scale</td>
<td>Minutes</td>
<td>Instance 1 Map 1 Map 2 2188 2668</td>
<td>0x6B (107) 1 0xF (15)</td>
<td>57</td>
<td>7015</td>
<td>uint RWES</td>
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<tr>
<td>r.rt</td>
<td>Control Loop (1) Ramp Rate</td>
<td>0.0 to 9,999.000°F or units 0.0 to 5,555.000°C</td>
<td>1.0°F or units 1.0°C</td>
<td>Instance 1 Map 1 Map 2 2192 2672</td>
<td>0x6B (107) 1 0x11 (17)</td>
<td>58</td>
<td>7017</td>
<td>float RWES</td>
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<tr>
<td>L.SP</td>
<td>Control Loop (1) Low Set Point</td>
<td>-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C</td>
<td>-1,999°F or units -1,128°C</td>
<td>Instance 1 Map 1 Map 2 2164 2644</td>
<td>0x6B (107) 1 to 2 3</td>
<td>52</td>
<td>7003</td>
<td>float RWES</td>
</tr>
<tr>
<td>h.SP</td>
<td>Control Loop (1) High Set Point</td>
<td>-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C</td>
<td>-1,999°F or units -1,128°C</td>
<td>Instance 1 Map 1 Map 2 2166 2646</td>
<td>0x6B (107) 1 4</td>
<td>53</td>
<td>7004</td>
<td>float RWES</td>
</tr>
<tr>
<td>SPLo</td>
<td>Control Loop (1) Set Point Open Limit Low</td>
<td>-100 to 100%</td>
<td>-100</td>
<td>Instance 1 Map 1 Map 2 2168 2649</td>
<td>0x6B (107) 1 5</td>
<td>54</td>
<td>7005</td>
<td>float RWES</td>
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<tr>
<td>SPHi</td>
<td>Control Loop (1) Set Point Open Limit High</td>
<td>-100 to 100%</td>
<td>100</td>
<td>Instance 1 Map 1 Map 2 2170 2650</td>
<td>0x6B (107) 1 6</td>
<td>55</td>
<td>7006</td>
<td>float RWES</td>
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</tbody>
</table>

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<th>CIP Class Instance Attribute hex (dec)</th>
<th>Proﬁbus Index</th>
<th>Parameter ID</th>
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<tbody>
<tr>
<td>Output Menu</td>
<td><strong>Function</strong></td>
<td>Output Digital (1 to 2)</td>
<td>Off (62)</td>
<td></td>
<td></td>
<td></td>
<td>6005</td>
<td>uint RWES</td>
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<td></td>
<td>Profile Event Out B (234)</td>
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<td>Profile Event Out A (233)</td>
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<td>Cool (20)</td>
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<td>Heat (36)</td>
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<td>Alarm (6)</td>
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<tr>
<td></td>
<td><strong>Function Instance</strong></td>
<td>Output Digital (1 to 2)</td>
<td>1 to 2</td>
<td>1</td>
<td>Instance 1 Map 1 Map 2 890 1010</td>
<td>0x6A (106) 1 to 2 5</td>
<td>84</td>
<td>6006</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Offset to next instance (Map 1 &amp; Map 2) equals +30</td>
<td></td>
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<tr>
<td></td>
<td><strong>Control</strong></td>
<td>Output Digital (1 to 2)</td>
<td>Fixed Time Base (34)</td>
<td></td>
<td>Instance 1 Map 1 Map 2 882 1002</td>
<td>0x6A (106) 1 to 4 2</td>
<td>85</td>
<td>6002</td>
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<tr>
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<td></td>
<td>Variable Time Base (103)</td>
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<tr>
<td></td>
<td><strong>Time Base</strong></td>
<td>Output Digital (1 to 2)</td>
<td>0.1 to 60.0 seconds (solid-state relay or switched dc)</td>
<td>0.1 sec. [SSR &amp; sw dc]</td>
<td>Instance 1 Map 1 Map 2 884 1004</td>
<td>0x6A (106) 1 to 2 3</td>
<td>86</td>
<td>6003</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5.0 to 60.0 seconds (mechanical relay or no-arc power control)</td>
<td>20.0 sec. [mech, relay, no-arc]</td>
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<tr>
<td></td>
<td></td>
<td><strong>Low Power Scale</strong></td>
<td>0.0 to 100.0%</td>
<td>0.0%</td>
<td>Instance 1 Map 1 Map 2 896 1016</td>
<td>0x6A (106) 1 to 2 9</td>
<td>87</td>
<td>6009</td>
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</tbody>
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<th>Pro-fibus Index</th>
<th>Param-eter ID</th>
<th>Data Type &amp; Read/Write</th>
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<tbody>
<tr>
<td>o.hi</td>
<td>Output Digital (1 to 2) High Power Scale</td>
<td>0.0 to 100.0%</td>
<td>100.0%</td>
<td>Instance 1 Map 1 Map 2 898 1018</td>
<td>0x6A (106) 1 to 2 0xA (10)</td>
<td>88</td>
<td>6010</td>
<td>float RWES</td>
</tr>
<tr>
<td>o.ty</td>
<td>Output Digital (1) Type</td>
<td>Volts (104)</td>
<td>Volts</td>
<td>Instance 1 Map 1 Map 2 720 840</td>
<td>0x76 (118) 1 1</td>
<td>95</td>
<td>18001</td>
<td>uint RWES</td>
</tr>
<tr>
<td>F.n</td>
<td>Output Process (1) Function</td>
<td>Off (62)</td>
<td>Off</td>
<td>Instance 1 Map 1 Map 2 722 842</td>
<td>0x76 (118) 1 2</td>
<td>96</td>
<td>18002</td>
<td>uint RWES</td>
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<tr>
<td>rSr</td>
<td>Output Process (1) Retransmit Source</td>
<td>Analog Input (142)</td>
<td>Analog Input</td>
<td>Instance 1 Map 1 Map 2 724 844</td>
<td>0x76 (118) 1 3</td>
<td>97</td>
<td>18003</td>
<td>uint RWES</td>
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<tr>
<td>F.i</td>
<td>Output Process (1) Function Instance</td>
<td>1 to 4</td>
<td>1</td>
<td>Instance 1 Map 1 Map 2 726 846</td>
<td>0x76 (118) 1 4</td>
<td>98</td>
<td>18004</td>
<td>uint RWES</td>
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<tr>
<td>S.Lo</td>
<td>Output Process (1) Scale Low</td>
<td>-100.0 to 100.0</td>
<td>0.00</td>
<td>Instance 1 Map 1 Map 2 736 856</td>
<td>0x76 (118) 1 9</td>
<td>99</td>
<td>18009</td>
<td>float RWES</td>
</tr>
<tr>
<td>S.hi</td>
<td>Output Process (1) Scale High</td>
<td>-100.0 to 100.0</td>
<td>10.00</td>
<td>Instance 1 Map 1 Map 2 738 858</td>
<td>0x76 (118) 1 0xA (10)</td>
<td>100</td>
<td>18010</td>
<td>float RWES</td>
</tr>
<tr>
<td>rLo</td>
<td>Output Process (1) Range Low</td>
<td>-1,999,999.000 to 9,999.999°F or units</td>
<td>0.0°F or units</td>
<td>Instance 1 Map 1 Map 2 740 860</td>
<td>0x76 (118) 1 0xB (11)</td>
<td>101</td>
<td>18011</td>
<td>float RWES</td>
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<tbody>
<tr>
<td>r.h.i</td>
<td>Output Process (1) Range High</td>
<td>-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C</td>
<td>9,999.0°F or units 5,537.0°C</td>
<td><strong>Instance 1</strong></td>
<td><strong>Map 1</strong></td>
<td><strong>Map 2</strong></td>
<td>742</td>
<td>862</td>
</tr>
<tr>
<td>a.l.o</td>
<td>Output Process (1) Low Power Scale</td>
<td>0.0 to 100%</td>
<td>0.0%</td>
<td><strong>Instance 1</strong></td>
<td><strong>Map 1</strong></td>
<td><strong>Map 2</strong></td>
<td>744</td>
<td>864</td>
</tr>
<tr>
<td>a.h.i</td>
<td>Output Process (1) High Power Scale</td>
<td>0.0 to 100%</td>
<td>100%</td>
<td><strong>Instance 1</strong></td>
<td><strong>Map 1</strong></td>
<td><strong>Map 2</strong></td>
<td>746</td>
<td>866</td>
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<tr>
<td>a.CA</td>
<td>Output Process (1) Calibration Offset</td>
<td>-1,999.000 to 9,999.000°F or units -1,110.555 to 5,555.000°C</td>
<td>0.0°F or units 0.0°C</td>
<td><strong>Instance 1</strong></td>
<td><strong>Map 1</strong></td>
<td><strong>Map 2</strong></td>
<td>732</td>
<td>852</td>
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</table>

**Alarm Menu**

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<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute hex (dec)</th>
<th>Profibus Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
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<tbody>
<tr>
<td>A.ty</td>
<td>Alarm (1 to 4) Type</td>
<td>Off (62)</td>
<td>Off</td>
<td><strong>Instance 1</strong></td>
<td><strong>Map 1</strong></td>
<td><strong>Map 2</strong></td>
<td>1508</td>
<td>1908</td>
</tr>
<tr>
<td>Sr.A</td>
<td>Alarm (1 to 4) Source Function A</td>
<td>Analog Input (142)</td>
<td>If Alarm type is set to Deviation or Process.</td>
<td><strong>Instance 1</strong></td>
<td><strong>Map 1</strong></td>
<td><strong>Map 2</strong></td>
<td>1512</td>
<td>1912</td>
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<th>CIP Class</th>
<th>Instance Attribute hex (dec)</th>
<th>ProfiBus Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
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</thead>
<tbody>
<tr>
<td>RHy</td>
<td>Alarm (1 to 4) Hysteresis</td>
<td>0.001 to 9,999.000°F or units</td>
<td>1.0°F or units</td>
<td>Instance 1 Map 1 Map 2 1484 1884</td>
<td>0x6D (109) 1 to 4 3</td>
<td>24</td>
<td>9003</td>
<td>float RWES</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.001 to 5,555.000°C</td>
<td>1.0°C</td>
<td>Offset to next instance (Map 1 equals +50, for Map 2 equals +60)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RLg</td>
<td>Alarm (1 to 4) Logic</td>
<td>Close On Alarm (17) Open On Alarm (66)</td>
<td>Close On Alarm</td>
<td>Instance 1 Map 1 Map 2 1488 1888</td>
<td>0x6D (109) 1 to 4 5</td>
<td>25</td>
<td>9005</td>
<td>uint RWES</td>
<td></td>
</tr>
<tr>
<td>R5d</td>
<td>Alarm (1 to 4) Sides</td>
<td>Both (13) High (37) Low (53)</td>
<td>Both</td>
<td>Instance 1 Map 1 Map 2 1486 1886</td>
<td>0x6D (109) 1 to 4 4</td>
<td>26</td>
<td>9004</td>
<td>uint RWES</td>
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<tr>
<td>RLr</td>
<td>Alarm (1 to 4) Latching</td>
<td>Non-Latching (60) Latching (49)</td>
<td>Non-Latching</td>
<td>Instance 1 Map 1 Map 2 1492 1892</td>
<td>0x6D (109) 1 to 4 7</td>
<td>27</td>
<td>9007</td>
<td>uint RWES</td>
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<tr>
<td>Rbl</td>
<td>Alarm (1 to 4) Blocking</td>
<td>Off (62) Startup (88) Set Point (85) Both (13)</td>
<td>Off</td>
<td>Instance 1 Map 1 Map 2 1494 1894</td>
<td>0x6D (109) 1 to 4 8</td>
<td>28</td>
<td>9008</td>
<td>uint RWES</td>
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</table>

**Note:**

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* Available with PM4, PM8 and PM9 models only
### Setup Page

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute hex (dec)</th>
<th>Profinbus Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>RS[ , ]</code> [ A.Si]</td>
<td><strong>Alarm (1 to 4) Silencing</strong> Turn alarm silencing on to allow the user to disable this alarm.</td>
<td><code>FF</code> Off (62) <code>FF</code> On (63)</td>
<td>Off</td>
<td><code>Instance 1 Map 1 Map 2</code> 1490 1890</td>
<td>Offset to next instance (Map 1 equals +50, for Map 2 equals +60)</td>
<td>0x6D (109)</td>
<td>29</td>
<td>9006</td>
</tr>
<tr>
<td><code> Rd5P[ , ]</code> [A.dSP]</td>
<td><strong>Display</strong> Display an alarm message when an alarm is active.</td>
<td><code>FF</code> Off (62) <code>FF</code> On (63)</td>
<td>On</td>
<td><code>Instance 1 Map 1 Map 2</code> 1510 1910</td>
<td>Offset to next instance (Map 1 equals +50, for Map 2 equals +60)</td>
<td>0x6D (109)</td>
<td>30</td>
<td>9016</td>
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<tr>
<td><code> RdL[ , ]</code> [A.dL]</td>
<td><strong>Alarm (1 to 4) Delay</strong> Set the span of time that the alarm will be delayed after the process value exceeds the alarm set point.</td>
<td>0 to 9,999 seconds</td>
<td>0</td>
<td><code>Instance 1 Map 1 Map 2</code> 1520 1920</td>
<td>Offset to next instance (Map 1 equals +50, for Map 2 equals +60)</td>
<td>0x6D (109)</td>
<td>31</td>
<td>9021</td>
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<tr>
<td><code>FUn[ , ]</code></td>
<td><strong>Function Key Menu</strong></td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td><code> L,F[ , ]</code> [LEv]</td>
<td><strong>Function Key (1 to 2) Level</strong> The Function Key will always power up in the low state. Pressing the Function Key will toggle the selected action.</td>
<td><code>h9</code> High (37) <code>l0</code> Low (53)</td>
<td>High</td>
<td><code>Instance 1 Map 1 Map 2</code> 1320 1560 <code>Instance 2 Map 1 Map 2</code> 1340 1580</td>
<td></td>
<td>0x6E (110)</td>
<td>137</td>
<td>10001</td>
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</table>

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*Available with PM4, PM8 and PM9 models only

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Watlow EZ-ZONE® PM PID Controller  •  59  •  Chapter 6 Setup Page
<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute (hex)</th>
<th>Profinet Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
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</thead>
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<tr>
<td></td>
<td><strong>Function Key (1 to 2)</strong></td>
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<td><strong>Digital Input Function</strong></td>
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<tr>
<td></td>
<td>Program the EZ Key to</td>
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</tr>
<tr>
<td></td>
<td>trigger an action. Functions respond to a level state change or an edge level change.</td>
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<tr>
<td></td>
<td><strong>Profile Start Step</strong></td>
<td>0 to 1</td>
<td>0</td>
<td>0x96 (110)</td>
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<td></td>
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<tr>
<td></td>
<td><strong>Profile Start/Stop, level triggered</strong></td>
<td></td>
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</tr>
<tr>
<td></td>
<td><strong>Profile Start Number, edge triggered</strong></td>
<td></td>
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<tr>
<td></td>
<td><strong>Profile Hold/Resume, level triggered</strong></td>
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<tr>
<td></td>
<td><strong>Profile Disable, level triggered</strong></td>
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<td></td>
<td><strong>TRU-TUNE® Disable</strong>, level triggered</td>
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<tr>
<td></td>
<td><strong>Control Outputs Off, level triggered</strong></td>
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<tr>
<td></td>
<td><strong>Manual/Auto Mode, level triggered</strong></td>
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<td></td>
<td><strong>Tune, edge triggered</strong></td>
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<tr>
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<td><strong>Idle Set Point Enable, level triggered</strong></td>
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<tr>
<td></td>
<td><strong>Force Alarm, level triggered</strong></td>
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<tr>
<td></td>
<td><strong>Alarm Outputs &amp; Control Loop Off, level triggered</strong></td>
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<tr>
<td></td>
<td><strong>Silence Alarms, edge triggered</strong></td>
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<tr>
<td></td>
<td><strong>Alarm Reset, edge triggered</strong></td>
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<tr>
<td></td>
<td><strong>Lock Keypad, level triggered</strong></td>
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<tr>
<td></td>
<td><strong>Restore User Settings, edge triggered</strong></td>
<td></td>
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</table>

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Available with PM4, PM8 and PM9 models only
## Setup Page

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name</th>
<th>Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class</th>
<th>ProField Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="R;typP" /></td>
<td><strong>Profile</strong></td>
<td><strong>Ramping Type</strong></td>
<td><img src="image" alt="Rate" /> Rate (81) <img src="image" alt="Time" /> Time (143)</td>
<td>Time</td>
<td><img src="image" alt="Instance 1" /> <img src="image" alt="Map 1" /> <img src="image" alt="Map 2" /> <img src="image" alt="4414" /></td>
<td><img src="image" alt="0x7A" /> (122)</td>
<td><img src="image" alt="1" /> <img src="image" alt="26" /> <img src="image" alt="38" /></td>
<td><img src="image" alt="22038" /></td>
<td><img src="image" alt="uint" /> <img src="image" alt="RWE" /></td>
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<tr>
<td><img src="image" alt="P;typP" /></td>
<td><strong>Profile</strong></td>
<td><strong>Profile Type</strong></td>
<td><img src="image" alt="Set Point" /> Set Point (85) <img src="image" alt="Process" /> Process (75)</td>
<td>Set Point</td>
<td><img src="image" alt="Instance 1" /> <img src="image" alt="Map 1" /> <img src="image" alt="Map 2" /> <img src="image" alt="4354" /></td>
<td><img src="image" alt="0x7A" /> (122)</td>
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<td><img src="image" alt="22008" /></td>
<td><img src="image" alt="uint" /> <img src="image" alt="RWE" /></td>
</tr>
<tr>
<td><img src="image" alt="gSE" /></td>
<td><strong>Profile</strong></td>
<td><strong>Guaranteed Soak Enable</strong></td>
<td><img src="image" alt="Off" /> Off (62) <img src="image" alt="On" /> On (63)</td>
<td>Off</td>
<td><img src="image" alt="Instance 1" /> <img src="image" alt="Map 1" /> <img src="image" alt="Map 2" /> <img src="image" alt="4350" /></td>
<td><img src="image" alt="0x7A" /> (122)</td>
<td><img src="image" alt="1" /> <img src="image" alt="6" /></td>
<td><img src="image" alt="22006" /></td>
<td><img src="image" alt="uint" /> <img src="image" alt="RWE" /></td>
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<tr>
<td><img src="image" alt="gSd1" /></td>
<td><strong>Profile</strong></td>
<td><strong>Guaranteed Soak Deviation 1</strong></td>
<td>0.0 to 9,999.000°F or units 0.0 to 5,555.000°C</td>
<td>10.0°F or units 6.0°C</td>
<td><img src="image" alt="Instance 1" /> <img src="image" alt="Map 1" /> <img src="image" alt="Map 2" /> <img src="image" alt="4352" /></td>
<td><img src="image" alt="0x7A" /> (122)</td>
<td><img src="image" alt="1" /> <img src="image" alt="7" /></td>
<td><img src="image" alt="22007" /></td>
<td><img src="image" alt="float" /> RWE</td>
</tr>
<tr>
<td><img src="image" alt="Si.a" /></td>
<td><strong>Profile Event Input Source Instance A</strong></td>
<td>Set the digital source for WE1.</td>
<td>5 to 6</td>
<td>5</td>
<td><img src="image" alt="Instance 1" /> <img src="image" alt="Map 1" /> <img src="image" alt="Map 2" /> <img src="image" alt="4390" /></td>
<td><img src="image" alt="0x7A" /> (122)</td>
<td><img src="image" alt="1" /> <img src="image" alt="0x1A" /> (26)</td>
<td><img src="image" alt="22060" /></td>
<td><img src="image" alt="uint" /> RWES</td>
</tr>
<tr>
<td><img src="image" alt="Si.b" /></td>
<td><strong>Profile Event Input Source Instance B</strong></td>
<td>Set the digital source for WE2.</td>
<td>5 to 6</td>
<td>5</td>
<td><img src="image" alt="Instance 1" /> <img src="image" alt="Map 1" /> <img src="image" alt="Map 2" /> <img src="image" alt="4392" /></td>
<td><img src="image" alt="7A" /> (122)</td>
<td><img src="image" alt="1" /> <img src="image" alt="0x1B" /> (27)</td>
<td><img src="image" alt="22061" /></td>
<td><img src="image" alt="uint" /> RWES</td>
</tr>
<tr>
<td><img src="image" alt="Poti" /></td>
<td><strong>Global Menu</strong></td>
<td><strong>Power Out Time</strong></td>
<td>0 to 9999 seconds</td>
<td>0</td>
<td><img src="image" alt="Instance 1" /> <img src="image" alt="Map 1" /> <img src="image" alt="Map 2" /> <img src="image" alt="4484" /></td>
<td><img src="image" alt="7A" /> (122)</td>
<td><img src="image" alt="1" /> <img src="image" alt="0x49" /> (73)</td>
<td><img src="image" alt="22073" /></td>
<td><img src="image" alt="uint" /> RWE</td>
</tr>
<tr>
<td><img src="image" alt="C.LEd" /></td>
<td><strong>Global Menu</strong></td>
<td><strong>Communications LED Action</strong></td>
<td><img src="image" alt="Comm port 2" /> (1189) <img src="image" alt="Comm port 1" /> (1190) <img src="image" alt="Comm port 1 and 2" /> (13) <img src="image" alt="Off" /> Off (62)</td>
<td>both</td>
<td><img src="image" alt="Instance 1" /> <img src="image" alt="Map 1" /> <img src="image" alt="Map 2" /> <img src="image" alt="1856" /> <img src="image" alt="2226" /></td>
<td><img src="image" alt="0x6A" /> (103)</td>
<td><img src="image" alt="1" /> <img src="image" alt="0x0E" /> (14)</td>
<td><img src="image" alt="3014" /></td>
<td><img src="image" alt="uint" /> RWES</td>
</tr>
<tr>
<td><img src="image" alt="Zone" /></td>
<td><strong>Global Menu</strong></td>
<td><strong>Zone</strong></td>
<td><img src="image" alt="Off" /> Off (62) <img src="image" alt="On" /> On (63)</td>
<td>On</td>
<td><img src="image" alt="Instance 1" /> <img src="image" alt="Map 1" /> <img src="image" alt="Map 2" /> <img src="image" alt="2350" /></td>
<td><img src="image" alt="0x6A" /> (103)</td>
<td><img src="image" alt="1" /> <img src="image" alt="0x1A" /> (26)</td>
<td><img src="image" alt="3026" /></td>
<td><img src="image" alt="uint" /> RWES</td>
</tr>
</tbody>
</table>

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* Available with PM4, PM8 and PM9 models only

---

Watlow EZ-ZONE® PM PID Controller  •  61  •  Chapter 6 Setup Page
## Setup Page

### Display

<table>
<thead>
<tr>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class</th>
<th>Profinet</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
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</thead>
<tbody>
<tr>
<td>Global Menu Channel</td>
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<td>Instance 1 Map 1 Map 2</td>
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<td>null</td>
<td>3027</td>
<td>uint RWES</td>
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<td>Display Pairs</td>
<td>1 to 10</td>
<td>2</td>
<td>Instance 1 Map 1 Map 2</td>
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<td>uint RWES</td>
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<td>Display Time</td>
<td>0 to 60</td>
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<td>User Settings Save</td>
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<td>Instance 1 Map 1 Map 2</td>
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<td>Communications Protocol</td>
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<td>Address Standard Bus</td>
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<td>Instance 1 Map 1 Map 2</td>
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<td>17001</td>
<td>uint RWE</td>
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<tr>
<td>Address Modbus</td>
<td>1 to 247</td>
<td>1</td>
<td>Instance 1 Map 1 Map 2</td>
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<td>uint RWE</td>
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<tr>
<td>Baud Rate Modbus</td>
<td>9,600 (188)</td>
<td>9,600</td>
<td>Instance 1 Map 1 Map 2</td>
<td></td>
<td>null</td>
<td>17002</td>
<td>uint RWE</td>
</tr>
</tbody>
</table>

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* Available with PM4, PM8 and PM9 models only

---

Watlow EZ-ZONE® PM PID Controller  •  62  •  Chapter 6 Setup Page
## Setup Page

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute hex (dec)</th>
<th>Profinet Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Par][1] Communications Parity Modbus (1)</td>
<td>Set the parity of this controller to match the parity of the serial network.</td>
<td>![odd][2] Odd (192) ![evel][3] Even (191) ![none][4] None (61)</td>
<td>None</td>
<td>![instance 1][5] Instance 1 Map 1 Map 2 2486 2966</td>
<td>0x96 (150) 1 4</td>
<td>-</td>
<td>-</td>
<td>![uint][6] RWE</td>
</tr>
<tr>
<td>![M.hL][12] Communications Modbus Word Order</td>
<td>Select the word order of the two 16-bit words in the floating-point values.</td>
<td>![low-high][13] Low-High (1331) ![high-low][14] High-Low (1330)</td>
<td>![low-high][13] Low-High (1331)</td>
<td>![instance 1][5] Instance 1 Map 1 Map 2 2488 2968</td>
<td>0x96 (150) 1 5</td>
<td>-</td>
<td>-</td>
<td>![uint][6] RWE</td>
</tr>
<tr>
<td>![Map][15]</td>
<td>![data map][16] Data Map</td>
<td>![1 to 2][17] 1 to 2</td>
<td>![1 to 2][17] 1 to 2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>![nVs][18] Communications Non-volatile Save</td>
<td>If set to Yes all values written to the control will be saved in EEPROM.</td>
<td>![yes][19] Yes (106) ![no][20] No (59)</td>
<td>![yes][19] Yes (106)</td>
<td>![instance 1][5] Instance 1 Map 1 Map 2 2494 2974</td>
<td>0x96 (150) 1 8</td>
<td>198</td>
<td>17051</td>
<td>![uint][6] RWE</td>
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</tbody>
</table>

### Real Time Clock Menu

| ![hour][21] Real Time Clock Hours | 0 to 23 | 0 | ![instance 1][5] Instance 1 Map 1 Map 2 - - - 4004 | 88 (136) 1 3 | - | - | 36003 | ![uint][6] RW |
| ![Min][22] Real Time Clock Minutes | 0 to 59 | 0 | ![instance 1][5] Instance 1 Map 1 Map 2 - - - 4006 | 88 (136) 1 4 | - | - | 36004 | ![uint][6] RW |

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* Available with PM4, PM8 and PM9 models only

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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 submenus will appear.

The Profiling Page allows you to enter your ramp and soak profile information.

To go to the Profiling Page from the Home Page, press the Advance Key ‡ for three seconds, until Prof appears in the lower display and the profile number appears in the upper display. Press the Up ‡ or Down ‡ key to change to another profile.

• Press the Advance Key ‡ to move to the selected profile's first step.
• Press the Up ‡ or Down ‡ keys to move through the steps.
• Press the Advance Key ‡ to move through the selected step's settings.
• Press the Up ‡ or Down ‡ keys to change the step's settings.
• Press the Infinity Key ‡ at any time to return to the step number prompt.
• Press the Infinity Key ‡ again to return to the profile number prompt.
• From any point press and hold the Infinity Key ‡ for two seconds to return to the Home Page.

Note:
Changes made to profile parameters in the Profiling Pages will be saved and will also have an immediate impact on the running profile. 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.

How to Start a Profile

After defining the profile follow the steps below to run the profile:
1. From the Home Page push the Advance Key ‡ repeatedly until Profile Start [P;St1] appears in the lower display.
2. Use the Up ‡ or Down ‡ key to choose the file or step number within a profile where you want the profile to begin running.
3. Press the Advance Key ‡. This takes you to Profile Action [P;AC1], where you can select the appropriate action.
   • [none] No action
   • [ProF] Begin execution from first step of the specified profile number, whether it exists or not.
   • [PAUS] Pause the currently running profile.
   • [RESU] Resume running the profile from the previously paused step.
   • [End] End the profile.
   • [SLEEP] Begin running the profile from the specified step number.

Note:
Avoid continuous writes within loops. Excessive writes to EEPROM will cause premature EEPROM failure. The EEPROM is rated for 1,000,000 writes. (To disable EEPROM writes, go to the Setup Page and then the [Com] menu. Proceed to the [nU;s] prompt and set it to no for [Com] 1, 2 or both.)

Profiling Parameters

<table>
<thead>
<tr>
<th>P1</th>
<th>to</th>
<th>P4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prof</td>
<td>I</td>
<td>to</td>
</tr>
<tr>
<td>Prof I</td>
<td>to</td>
<td>10</td>
</tr>
<tr>
<td>Step Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target Set Point Loop 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minutes</td>
<td></td>
<td></td>
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<tr>
<td>Seconds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rate</td>
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</tr>
<tr>
<td>Wait For Process 1</td>
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<tr>
<td>Wait For Event 1</td>
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</table>

Wait for Event 2
Day of Week
Jump Step
Jump Count
End Type
Event 1
Event 2
### Profiling Page

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class</th>
<th>Instance Attribute hex (dec)</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
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</thead>
<tbody>
<tr>
<td>p1</td>
<td>Step</td>
<td>1 to 10 [profile 1]</td>
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<tr>
<td>p1</td>
<td></td>
<td>11 to 20 [profile 2]</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
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<td>.</td>
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<tr>
<td>p1</td>
<td></td>
<td>21 to 30 [profile 3]</td>
<td>.</td>
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<tr>
<td>p1</td>
<td></td>
<td>31 to 40 [profile 4]</td>
<td>.</td>
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</tbody>
</table>

#### Step Type

Select a step type.

**Note:** When configuring the profile type there will be a 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.

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class</th>
<th>Instance Attribute hex (dec)</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
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</thead>
<tbody>
<tr>
<td>syp</td>
<td>Step Type Parameters</td>
<td>Unused Step (50)</td>
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<tr>
<td>syp</td>
<td></td>
<td>End (27)</td>
<td>.</td>
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<td>.</td>
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<tr>
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<tr>
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<td>Wait For Time (1543)</td>
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<tr>
<td>syp</td>
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<td>Wait For Both (210)</td>
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<tr>
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<td>Wait For Event (144)</td>
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<tr>
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<tr>
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<tr>
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<td>Rate (81)</td>
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</table>

#### Step Type Parameters

**Target Set Point** (loop 1)

Select the set point for this step.

-1,999.000 to 9,999.000°F or units
-1,128 to 5,537.000°C

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class</th>
<th>Instance Attribute hex (dec)</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>l [t.SP1]</td>
<td>Step Type Parameters</td>
<td>0.0°F or units</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>l [t.SP1]</td>
<td></td>
<td>-18°C</td>
<td>.</td>
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<td>.</td>
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#### Step Type Parameters

**Hours**

Select the hours (plus Minutes and Seconds) for a timed step.

0 to 99

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class</th>
<th>Instance Attribute hex (dec)</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>h [hoUr]</td>
<td>Step Type Parameters</td>
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<td>.</td>
<td>.</td>
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<tr>
<td>h [hoUr]</td>
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<td>0  to 99</td>
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#### Step Type Parameters

**Minutes**

Select the minutes (plus Hours and Seconds) for a timed step.

0 to 59

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class</th>
<th>Instance Attribute hex (dec)</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>m [Min]</td>
<td>Step Type Parameters</td>
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<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>m [Min]</td>
<td></td>
<td>0  to 59</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
</tbody>
</table>

#### Step Type Parameters

**Seconds**

Select the seconds (plus Hours and Minutes) for a timed step.

0 to 59

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class</th>
<th>Instance Attribute hex (dec)</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>s [SEC]</td>
<td>Step Type Parameters</td>
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<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>s [SEC]</td>
<td></td>
<td>0  to 59</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
</tbody>
</table>

#### Note:

Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.
### Profiling Page

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute (hex)</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step Type Parameters Rate</td>
<td>Select the rate for ramping in degrees or units per minute.</td>
<td>0 to 9,999.000°F or units per minute 0 to 5,555.000°C per minute</td>
<td>0.0</td>
<td>Instance 1 Map 1 Map 2 2580 4510 Offset to next instance (Map 1 equals +50, Map 2 equals +100)</td>
<td>0x79 (121) 1 to 40 6</td>
<td>21006</td>
<td>float RWE</td>
</tr>
<tr>
<td>Step Type Parameters Wait For Process Value</td>
<td>Select which analog input Wait For Process will use.</td>
<td>-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C</td>
<td>0.0°F or units -18.0°C</td>
<td>Instance 1 Map 1 Map 2 2590 4520 Offset to next instance (Map 1 equals +50, Map 2 equals +100)</td>
<td>0x79 (121) 1 to 40 0xB (11)</td>
<td>21011</td>
<td>float RWE</td>
</tr>
<tr>
<td>Step Type Parameters Wait Event (5-6)</td>
<td>Select the event state that must be satisfied during this step. Digital input 5 provides the state of Event 1, and digital input 6 provides the state of Event 2.</td>
<td></td>
<td>Off (62) On (63) None (61)</td>
<td>Instance 1 Map 1 Map 2 2586 4516 Offset to next instance (Map 1 equals +50, Map 2 equals +100)</td>
<td>0x79 (121) 1 to 40 9</td>
<td>21009</td>
<td>uint RWE</td>
</tr>
<tr>
<td>Step Type Parameters Wait Event (5-6)</td>
<td>Select the event state that must be satisfied during this step. Digital input 5 provides the state of Event 1, and digital input 6 provides the state of Event 2.</td>
<td></td>
<td>Off (62) On (63) None (61)</td>
<td>Instance 1 Map 1 Map 2 2588 4518 Offset to next instance (Map 1 equals +50, Map 2 equals +100)</td>
<td>0x79 (121) 1 to 40 0xA (10)</td>
<td>21010</td>
<td>uint RWE</td>
</tr>
<tr>
<td>Step Type Parameters Day of Week</td>
<td>Every Day (1567) Week days (1566) Monday (1559) Tuesday (1560) Wednesday (1561) Thursday (1562) Friday (1563) Saturday (1564)</td>
<td>Sunday</td>
<td></td>
<td>Instance 1 Map 1 Map 2 - - - - 4580 Offset to next instance Map 2 equals +100)</td>
<td>0x79 (121) 1 to 40 0x29 (41)</td>
<td>21041</td>
<td>uint RWE</td>
</tr>
<tr>
<td>Step Type Parameters Jump Step</td>
<td>Select a step to jump to.</td>
<td>1 to 40</td>
<td>0</td>
<td>Instance 1 Map 1 Map 2 2592 4522 Offset to next instance (Map 1 equals +50, Map 2 equals +100)</td>
<td>0x79 (121) 1 to 40 0xC (12)</td>
<td>21012</td>
<td>uint RWE</td>
</tr>
</tbody>
</table>

**Note:**
Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.
### Profiling Page

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class</th>
<th>Param- eter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>J[C]</td>
<td>Step Type Parameters Jump Count</td>
<td>0 to 9,999</td>
<td>0</td>
<td>Instance 1</td>
<td>Map 1 Map 2 2594 4524</td>
<td>Offset to next instance (Map 1 equals +50, Map 2 equals +100)</td>
<td>0x79 (121) 1 to 40 0xD (13)</td>
</tr>
<tr>
<td>E[End]</td>
<td>Step Type Parameters End Type</td>
<td></td>
<td>Off</td>
<td>Instance 1</td>
<td>Map 1 Map 2 2596 4526</td>
<td>Offset to next instance (Map 1 equals +50, Map 2 equals +100)</td>
<td>0x79 (121) 1 to 40 0xE (14)</td>
</tr>
<tr>
<td>E[Ent1]</td>
<td>Profile Event Output (A)</td>
<td></td>
<td>Off (62)</td>
<td>Instance 1</td>
<td>Map 1 Map 2 2582 4512</td>
<td>Offset to next instance (Map 1 equals +50, Map 2 equals +100)</td>
<td>0x79 (121) 1 to 40 7</td>
</tr>
<tr>
<td>E[Ent2]</td>
<td>Profile Event Output (B)</td>
<td></td>
<td>Off (62)</td>
<td>Instance 1</td>
<td>Map 1 Map 2 2584 4514</td>
<td>Offset to next instance (Map 1 equals +50, Map 2 equals +100)</td>
<td>0x79 (121) 1 to 40 8</td>
</tr>
</tbody>
</table>

**Note:**
Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces.
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 ˆ 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 ˆ to move backwards through the levels: parameter to submenu; submenu to menu; menu to Home Page.
• Press and hold the Infinity Key ˆ for two seconds to return to the Home Page.

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

[CUS] Custom Setup Menu

[CUS] Custom Setup
PRr Parameter
iid Instance ID

[LoC] Security Setting Menu

[LoC] Security Setting
LoCo Operations Page
LoCP Profiling Page
PASE Password Enable
RLc Read Lock
SLc Write Security
LoCL Locked Access Level
rclL Rolling Password
PUS User Password
PUSR Administrator Password

[ULc] Security Setting Menu

[ULc] Public Key
PASS Password

[d:89] Diagnostics Menu

[d:89] Diagnostics
Pn Part Number
SEw Software Revision
SBld Software Build Number
Sn Serial Number
dAEE Date of Manufacture

[CAL] Calibration Menu

[CAL] Calibration
Pc Electrical Measurement

[CAL] Calibration
Pc Electrical Measurement

[ELi:o] Electrical Input Offset
[ELi:S] Electrical Input Slope
[ELo:o] Electrical Output Offset
[ELo:S] Electrical Output Slope
### Custom Menu

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute hex (dec)</th>
<th>Profibus Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
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</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
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<td></td>
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<tr>
<td>95d</td>
<td>Guaranteed Soak Deviation 1 Value</td>
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<td>Profile Action Request</td>
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<td>RCSP</td>
<td>Active Set Point</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RWES</td>
</tr>
<tr>
<td>RCPu</td>
<td>Active Process Value</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RWES</td>
</tr>
<tr>
<td>SEp</td>
<td>Set Point</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RWES</td>
</tr>
<tr>
<td>UCSE</td>
<td>Custom Menu</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>RWES</td>
</tr>
<tr>
<td>RhY</td>
<td>Alarm Hysteresis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RWES</td>
</tr>
<tr>
<td>Rh</td>
<td>Alarm High Set Point</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>RWES</td>
</tr>
<tr>
<td>RLa</td>
<td>Alarm Low Set Point</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RWES</td>
</tr>
<tr>
<td>USrc</td>
<td>User Restore Set</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>RWES</td>
</tr>
<tr>
<td>C F</td>
<td>Display Units</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RWES</td>
</tr>
<tr>
<td>ICa</td>
<td>Input Calibration Offset</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RWES</td>
</tr>
</tbody>
</table>

### Security Setting Menu

| LoC    | Operations Page             | 1 to 3 | 2      |        |        |        | 3002   | 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.**
## Factory Page

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name / Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute (dec)</th>
<th>PROFIBUS Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>[LoC.P]</td>
<td>Security Setting Profiling Page</td>
<td>1 to 3</td>
<td>3</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>3008</td>
<td>uint RWE</td>
</tr>
<tr>
<td>[LoC.CP]</td>
<td>Security Setting Password Enable</td>
<td>Off, On</td>
<td>Off</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>3009</td>
<td>uint RWE</td>
</tr>
<tr>
<td>[LoC.r]</td>
<td>Security Setting Read Lock</td>
<td>1 to 5</td>
<td>5</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>3010</td>
<td>uint RWE</td>
</tr>
<tr>
<td>[LoC.S]</td>
<td>Security Setting Write Security</td>
<td>0 to 5</td>
<td>5</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>3011</td>
<td>uint RWE</td>
</tr>
<tr>
<td>[LoC.L]</td>
<td>Security Setting Locked Access Level</td>
<td>1 to 5</td>
<td>5</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>3016</td>
<td>uint RWE</td>
</tr>
<tr>
<td>[LoC.R]</td>
<td>Security Setting Rolling Password</td>
<td>Off, On</td>
<td>Off</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>3019</td>
<td>uint RWE</td>
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<tr>
<td>[PAS.u]</td>
<td>Security Setting User Password</td>
<td>10 to 999</td>
<td>63</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>3017</td>
<td>uint RWE</td>
</tr>
<tr>
<td>[PAS.A]</td>
<td>Security Setting Administrator Password</td>
<td>10 to 999</td>
<td>156</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>3018</td>
<td>uint RWE</td>
</tr>
</tbody>
</table>

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### Security Setting Menu

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute hex (dec)</th>
<th>Profibus Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code</td>
<td>Security Setting Public Key</td>
<td></td>
<td>Customer Specific</td>
<td>- - -</td>
<td>- - -</td>
<td>- - -</td>
<td>3020</td>
<td>uint</td>
</tr>
<tr>
<td>PASS</td>
<td>Security Setting Password</td>
<td>-1999 to 9999</td>
<td>0</td>
<td>- - -</td>
<td>- - -</td>
<td>- - -</td>
<td>3022</td>
<td>int RW</td>
</tr>
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</table>

### Diagnostics Menu

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute hex (dec)</th>
<th>Profibus Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pn</td>
<td>Diagnostics Part Number</td>
<td>15 characters</td>
<td>- - -</td>
<td>- - -</td>
<td>0x65 (101)</td>
<td>1</td>
<td>115</td>
<td>1009 string RWE</td>
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<tr>
<td>rEu</td>
<td>Diagnostics Software Revision</td>
<td>1 to 10</td>
<td>- - -</td>
<td>- - -</td>
<td>0x65 (101)</td>
<td>0x11 (17)</td>
<td>116</td>
<td>1003 string R</td>
</tr>
<tr>
<td>SbLd</td>
<td>Diagnostics Software Build Number</td>
<td>0 to 2,147,483,647</td>
<td>- - -</td>
<td>Instance 1 Map 1 Map 2 8 8</td>
<td>0x65 (101)</td>
<td>1</td>
<td>1005 dint R</td>
<td></td>
</tr>
<tr>
<td>Sn</td>
<td>Diagnostics Serial Number</td>
<td>0 to 2,147,483,647</td>
<td>- - -</td>
<td>- - -</td>
<td>0x65 (101)</td>
<td>0x20 (32)</td>
<td>1032 string RWE</td>
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<tr>
<td>dAtE</td>
<td>Diagnostics Date of Manufacture</td>
<td>0 to 2,147,483,647</td>
<td>- - -</td>
<td>Instance 1 Map 1 Map 2 14 14</td>
<td>0x65 (101)</td>
<td>1</td>
<td>1008 dint RWE</td>
<td></td>
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</table>

### Calibration Menu

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute hex (dec)</th>
<th>Profibus Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
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</thead>
<tbody>
<tr>
<td>Mv</td>
<td>Calibration (1 to 2)</td>
<td>-3.4e38 to 3.4e38</td>
<td>- - -</td>
<td>Instance 1 Map 1 Map 2 400 400</td>
<td>0x68 (104)</td>
<td>1 to 2</td>
<td>4021 float R</td>
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## Factory Page

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameter Name Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Address hex (dec)</th>
<th>Profibus Index</th>
<th>Parameter ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL:0</td>
<td>Electrical Input Offset</td>
<td>-1,999.000 to 9,999.000</td>
<td>0.0</td>
<td>Instance 1 Map 1 Map 2 378 378 Instance 2 Map 1 Map 2 458 468</td>
<td>0x68 (104) 1 to 2 0xA (10)</td>
<td>- - -</td>
<td>4010</td>
<td>float RWES</td>
</tr>
<tr>
<td>EL:5</td>
<td>Electrical Input Slope</td>
<td>-1,999.000 to 9,999.000</td>
<td>1.0</td>
<td>Instance 1 Map 1 Map 2 380 380 Instance 2 Map 1 Map 2 460 470</td>
<td>0x68 (104) 1 to 2 0xB (11)</td>
<td>- - -</td>
<td>4011</td>
<td>float RWES</td>
</tr>
<tr>
<td>EL:0</td>
<td>Electrical Output Offset</td>
<td>-1,999.000 to 9,999.000</td>
<td>0.0</td>
<td>- - - - - - - - - -</td>
<td>- - - - - - - -</td>
<td>18005</td>
<td>- - -</td>
<td>- - -</td>
</tr>
<tr>
<td>EL:5</td>
<td>Electrical Output Slope</td>
<td>-1,999.000 to 9,999.000</td>
<td>1.0</td>
<td>- - - - - - - - - -</td>
<td>- - - - - - - -</td>
<td>18006</td>
<td>- - -</td>
<td>- - -</td>
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</table>

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<td>- Proportional plus Integral (PI) Control</td>
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<tr>
<td>- Proportional plus Integral plus Derivative (PID) Control</td>
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<td>- Dead Band</td>
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<td>Software Configuration</td>
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Saving and Restoring User Settings

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

After you program the controller and verify proper operation, use User Save Set [USr.S] (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 parameters.

**Note:**

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

Programming the Home Page

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

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

The default parameters will automatically appear in the Home Page.

Change the list of parameters in the Home Page from the Custom Menu [CUSE] (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 allow 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 Request [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 Closed Loop Set Point.

If you need to adjust the tuning procedure’s aggressiveness, use Autotune Aggressiveness [T,Agr] (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 [Crit] 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 \( hPb \) and/or Cool Proportional Band \( cPb \) to 5. Set Time Integral \( ti \) to 0. Set Time Derivative \( td \) 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 \( hPr \) or Cool Power \( cPr \) (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 \( tUn \) (Setup Page, Loop Menu).

Use TRU-TUNE\(^+\) Band \( bnd \) (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 \( g \) (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** \( Se \) (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. Enable TRU-TUNE\(^+\).
3. Initiate an autotune. (See Autotuning in this chapter.)
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 (Operations Page, Analog Input Menu).

#### Follow these steps for a thermocouple or process input:

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

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

#### Follow these steps for an RTD input:

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

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

### Calibration

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

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Low Source</th>
<th>High Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>thermocouple</td>
<td>0.000 mV</td>
<td>50.000 mV</td>
</tr>
<tr>
<td>millivolts</td>
<td>0.000 mV</td>
<td>50.000 mV</td>
</tr>
<tr>
<td>volts</td>
<td>0.000V</td>
<td>10.000V</td>
</tr>
<tr>
<td>milliamps</td>
<td>0.000 mA</td>
<td>20.000 mA</td>
</tr>
<tr>
<td>100 Ω RTD</td>
<td>50.00 Ω</td>
<td>350.00 Ω</td>
</tr>
<tr>
<td>1,000 Ω RTD</td>
<td>500.00 Ω</td>
<td>3,500.00 Ω</td>
</tr>
<tr>
<td>Thermistor 5K</td>
<td>50.00 Ω</td>
<td>5000.00 Ω</td>
</tr>
<tr>
<td>Thermistor 10K</td>
<td>50.00 Ω</td>
<td>10000.00 Ω</td>
</tr>
<tr>
<td>Thermistor 20K</td>
<td>50.00 Ω</td>
<td>20000.00 Ω</td>
</tr>
<tr>
<td>Thermistor 40K</td>
<td>50.00 Ω</td>
<td>40000.00 Ω</td>
</tr>
</tbody>
</table>
Filter Time Constant

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

Adjust the filter time interval with Filter Time \( F_{\text{Ti}} \) (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.

Scale High and Scale Low

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

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

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

Select the low and high values with Scale Low \( S_{\text{Lo}} \) and Scale High \( S_{\text{hi}} \) (Setup Page, Analog Input Menu).

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 set point low limit and a set point high limit.

Set the set point limits with Low Set Point \( L_{\text{SP}} \) and High Set Point \( H_{\text{SP}} \) (Setup Page, Loop Menu).

There are two sets of set point low and high limits: one for a closed-loop set point, another for an open-loop set point.

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.

Outputs 1 and 3 can be ordered as process outputs. Select duplex **Dupl** as the Output Function (Setup Page, Output Menu). Set the output to volts **Vol** or milliamps **MA** with Output Type **Oty**. Set the range of the process output with Scale Low **SL** and Scale High **Sh**.

### 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.

### 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 1 for oil-cooled extruders and curve 2 for water-cooled extruders.

### 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 **rMt** as the Output Function (Setup Page, Output Menu). Set the output to volts **Vol** or milliamps **MA** with Output Type **Oty**. Select the signal to retransmit with Retrans **rSr**.

Set the range of the process output with Scale Low **SL** and Scale High **Sh**. 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 1 for oil-cooled extruders and curve 2 for water-cooled extruders.
Select a nonlinear cool output curve with Cool Output Curve \(\text{C}_c\) (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 Failure \(\text{FA}_{\text{FL}}\) (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 \(\text{Attn}\) in the lower display and respond to the failure according to the setting of Input Error Failure \(\text{FA}_{\text{FL}}\). You can configure the controller to perform a “bumpless” transfer \(\text{bPLS}\), switch power to output a preset fixed level \(\text{MAn}\), or turn the output power off.

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 (Operations Page, Loop) prior to sensor failure, and that power level is less than 75 percent.

Input Error Latching \(\text{iEr}\) (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 \(\text{C}^c\) then the Up Key \(\uparrow\) or Down Key \(\downarrow\).

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 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 \(\text{CM}\) parameter is selected to appear in the Home Page.

To transfer to manual mode from auto mode, press the Advance Key \(\text{C}^c\) until \(\text{CM}\) appears in the lower display. The upper display will display \(\text{Attn}\) for auto mode. Use the Up \(\uparrow\) or Down \(\downarrow\) keys to select \(\text{MAn}\). 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 \(\text{C}^c\) until \(\text{CM}\) appears in the lower display. The upper display will display
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Press \( \text{MAN} \) for manual mode. Use the Up \( \text{or Down} \) keys to select \( \text{AUTO} \). 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 \( \text{or} \) the Infinity Key \( \text{.}

### 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 \([\text{hAg}]\) or Cool Algorithm \([\text{cAg}]\) (Setup Page, Loop Menu).

On-off hysteresis can be set with Heat Hysteresis \([\text{hHy}]\) or Cool Hysteresis \([\text{cHy}]\) (Operations Page, Loop Menu).

**Note:**

Input Error Failure Mode \([\text{faIl}]\) 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 \([\text{hPb}]\) or Cool Proportional Band \([\text{cPb}]\) (Operations Page, Loop Menu).

---

### 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 start-up 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 \([\text{ti}]\) (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 [\textit{td}] (Operations Page, Loop Menu).

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.

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.

Adjust the dead band with Dead Band [\textit{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.

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

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

100 percent output
10 ON, 0 OFF

50 percent output
3 ON, 3 OFF

66 percent output
6 ON, 3 OFF

Note:
When output 1 is a universal process output, output 2 cannot use variable time base, fixed time base only.

**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.
- **St** ramp at startup.
- **StP** 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).

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

The alarm low set point defines the temperature that will trigger a low side alarm. It must be lower than the alarm high set point and higher than the low limit of the sensor range.
View or change alarm set points with Low Set Point [RL] and High Set Point [Rh] (Operations Page, Alarm Menu).

**Alarm Hysteresis**

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

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

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

**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 [Attn] in the lower display.

Push the Advance Key to display [[ignr]] 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 [CL] or Silence [SL]. 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 alarm latching on or off with Latching [La] (Setup Page, Alarm Menu).

**Alarm Silencing**

If alarm 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 [Attn] in the lower display.

Push the Advance Key to display [[ignr]] 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 [CL] or Silence [SL]. 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 alarm silencing on or off with Silencing [Si] (Setup Page, Alarm Menu).

**Alarm Blocking**

Alarm blocking allows a system to warm up after it has been started up. With alarm blocking on, an alarm is not triggered when the process temperature is initially lower than the alarm low set point or higher than the alarm 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 alarm blocking on or off with Blocking [bL] (Setup Page, Alarm Menu).

**Open Loop Detection**

When Open Loop Detection is enabled [ld], 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 \([L,d,t]\). 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 \(\uparrow\) and Down \(\downarrow\) keys for six seconds. \([SEt]\) will appear in the upper display and \([SEt]\) will appear in the lower display.

2. Press the Up Key \(\uparrow\) until \([Fun]\) appears in the upper display and \([SEt]\) will appear in the lower display.

3. Press the Advance Key \(\rightarrow\) until Digital Input Level \([IE\nu]\) 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 \(\rightarrow\). The lower display will show Digital Function \([Fn]\). Press the Up \(\uparrow\) or Down \(\downarrow\) key to scroll through the functions that can be assigned to the EZ Key.

   When Profile Start/Stop \([PS,Es]\) appears in the upper display and \([Fn]\) appears in the lower display, press the Advance Key \(\rightarrow\) once to select that function and move to the Function Instance \([Fn]\) parameter.

5. Press the Up \(\uparrow\) or Down \(\downarrow\) 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 \(\infty\) once to return to the submenu, twice to return to the main menu or three times to return to the Home Page.

### Using Lockout to Hide Pages and Menus

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

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

### Lockout Menu

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

- **Lock Operations Page \(L,Co\)** sets the security level for the Operations Page. (default: 2)

**Note:**
The Home and Setup Page lockout levels are fixed and cannot be changed.

- **Lock Profiling Page \(L,Co,P\)** sets the security level for the Profiling Page. (default: 3)

- **Password Security Enable \(P,SE\)** will turn on or off the Password security feature. (default: off)

- **Read Lockout Security \(r,LoC\)** determines which pages can be accessed. The user can access the selected level and all lower levels. (default: 5)

- **Set Lockout Security \(S,LoC\)** determines which parameters within accessible pages can be written to. The user can write to the selected level and all lower levels. (default: 5)

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

<table>
<thead>
<tr>
<th>Lockout Security (S,LoC) &amp; (r,LoC)</th>
<th>Lockout Level</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tbody>
<tr>
<td>Home Page</td>
<td></td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
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<tr>
<td>Operations Page</td>
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<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Setup Page</td>
<td></td>
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<td>N</td>
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<td>Y</td>
<td></td>
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<tr>
<td>Profile Page</td>
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<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td></td>
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</tbody>
</table>

**Factory Page**

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<thead>
<tr>
<th>Custom Menu</th>
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<th>N</th>
<th>N</th>
<th>N</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnostic Menu</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Calibration Menu</td>
<td></td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
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</tbody>
</table>

**Lockout Menu**

<table>
<thead>
<tr>
<th>(L,Co)</th>
<th>(L,Co,P)</th>
<th>(P,SE)</th>
<th>(r,LoC)</th>
<th>(S,LoC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>N</td>
<td>Y</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

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

1. You can lock out access to the Operations Page but allow an operator access to the Profile Menu, by changing the default Profile Page and Operations Page security levels. Change Lock Operations Page \(L,Co\) to 3 and Lock Profiling Page...
How to Enable Password Security

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

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

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

**Note:**

If Password Security (Password Enabled  is On) is enabled, the two prompts mentioned below in the first step will not be visible. If unknown, call the individual or company that originally set up the control.

1. Acquire either the User Password  or the Administrator Password  .
2. Push the Advance  key one time where the Code  prompt will be visible.

**Note:**

a. If the Rolling Password is off push the Advance  key one more time where the Password  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  was turned on proceed on through steps 3 - 9.

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

---

Using Password Security

It is sometimes desirable to apply a higher level of security to the control where a limited number of menus are visible and not providing access to others without a security password. Without the appropriate password those menus will remain inaccessible. If Password Enabled  is On in the Factory Page under the  Menu is set to On, an overriding Password Security will be in effect. When in effect, the only Pages that a User without a password has visibility to are defined in the Locked Access Level  prompt. On the other hand, a User with a password would have visibility restricted by the Read Lockout Security  . As an example, with Password Enabled  set to 1 and  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.

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Chapter 9 Features
4. Execute the calculation defined below (7b or 8b) for either the User or Administrator.

5. Enter the result of the calculation in the upper display by using the Up or Down arrow keys or use EZ-ZONE Configurator 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 is Off, Password equals User Password.
   b. If Rolling Password is On, Password equals: \((\text{User Password} \times \text{code}) \mod 929 + 70\)

8. **Administrator**
   a. If Rolling Password is Off, Password equals User Password.
   b. If Rolling Password is On, Password equals: \((\text{Administrator Password} \times \text{code}) \mod 997 + 1000\)

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

- User without a password is restricted by the Locked Access Level.
- A User with a password is restricted by the Read Lockout Security never having access to the Lock Menu.
- An Administrator is restricted according to the Read Lockout Security 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 manual (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 ST control.

**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 below.

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 online.

After clicking the next button above it is necessary to define the communications port on the PC to use.

When complete the software will display all of the available devices found on the network as shown below.
In the previous screen shot the PM 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. After clicking on the control of choice simply click the next button once again. The next screen appears below.

In the screen shot above notice that the device part number is clearly displayed at the top of the page (green 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

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. As an alternative, clicking on the negative symbol next to Setup will collapse the Setup Menu where the Operations Menu will appear next and perhaps deliver more clarity for the area of focus by not displaying 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 RTD is selected, TC Linearization 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 from to copy to 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:

\Program Files\Watlow\EZ-ZONE CONFIGURATOR\Saved Configurations

The user can save the file to any folder of choice.
## Troubleshooting Alarms, Errors and Control Issues

<table>
<thead>
<tr>
<th>Indication</th>
<th>Description</th>
<th>Possible Causes</th>
<th>Corrective Action</th>
</tr>
</thead>
</table>
| Alarm won’t clear or reset | Alarm will not clear or reset with keypad or digital input | • Alarm latching is active  
  • Alarm set to incorrect output  
  • Alarm is set to incorrect source  
  • Sensor input is out of alarm set point range  
  • Alarm set point is incorrect  
  • Alarm is set to incorrect type  
  • Digital input function is incorrect | • Reset alarm when process is within range or disable latching  
  • Set output to correct alarm source instance  
  • Set alarm source to correct input instance  
  • Correct cause of sensor input out of alarm range  
  • Set alarm set point to correct trip point  
  • Set alarm to correct type: process, deviation or power  
  • Set digital input function and source instance |
| Alarm won’t occur           | Alarm will not activate output                    | • Alarm silencing is active  
  • Alarm blocking is active  
  • Alarm is set to incorrect output  
  • Alarm is set to incorrect source  
  • Alarm set point is incorrect  
  • Alarm is set to incorrect type  | • Disable alarm silencing, if required  
  • Disable alarm blocking, if required  
  • Set output to correct alarm source instance  
  • Set alarm source to correct input instance  
  • Set alarm set point to correct trip point  
  • Set alarm to correct type: process, deviation or power |
| **AL;E1** Alarm Error       | 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         | 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        | 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 |
<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
<th>Solutions</th>
</tr>
</thead>
</table>
| 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 |
| 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  
• Wire thermocouple correctly, (red wire is negative)  
• Set correct Open Loop Detect Time for application  
• Set correct Open Loop Deviation value for application  
• Set output function correctly  
• Set output function correctly  
• Set output function correctly  
• Wire thermocouple correctly, (red wire is negative) |
| Ramping 1 | Controller is ramping to new set point | • Ramping feature is activated  
• Disable ramping feature if not required |
| 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 |
<table>
<thead>
<tr>
<th>Indication</th>
<th>Description</th>
<th>Possible Causes</th>
<th>Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process doesn’t control to set point</td>
<td>Process is unstable or never reaches set point</td>
<td>• Controller not tuned correctly</td>
<td>• Perform autotune or manually tune system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Control mode is incorrectly set</td>
<td>• Set control mode appropriately (Open vs Closed Loop)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Control set point is incorrect</td>
<td>• Set control set point in appropriate control mode and check source of set point: remote, idle, profile, closed loop, open loop</td>
</tr>
<tr>
<td>Temperature runway</td>
<td>Process value continues to increase or decrease past set point.</td>
<td>• Controller output incorrectly programmed</td>
<td>• Verify output function is correct (heat or cool)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Thermocouple reverse wired</td>
<td>• Correct sensor wiring (red wire negative)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Controller output wired incorrectly</td>
<td>• Verify and correct wiring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Short in heater</td>
<td>• Replace heater</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Power controller connection to controller defective</td>
<td>• Replace or repair power controller</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Controller output defective</td>
<td>• Replace or repair controller</td>
</tr>
<tr>
<td>Device Error</td>
<td>Controller displays internal mal-function message at power up.</td>
<td>• Controller defective</td>
<td>• Replace or repair controller</td>
</tr>
<tr>
<td>Menus inaccessible</td>
<td>Unable to access [SET], [OP-Er], [FKEY], [PrOf] menus or particular prompts in Home Page</td>
<td>• Security set to incorrect level</td>
<td>• Check lockout setting in Factory Page</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Digital input set to lockout keypad</td>
<td>• Change state of digital input</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Custom parameters incorrect</td>
<td>• Change custom parameters in Factory Page</td>
</tr>
<tr>
<td>EZ-Key doesn’t work</td>
<td>EZ-Key does not activate required function</td>
<td>• EZ-Key function incorrect</td>
<td>• Verify EZ-Key function in Setup Menu</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• EZ-Key function instance not incorrect</td>
<td>• Check that the function instance is correct</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Keypad malfunction</td>
<td>• Replace or repair controller</td>
</tr>
</tbody>
</table>
## Assembly Definition Addresses and Assembly Working Addresses

<table>
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<th>Assembly Definition Addresses</th>
<th>Assembly Working Addresses</th>
<th>Assembly Definition Addresses</th>
<th>Assembly Working Addresses</th>
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<tbody>
<tr>
<td>40 &amp; 41</td>
<td>200 &amp; 201</td>
<td>80 &amp; 81</td>
<td>240 &amp; 241</td>
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<td>42 &amp; 43</td>
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<td>276 &amp; 277</td>
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<td>78 &amp; 79</td>
<td>238 &amp; 239</td>
<td>118 &amp; 119</td>
<td>278 &amp; 279</td>
</tr>
</tbody>
</table>

### Pointer 1
- Value of Pointer 1
- Pointer 1 = 1880 & 1881
- Loop Control Mode

### Pointer 2
- Value of Pointer 2
- Pointer 2 = 2160 & 2161
- Closed Loop Set Point

### Pointer 3
- Value of Pointer 3
- Pointer 3 = 2162 & 2163
- Open Loop Set Point

### Pointer 4
- Value of Pointer 4
- Pointer 4 = 1480 & 1481
- Alarm 1 High Set Point

### Pointer 5
- Value of Pointer 5
- Pointer 5 = 1482 & 1483
- Alarm 1 Low Set Point

### Pointer 6
- Value of Pointer 6
- Pointer 6 = 1530 & 1531
- Alarm 2 High Set Point

### Pointer 7
- Value of Pointer 7
- Pointer 7 = 1532 & 1533
- Alarm 2 Low Set Point

### Pointer 8
- Value of Pointer 8
- Pointer 8 = 1580 & 1581
- Alarm 3 High Set Point

### Pointer 9
- Value of Pointer 9
- Pointer 9 = 1582 & 1583
- Alarm 3 Low Set Point

### Pointer 10
- Value of Pointer 10
- Pointer 10 = 1630 & 1631
- Alarm 4 High Set Point

### Pointer 11
- Value of Pointer 11
- Pointer 11 = 1632 & 1633
- Alarm 4 Low Set Point

### Pointer 12
- Value of Pointer 12
- Pointer 12 = 2540 & 2541
- Profile Action Request

### Pointer 13
- Value of Pointer 13
- Pointer 13 = 2520 & 2521
- Profile Start

### Pointer 14
- Value of Pointer 14
- Pointer 14 = 1890 & 1891
- Heat Proportional Band

### Pointer 15
- Value of Pointer 15
- Pointer 15 = 1892 & 1893
- Cool Proportional Band

### Pointer 16
- Value of Pointer 16
- Pointer 16 = 1894 & 1895
- Time Integral

### Pointer 17
- Value of Pointer 17
- Pointer 17 = 1896 & 1897
- Time Derivative

### Pointer 18
- Value of Pointer 18
- Pointer 18 = 1900 & 1901
- Heat Hysteresis

### Pointer 19
- Value of Pointer 19
- Pointer 19 = 1902 & 1903
- Cool Hysteresis

### Pointer 20
- Value of Pointer 20
- Pointer 20 = 1898 & 1899
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Modbus Default Assembly Structure 80-119

Assembly Definition Addresses
Default Pointers

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Analog Input 1 Process Value

Assembler Working Addresses

Registers 240 & 241
Value of Pointer 21

Registers 82 & 83
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Registers 242 & 243
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Registers 84 & 85
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Analog Input 2 Process Value

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Pointer 24 = 442 & 443
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Registers 88 & 89
Pointer 25 = 1496 & 1497
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Value of Pointer 25

Registers 90 & 91
Pointer 26 = 1548 & 1547
Alarm 2 State

Registers 250 & 251
Value of Pointer 26

Registers 92 & 93
Pointer 27 = 1596 & 1597
Alarm 3 State

Registers 252 & 253
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Registers 254 & 255
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Pointer 29 = 1328 & 1329
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Registers 256 & 257
Value of Pointer 29

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Pointer 30 = 1348 & 1349
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Registers 258 & 259
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Assembly Definition Registers
Default Pointers

Registers 100 & 101
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Registers 260 & 261
Value of Pointer 31

Registers 102 & 103
Pointer 32 = 1904 & 1905
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Registers 262 & 263
Value of Pointer 32

Registers 104 & 105
Pointer 33 = 1906 & 1907
Cool Power

Registers 264 & 265
Value of Pointer 33

Registers 106 & 107
Pointer 34 = 2520 & 2521
Profile Start

Registers 266 & 267
Value of Pointer 34

Registers 108 & 109
Pointer 35 = 2522 & 2523
Profile Action Request

Registers 268 & 269
Value of Pointer 35

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Pointer 36 = 2524 & 2525
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Registers 270 & 271
Value of Pointer 36

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Pointer 37 = 2526 & 2527
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Registers 274 & 275
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Registers 116 & 117
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Registers 276 & 277
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Pointer 40 = 2532 & 2533
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Value of Pointer 40
Specifications

Line Voltage/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)
- 10V maximum power consumption (PM3 & 6)
- Data retention upon power failure via nonvolatile memory
- Compliant with SEMIF47-0200, Figure R1-1 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, IP66 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. compliant
- 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
- PM3/6 CSA C22. No. 24 File 158031 Class 4813-02, both 1/32 and 1/16 DIN CSA approved
- UL® reviewed to Standard No. C22.2 No.213-M1987, Canadian 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: lithium (recycle properly)
- 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 mm (12 to 22 AWG)
- Wire strip length 7.6 mm (0.30 in.)
- Torque 0.8 Nm (7.0 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/°C)
- Process, 0-20mA @ 100Ω , or 0-10V =(dc) @ 20kΩ input imped-

Watlow EZ-ZONE® PM PID Controller • 95 • Appendix
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

<table>
<thead>
<tr>
<th>Base R @ 25°C</th>
<th>Alpha Techniques</th>
<th>Beta THERM</th>
<th>YSI</th>
<th>Prompt</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.252K</td>
<td>Curve A</td>
<td>2.2K3A</td>
<td>004</td>
<td>A</td>
</tr>
<tr>
<td>10K</td>
<td>Curve A</td>
<td>10K3A</td>
<td>016</td>
<td>B</td>
</tr>
<tr>
<td>10K</td>
<td>Curve C</td>
<td>10K4A</td>
<td>006</td>
<td>C</td>
</tr>
</tbody>
</table>

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 update rate 10Hz
  - Output voltage 24V, current limit, Output 6 = 10mA max., Output 5 = 3 pole DIN-A-MITE® or 24mA max.

Output Hardware
- Switched dc = 22 to 32V= (dc) @30mA
- 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

<table>
<thead>
<tr>
<th>Size</th>
<th>Behind Panel (max.)</th>
<th>Width</th>
<th>Height</th>
<th>Display Character Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/32</td>
<td>101.6 mm (4.00 in)</td>
<td>53.3 mm (2.10 in)</td>
<td>30.9 mm (1.22 in)</td>
<td>left: 7.59 mm (0.299 in) right: 5.90 mm (0.220 in)</td>
</tr>
<tr>
<td>1/4</td>
<td>100.8 mm (3.97 in)</td>
<td>100.3 mm (3.95 in)</td>
<td>100.3 mm (3.95 in)</td>
<td>up: 11.43 mm (0.450 in) middle: 9.53 mm (0.375 in) low: 7.62 mm (0.300 in)</td>
</tr>
<tr>
<td>1/16</td>
<td>101.6 mm (4.00 in)</td>
<td>53.3 mm (2.10 in)</td>
<td>53.3 mm (2.10 in)</td>
<td>up: 10.80 mm (0.425 in) low: 6.98 mm (0.275 in)</td>
</tr>
<tr>
<td>1/8 (H)</td>
<td>101.6 mm (4.00 in)</td>
<td>100.3 mm (3.95 in)</td>
<td>53.9 mm (2.12 in)</td>
<td>top: 11.4 mm (0.450 in) middle: 9.53 mm (0.375 in) bottom: 7.62 mm (0.300 in)</td>
</tr>
<tr>
<td>1/8 (V)</td>
<td>101.6 mm (4.00 in)</td>
<td>53.3 mm (2.10 in)</td>
<td>100.3 mm (3.95 in)</td>
<td>top: 11.4 mm (0.450 in) middle: 9.53 mm (0.375 in) bottom: 7.62 mm (0.300 in)</td>
</tr>
</tbody>
</table>

Weight

<table>
<thead>
<tr>
<th>Weight</th>
<th>1/32 DIN (PM3)</th>
<th>1/8 DIN (PM8&amp;9)</th>
<th>1/16 DIN (PM6)</th>
<th>1/4 DIN (PM4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller</td>
<td>127 g (4.5 oz.)</td>
<td>284 g (10 oz.)</td>
<td>186 g (6.6 oz.)</td>
<td>331 g (11.7 oz.)</td>
</tr>
</tbody>
</table>

User Manual
- User manual: 221.81 g (7.82 oz)

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EtherNet/IP™ is a trademark of ControlNet International Ltd. used under license by Open DeviceNet Vendor Association, Inc. (ODVA).
UL® is a registered trademark of Underwriters Laboratories Inc.
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Note:
These specifications are subject to change without prior notice.
# Ordering Information for PID Controller Models

## Controller

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

## Package Size

<table>
<thead>
<tr>
<th>Package Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Panel Mount 1/32 DIN</td>
</tr>
<tr>
<td>6</td>
<td>Panel Mount 1/16 DIN</td>
</tr>
<tr>
<td>8</td>
<td>Panel Mount 1/8 DIN Vertical</td>
</tr>
<tr>
<td>9</td>
<td>Panel Mount 1/8 DIN Horizontal</td>
</tr>
<tr>
<td>4</td>
<td>Panel Mount 1/4 DIN Horizontal</td>
</tr>
</tbody>
</table>

## Primary Function

<table>
<thead>
<tr>
<th>Primary Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>PID Controller with Universal Input</td>
</tr>
<tr>
<td>R</td>
<td>PID Controller with Universal Input and Profiling Ramp and Soak</td>
</tr>
<tr>
<td>B</td>
<td>PID Controller with Universal Input and Profiling Ramp and Soak and Battery Backup with Real Time Clock</td>
</tr>
<tr>
<td>J</td>
<td>PID Controller with Thermistor Input and Profiling Ramp and Soak and Battery Backup with Real Time Clock</td>
</tr>
<tr>
<td>N</td>
<td>PID Controller with Thermistor Input and Profiling Ramp and Soak</td>
</tr>
<tr>
<td>E</td>
<td>PID Controller with Thermistor Input and Profiling Ramp and Soak and Battery Backup with Real Time Clock</td>
</tr>
<tr>
<td>S</td>
<td>Custom Firmware</td>
</tr>
</tbody>
</table>

- Options B and E are not available with PM3 or PM6

## Power Supply, Digital Input/Output

<table>
<thead>
<tr>
<th>Power Supply, Digital Input/Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100 to 240V~ (ac)</td>
</tr>
<tr>
<td>2</td>
<td>100 to 240V~ (ac) plus 2 Digital I/O points</td>
</tr>
<tr>
<td>3</td>
<td>15 to 36V= (dc) and 24V~ (ac)</td>
</tr>
<tr>
<td>4</td>
<td>15 to 36V= (dc) and 24V~ (ac), plus 2 Digital I/O points</td>
</tr>
</tbody>
</table>

## Output 1 and 2 Hardware Options

<table>
<thead>
<tr>
<th>Output 1</th>
<th>Output 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>None</td>
</tr>
<tr>
<td>CH</td>
<td>NO-ARC 15 A power control</td>
</tr>
<tr>
<td>CC</td>
<td>Switched dc</td>
</tr>
<tr>
<td>CJ</td>
<td>Mechanical relay 5 A, form A</td>
</tr>
<tr>
<td>CK</td>
<td>Solid-State Relay 0.5 A, form A</td>
</tr>
<tr>
<td>EA</td>
<td>None</td>
</tr>
<tr>
<td>EH</td>
<td>NO-ARC 15 A power control</td>
</tr>
<tr>
<td>EC</td>
<td>Switched dc</td>
</tr>
<tr>
<td>EJ</td>
<td>Mechanical relay 5 A, form A</td>
</tr>
<tr>
<td>EK</td>
<td>Solid-State Relay 0.5 A, form A</td>
</tr>
<tr>
<td>FA</td>
<td>None</td>
</tr>
<tr>
<td>FC</td>
<td>Switched dc (cannot use variable time base)</td>
</tr>
<tr>
<td>FJ</td>
<td>Mechanical relay 5 A, form A (cannot use variable time base)</td>
</tr>
<tr>
<td>FK</td>
<td>Solid-State Relay 0.5 A, form A (cannot use variable time base)</td>
</tr>
<tr>
<td>AK</td>
<td>Solid-State Relay 0.5 A, form A</td>
</tr>
<tr>
<td>KH</td>
<td>NO-ARC 15 A power control</td>
</tr>
<tr>
<td>KK</td>
<td>Solid-State Relay 0.5 A, form A</td>
</tr>
</tbody>
</table>

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

## Communications Options

<table>
<thead>
<tr>
<th>Communications Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>None</td>
</tr>
<tr>
<td>1</td>
<td>EIA 485 Modbus RTU®</td>
</tr>
</tbody>
</table>

- Standard Bus EIA-485 always included - all models

## Future Options

<table>
<thead>
<tr>
<th>Future Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAAA</td>
<td>None</td>
</tr>
</tbody>
</table>

## Custom Options

<table>
<thead>
<tr>
<th>Custom Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>Standard EZ-ZONE face plate</td>
</tr>
<tr>
<td>12</td>
<td>Class 1, Div. 2 (Not available with mechanical relay output types E, H, J)</td>
</tr>
</tbody>
</table>
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Declaration of Conformity

Series EZ-ZONE® PM

WATLOW
1241 Bundy Blvd.
Winona, MN 55987 USA

an ISO 9001 approved facility since 1996.

Declares that the following product:

Designation: Series EZ-ZONE® PM (Panel Mount)
Model Numbers: PM (3, 6, 8, 9 or 4)(Any Letter or number) – (1, 2, 3 or 4)(A, C, E, F or K) (A, C, H, J or K)(Any letter or number) – (Any letter or number)(A, C, E, F or K)(A, C, H, J or K) (Any three letters or numbers)

Classification: Temperature control, Installation Category II, Pollution degree 2, IP66
Rated Voltage and Frequency: 100 to 240 V~ (ac 50/60 Hz) or 15 to 36 V~ dc/ 24 V~ac 50/60 Hz
Rated Power Consumption: 10 VA maximum PM3, PM6 Models.
14 VA maximum PM8, PM9, PM4 Models

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

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

\(^{1}\)For mechanical relay loads, cycle time may need to be extended up to 160 seconds to meet flicker requirements depending on load switched and source impedance.

2006/95/EC Low-Voltage Directive
EN 61010-1 2001 Safety Requirements of electrical equipment for measurement, control and laboratory use. Part 1: General requirements

Compliant with 2002/95/EC RoHS Directive


Raymond D. Feller III Winona, Minnesota, USA
Name of Authorized Representative Place of Issue

General Manager June 2009
Title of Authorized Representative Date of Issue

Signature of Authorized Representative

CE DOC EZ-ZONE PM-06-09