EZ-ZONE® ST

User’s Manual

Integrated Control Loop

WATLOW

1241 Bundy Boulevard, Winona, Minnesota USA 55987
Phone: +1 (507) 454-5300, Fax: +1 (507) 452-4507  http://www.watlow.com

TOTAL CUSTOMER SATISFACTION
3 Year Warranty

ISO 9001

Registered Company
Winona, Minnesota USA

Made in the U.S.A.

January 2010
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 safety alert symbol, \( \text{\textregistered} \) (an exclamation point in a triangle) precedes a general CAUTION or WARNING statement.

The electrical hazard symbol, \( \text{\textregistered} \) (a lightning bolt in a triangle) precedes an electric shock hazard CAUTION or WARNING safety statement.

![CAUTION or WARNING]

Electrical Shock Hazard

CAUTION or WARNING

Warranty

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

The purchaser must use Watlow parts to maintain all listed ratings.

Technical Assistance

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

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

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 RMAs 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 not repairable, you will receive a letter of explanation and be given the option to have the unit returned to you at your expense or to have us scrap the unit.

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

The EZ-ZONE® ST User's Manual is copyrighted by Watlow Electric, Inc., © January 2010 with all rights reserved.

EZ-ZONE® ST is covered by U.S. Patent No. 6,005,577 and Patents Pending.
### Table of Contents

**Chapter 1: Overview** ................................................................. 3  
The EZ-ZONE® ST Provides Total Thermal System Control ............. 3  
A Conceptual View of the ST ...................................................... 4  
Getting Started Quickly ........................................................... 5  

**Chapter 2: Install, Wire and Set Address** ............................. 7  
Wiring ......................................................................................... 9  
Installation ............................................................................... 14  
Replacing the Solid-State Relay ............................................... 15  
ST Isolation Block ..................................................................... 17  
Setting the Address ................................................................... 26  
Conventions Used in the Menu Pages ....................................... 27  

**Chapter 3: Operations Pages** ............................................... 30  
Analog Input Menu .................................................................. 31  
Digital Input/Output Menu ....................................................... 32  
Limit Menu ............................................................................... 32  
Monitor Menu ........................................................................... 32  
Loop Menu ............................................................................... 33  
Alarm Menu ............................................................................. 35  
Current Menu ........................................................................... 36  
Profile Status Menu ................................................................... 37  

**Chapter 4: Setup Pages** ....................................................... 39  
Analog Input Menu .................................................................. 40  
Digital Input/Output Menu ....................................................... 42  
Limit Menu ............................................................................... 44  
Control Loop Menu .................................................................. 44  
Output Menu ............................................................................. 47  
Alarm Menu ............................................................................. 48  
Current Menu ........................................................................... 50  
Function Key ............................................................................ 51  
Global Menu ............................................................................. 52  
Communications Menu ............................................................. 53  

**Chapter 5: Profiling Page** ...................................................... 54  

**Chapter 6: Factory Pages** ...................................................... 59  
Custom Setup Menu ................................................................. 60  
Security Setting Menu ............................................................... 60  
Security Setting Menu ............................................................... 62  
Diagnostics Menu ..................................................................... 62  
Calibration Menu ...................................................................... 63  

**Chapter 7: Features** ............................................................... 64  
Saving and Restoring User Settings ......................................... 65  
Tuning the PID Parameters ...................................................... 65  
Inputs ......................................................................................... 66  
Control Methods ..................................................................... 68  
Alarms ....................................................................................... 72  
Using Lockout to Hide Pages and Menus ................................ 73
<table>
<thead>
<tr>
<th>Chapter 8: Appendix</th>
<th>79</th>
</tr>
</thead>
<tbody>
<tr>
<td>Troubleshooting</td>
<td>79</td>
</tr>
<tr>
<td>Modbus - Programmable Memory Blocks</td>
<td>82</td>
</tr>
<tr>
<td>CIP Implicit O to T (Originator to Target) Assembly Structure</td>
<td>84</td>
</tr>
<tr>
<td>CIP Implicit T to O (Target to Originator) Assembly Structure</td>
<td>84</td>
</tr>
<tr>
<td>Specifications</td>
<td>85</td>
</tr>
<tr>
<td>Ordering Information</td>
<td>86</td>
</tr>
<tr>
<td>Index</td>
<td>89</td>
</tr>
<tr>
<td>Declaration of Conformity</td>
<td>93</td>
</tr>
<tr>
<td>How to Reach Us</td>
<td>95</td>
</tr>
</tbody>
</table>
Chapter 1: Overview

The EZ-ZONE® ST Provides Total Thermal System Control

The EZ-ZONE ST solid-state controller offers complete thermal system control in a single package while reducing system complexity and the cost of control-loop ownership. You can order a PID controller already connected to a high-amperage, solid-state relay capable of zero cross or phase angle firing with the option of adding a properly sized heat sink, an over-under temperature limit, a shut-down power contactor, and digital communications in one package.

It just got a whole lot easier to solve the thermal requirements of your system. Because the EZ-ZONE ST along with the entire family of EZ-ZONE controls are highly scalable where you pay only for what you need. So if you are looking for a PID controller with high amperage outputs, an over-under limit controller or an integrated controller, the EZ-ZONE ST is the answer.

Features and Benefits

Back panel or DIN rail mount
• Provides several mounting options

Compact package
• Reduces panel size

Touch-safe package
• IP2X-Touch safe with back of hand
• Increases safety for installers and operators

±0.1 percent temperature accuracy
• Provides efficient and accurate temperature control

Agency approvals: [UL®] (with factory-installed heatsink); [CSA] (without factory-installed heatsink); CE; RoHS; W.E.E.E.; CSA
• Limit version features FM approval
• Provides third-party recognition

Three-year warranty
• Provides Watlow reliability and product support

Off-the-shelf designed system solution
• Improves system reliability and reduces wiring
• Reduces installation cost
• Eliminates compatibility headaches often encountered when using many different components and brands

Profile capability
• Includes ramp and soak with four files and forty steps

Communications with PLC, PC or HMI
• ST with optional Modbus® RTU protocol

• When used with the optional Remote User Interface/Gateway (RUI/GTW) the following protocols are available:
  - EIA 232/485 Modbus RTU
  - Modbus TCP
  - EtherNet/IP
  - DeviceNet
  - Profinbus DP

Solid-State Relay output
• Provides faster cycling, more precise control, increased heater life and energy efficiency
• Resistor or inductive load current of up to 75 amperes using either zero-cross or phase angle control modes
• Soft start feature with phase angle control mode to prevent load failure or blowing fuses

PID temperature control
• Provides accurate temperature control
• Provides a single input and dual outputs
• Provides standard or adaptive (TRU-TUNE+) PID tuning algorithms.

Optional temperature limit
• Increases safety during under and over-temperature conditions

Optional definite purpose mechanical contactor
• Enables circuit safety shutdown driven by a limit controller or a PID alarm output signal

Optional current monitoring feature
• Detects heater current flow and alarm indication of failed Solid-State Relay or a heater zone

Optional Solid-State Relay heat sink
• Sized and engineered for specific applications
• Factory assembled heat sink required for UL listing

System diagnostics
• Provides continuous system level monitoring with alerts reducing the overall cost for maintenance and service

Advanced controllability algorithms
• TRU-TUNE+™ meets demanding controllability requirements.

PC Software: EZ-ZONE ST Configurator
• Wizard-style configuration of controller settings
• Online or offline recipe editing

UL® is a registered trademark of Underwriter's Laboratories Inc. Modbus™ is a trademark of Schneider Automation Incorporated.
A Conceptual View of the ST

The flexibility of the ST 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 terms of functions; there are internal and external functions. An input and an output would be considered external functions where the PID calculation would be an internal function. Information flows from an input function to an internal function to an output function when the controller is properly configured. A single ST control can carry out several functions at the same time. For instance, closed-loop control monitoring for several different alarm situations, while at the same time operating switched devices, such as lights and motors. Each process needs to be thought out carefully and the controller’s various functions set up properly.

Inputs Functions

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 controller with digital input-output (DIO) hardware includes two sets of terminals each. Each DIO must be configured to function as either an input or output with the Direction parameter in the Digital Input/Output Menu (Setup Page).

The EZ-ZONE Remote User Interface (RUI) has a function, or EZ Key on the front panel, this too can be configured as a digital input by toggling the function assigned to it in the Digital Input Function parameter in the Function Key Menu (Setup Page). If interested in learning more about the RUI and how it is used with the ST retrieve the RUI user manual from the Watlow web site. Point your browser to:
http://www.watlow.com/literature/pti_search.cfm?dltype=5

Once there, type in EZ-ZONE for a keyword at the bottom of the page and then click on the search button to find the user manual.

Internal 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).

Outputs Functions

Outputs can perform various functions or actions in response to information provided by a function, such as operating a heater, driving a compressor, turning a light on or off, unlocking a door, turning on a buzzer etc...

Assign an output to a Function in the Output Menu or DIO Menu. Then select which instance of that function will drive the selected output. For example, you might assign an output to respond to alarm 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 ST control has a page and menu structure that is listed below along with a brief description of its purpose.

**Setup Page**
Push and hold the up and down keys (↑ ↓) for 6 seconds to enter. (See the **Setup Page** for further information)

Once received, a user would want to setup their control prior to operation. As an example, define the input type and set the output cycle time.

**Operations Page**
Push and hold the up and down keys (↑ ↓) for 3 seconds to enter. (See the **Operations Page** for further information)

After setting up the control to reflect your equipment, the Operations Page would be used to monitor or change 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.

**Factory Page**
Push and hold the Infinity and the green Advance keys (↑) for 6 seconds to enter. (See the **Factory Page** for further information)

For the most part the Factory Page has no bearing on the control when running. Here, a user may want to enable password protection, view the control part number or perhaps create a custom Home Page.

**Profile Page**
Push and hold the the green Advance key (↑) for 6 seconds to enter. (See the **Profile Page** for further information)

If equipped with this feature, a user would want to go here to configure a profile.

The default ST 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.

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.
**WARNING:** When the controller is powered up, the outputs may turn on.

**Note:**
A current error can be sent to the RUI (Remote User Interface) soft error display by enabling Current Reading \( \text{CU;r} \) in the Setup Page.

---

* EZ-ZONE Remote User Interface (RUI)
2 Chapter 2: Install, Wire and Set Address

EZ-ZONE® ST with 25A or 40A Contactor

WARNING: The heat sink can become hot during operation.

CAUTION: The EZ-ZONE ST must be mounted vertically (as shown) to meet the ampere/ambient-temperature performance curve.

EZ-ZONE ST Without a 25A or 40A Contactor

WARNING: The heat sink can become hot during operation.

CAUTION: The EZ-ZONE ST must be mounted vertically (as shown) to meet the ampere/ambient-temperature performance curve.
EZ-ZONE ST Without a Contactor

WARNING: The heat sink can become hot during operation.

CAUTION: The EZ-ZONE ST must be mounted vertically (as shown) to meet the ampere/ambient-temperature performance curve.
Wiring with a contactor (ST _ _ - (B or F) _ _ _ - _ _ _ _)

Note:
A2 is connected internally to terminal 98. A1 is connected internally to the contactor coil. The other side of the coil is connected to terminal 99.

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.

WARNING: If high voltage is applied to a low-voltage controller, irreversible damage will occur.

Note:
Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

Note:
Use the contactor with a minimum load of 100 watts.

STATUS Indicator Light
Flashing green indicates the controller is running with no input errors.
Flashing red indicates an input error.
No flashing indicates that the controller is not functioning.

CAUTION: Always mount the controller as shown, with the heat-sink fins aligned vertically.

Note:
The control common terminal and the digital common terminal are referenced to different voltages and must remain isolated.
**Wiring without a contactor**

(\text{ST} \quad \_ \quad \_ \quad A \quad \_ \quad \_ \quad \_ \quad \_ \quad \_)

\textbf{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.

\textbf{WARNING:} If high voltage is applied to a low-voltage controller, irreversible damage will occur.

\textbf{CAUTION:} Always mount the controller as shown, with the heat-sink fins aligned vertically.

\textbf{Note:}

If 75A heat sink is ordered D6 (Digital Input) will be factory set and used as the SSR over temperature shut-down.
Ground Connection
Connect the ground to the heat sink.
There is no ground connection on models without a heat sink.

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

Note:
If 75A heat sink is ordered D6 (Digital Input) will be factory set and used as the SSR over temperature shut-down.
Internal wiring in an ST with a single-pole contactor without a limit (ST _ B - B _ _ _ _ _ _).

Use single-pole contactors for hot-to-neutral loads. NEC does not permit neutral to be switched.

Use double-pole contactors for hot-to-hot loads. Both hot legs must be opened together on limit conditions to remove power from circuit.

You may remove the factory-installed jumper between A1 and L4 to install a safety switch for the limit relay (ST _ L - _ _ _ _ _ _).

(Dotted lines represent internal wiring.)

You can use output 2 (L2 and K2) to deactivate the contactor coil on an ST without a limit (ST _ B - _ _ _ _ _ _ _ _).

(Dotted lines represent internal wiring.)
System with a limit using an external contactor (ST _ L - A _ _ _ - _ _ _ _ ).

System (with optional RUI) using the auxiliary terminals (20 A maximum) to operate a secondary load.

**Sub-assembly Labels**

**Controller label.**

**Module**

**Base label.**

**Heat sink label.**

The model number at the top of each label identifies the controller configuration.

See Ordering Information and Model Numbers in the Appendix for more detailed information.

<table>
<thead>
<tr>
<th>Heat Sink</th>
<th>Patent Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST??.????-B???</td>
<td>US PAT. 5598322; D531138</td>
</tr>
<tr>
<td>ST??.????-C???</td>
<td>US PAT. 5598322; D529874</td>
</tr>
<tr>
<td>ST??.A??-???</td>
<td>US PAT. D553581; D558683</td>
</tr>
<tr>
<td>ST??.[B,F]??.???</td>
<td>US PAT. D553094; D553099</td>
</tr>
</tbody>
</table>

Watlow EZ-ZONE® ST

Chapter 2 Install and Wire
Installation

Mounting and Dismounting the Controller from a DIN Rail

To mount the controller on a DIN rail, first hook the top flange on the back of the heat sink on to the top of the DIN rail. Then rotate the controller to an upright position until the lower flange snaps into place.

To dismount the controller, first use a screwdriver to pull down the small lever on the bottom of the heat sink and rotate the bottom of the controller forward. Then lift the controller off of the rail.

Note:
Typically, the DIN rail is mounted before components are mounted on it.
Replacing the Solid-State Relay on a Controller without a Contactor (ST _ _-A _ _ _-_ _ _)

1. Pinch the release levers on the top and bottom of the control module and lift the bottom edge forward to detach the unit.

2. With a Phillips screwdriver, remove the four nearest screws that were under the module.

3. Lift the controller body, exposing the solid-state relay.

Replacing the Solid-State Relay

1. Using a Phillips screwdriver, replace the two screws connecting the solid-state relay to the heat sink.

2. Place the controller body over the solid-state relay and, using a Phillips screwdriver, replace the four screws securing it.

3. Snap the control module in place, bottom edge first.

4. Using a Phillips screwdriver, remove the two screws connecting the solid-state relay to the heat sink.

Note:

For controller models without a contactor (ST _ _-A _ _ _-_ _ _), the solid-state relay must be mounted with the larger power terminals on the top and the smaller control terminals on the bottom.

Note:

Factory calibration is done using control and base modules as matched pairs. Due to this fact, current detection (if turned on) may not read accurately if a control module is placed into another base module.
Replacing the Solid-State Relay on a Controller with a Contactor (ST _ _ - (B or F) _ _ - _ _)

1. Pinch the release levers on the top and bottom of the control module and lift the right edge forward to detach the unit.

2. With a Phillips screwdriver, remove the four nearest screws that were under the module.

3. With a Phillips screwdriver, remove the two screws at the top corners of the controller.

4. Lift the controller body, exposing the solid-state relay.

5. Using a Phillips screwdriver, remove the two screws connecting the solid-state relay to the heat sink.

Replacing the Solid-state Relay

1. Using a Phillips screwdriver, replace the two screws connecting the solid-state relay to the heat sink. Check that the bottom of the solid-state relay is on the left.

2. Place the controller body over the solid-state relay and, using a Phillips screwdriver, replace the six screw securing it.

3. Snap the control module in place, left edge first.

Note:
For controller models with a contactor (ST _ -A _ _ - _ _ _), the solid-state relay must be mounted with the larger power terminals on the right and the smaller control terminals on the left.
### Indicator Lights and Slot Identification

#### Limit:
Indicates that the controller is in a limit state.

#### Output 3:
Indicates that output 3 is in an on state.

#### Solid-State Relay:
Indicates that the solid-state relay is in an on state.

#### Status:
- Flashing green indicates the controller is running with no input errors.
- Flashing red indicates an input error.
- No flashing indicates that the controller is not functioning.

#### Output 2:
Indicates that output 2 is in an on state.

### ST Isolation Block

- **Controller Power Supply**
  - 20 to 26V (dc)
  - 20 to 26V~ (ac)
  - 85 to 264V~ (ac)

- **Mechanical Relay, Solid-State Relay, Outputs**

- **Low-voltage Isolation: 42V peak**

- **Safety Isolation: 2300V~ (ac)**

- **No Isolation**
  - Digital Inputs & Outputs 5-6
  - Analog Input 1
  - Analog Input 2
  - Communications Ports

---

Watlow EZ-ZONE® ST

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: To prevent ground loops, isolation needs to be maintained from input to output when using switched DC or analog process outputs.

CAUTION: Always mount the controller with the heat-sink fins aligned vertically.

NOTE: Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

WARNING: If high voltage is applied to a low-voltage controller, irreversible damage will occur.

---

Power

- Minimum/Maximum Ratings
  - 85 to 264V~ (ac)
  - 20.4 to 26.4 V~ (ac) / V= (dc)
  - 47 to 63 Hz
  - 12VA maximum power consumption without mechanical contactor in system
  - 50VA maximum power consumption with mechanical contactor in system, 140VA if using external contactor

---

Input 1 Thermocouple

- 20 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.

ST _ _ _ _ _ _ _ _ _ _ (all)

---

Input 1 RTD

- platinum, 100 and 1,000 Ω @ 0°C
- calibration to DIN curve (0.00385 Ω/°C)
- 20 Ω maximum 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.

ST _ _ _ _ _ _ _ _ _ _ (all)

---

Input 1 Process

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

ST _ _ _ _ _ _ _ _ _ _ (all)

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

NOTE: To prevent ground loops, isolation needs to be maintained from input to output when using switched DC or analog process outputs.

CAUTION: Always mount the controller with the heat-sink fins aligned vertically.

NOTE: Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

WARNING: If high voltage is applied to a low-voltage controller, irreversible damage will occur.

---

**Input 2 Thermocouple**

- 20 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 S2.
- To reduce errors, the extension wire for thermocouples must be of the same alloy as the thermocouple.

ST \_ L \_ \_ \_ \_ \_ \_ \_ (limit)

**Input 2 RTD**

- platinum, 100 and 1,000 Ω @ 0°C
- calibration to DIN curve (0.00385 Ω/°C)
- 20 Ω maximum 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 R2.
- For best accuracy use a 3-wire RTD to compensate for lead-length resistance. All three lead wires must have the same resistance.

ST \_ L \_ \_ \_ \_ \_ \_ \_ (limit)

**Input 2 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

ST \_ L \_ \_ \_ \_ \_ \_ \_ (limit)
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: To prevent ground loops, isolation needs to be maintained from input to output when using switched DC or analog process outputs.

CAUTION: Always mount the controller with the heat-sink fins aligned vertically.

NOTE: Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

WARNING: If high voltage is applied to a low-voltage controller, irreversible damage will occur.
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: To prevent ground loops, isolation needs to be maintained from input to output when using switched DC or analog process outputs.

CAUTION: Always mount the controller with the heat-sink fins aligned vertically.

NOTE: Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

WARNING: If high voltage is applied to a low-voltage controller, irreversible damage will occur.

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: To prevent ground loops, isolation needs to be maintained from input to output when using switched DC or analog process outputs.

CAUTION: Always mount the controller with the heat-sink fins aligned vertically.

NOTE: Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

WARNING: If high voltage is applied to a low-voltage controller, irreversible damage will occur.

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

---

**Output 2 Mechanical Relay, Form A**

- 5 A at 240V~ (ac) or 30V= (dc) maximum resistive load
- 20 mA at 24V minimum load
- 125 VA pilot duty 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.  
ST (H, D, J, C) _ _ _ _ _ _ _ _

---

**Output 2 Solid-State Relay, Form A**

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

See Quencharc note.  
ST (K, B, P, E) _ _ _ _ _ _ _ _

---

**Output 3 Mechanical Relay, Form C**

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

See Quencharc note.  
ST _L - _ _ _ _ (limit)

---

**Output 4 Mechanical Relay, Form A**

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

See Quencharc note.  
ST _L - _ _ _ _ (limit)
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: To prevent ground loops, isolation needs to be maintained from input to output when using switched DC or analog process outputs.

CAUTION: Always mount the controller with the heat-sink fins aligned vertically.

NOTE: Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

WARNING: If high voltage is applied to a low-voltage controller, irreversible damage will occur.

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

- Internal supply provides a constant power output of 750mW
- Maximum output sink current per output is 1.5A (external class 2 or SELV supply required)
- Total sink current for all outputs not to exceed 8A
- Do not connect outputs in parallel

ST [B, C, D or E] __ __ __ __ 

Quencharc Wiring Example

In this example the Quencharc circuit (Watlow part# 0804-0147-0000) is used to protect ST internal circuitry from the counter electromagnetic 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 ST outputs.
**Warning:**
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

**NOTE:** To prevent ground loops, isolation needs to be maintained from input to output when using switched DC or analog process outputs.

**CAUTION:** Always mount the controller with the heat-sink fins aligned vertically.

**NOTE:** Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

**WARNING:** If high voltage is applied to a low-voltage controller, irreversible damage will occur.

Note: Excessive writes to EEPROM over Modbus can cause premature EEPROM failure. The EEPROM is rated for 1,000,000 writes. See "Saving Settings to Nonvolatile Memory" in Chapter 2, Install and Wire.

---

### Standard Bus EIA-485 Communications

- Wire T-/R- to the A terminal of the EIA-485 port.
- Wire T+/R+ to the B terminal of the EIA-485 port.
- Wire common to the common terminal of the EIA-485 port.
- Do not route network wires with power wires. Connect network wires in daisy-chain fashion when connecting multiple devices in a network.

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

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

---

**Modbus-IDA Terminal**

<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>

---

*All models include Standard Bus communications*
**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:** To prevent ground loops, isolation needs to be maintained from input to output when using switched DC or analog process outputs.

**CAUTION:** Always mount the controller with the heat-sink fins aligned vertically.

**NOTE:** Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

**WARNING:** If high voltage is applied to a low-voltage controller, irreversible damage will occur.

**Note:** Excessive writes to EEPROM over Modbus can cause premature EEPROM failure. The EEPROM is rated for 1,000,000 writes. See “Saving Settings to Nonvolatile Memory” in Chapter 2, Install and Wire.

---

**Wiring a Serial EIA-485 Network**

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

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

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

**Note:**
Do not route network wires with power wires.

---

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

---

**A network with all devices configured using Modbus RTU.**
Setting the Address

Modbus Controller Address

The address of an EZ-ZONE® ST controller with the Modbus option (ST _ _-_ _ M _- _- _) can be set to ranges from 1 to 8 using the DIP switch and ranges 1 to 247 using software.

Set switch 4 to on to use Modbus communications. Modbus™ RTU addresses from 1 to 247 can be programmed into the controller using Standard bus communications. Only one controller can be connected to the network while changing the address using communications. After the Modbus address is changed, all four DIP switches must be turned on (set to 8) and the controller restarted for the new address to become available on the Modbus network.

As many as 247 controllers can be connected to a network.

DIP Switch

<table>
<thead>
<tr>
<th>Zone</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>off</td>
<td>off</td>
<td>off</td>
<td>on</td>
</tr>
<tr>
<td>2</td>
<td>on</td>
<td>off</td>
<td>off</td>
<td>on</td>
</tr>
<tr>
<td>3</td>
<td>off</td>
<td>on</td>
<td>off</td>
<td>on</td>
</tr>
<tr>
<td>4</td>
<td>on</td>
<td>on</td>
<td>off</td>
<td>on</td>
</tr>
<tr>
<td>5</td>
<td>off</td>
<td>off</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td>6</td>
<td>on</td>
<td>off</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td>7</td>
<td>off</td>
<td>on</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td><strong>8</strong></td>
<td>on</td>
<td>on</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td><strong>1 to 247</strong></td>
<td>on</td>
<td>on</td>
<td>on</td>
<td>on</td>
</tr>
</tbody>
</table>

** Set switch 4 to on to use Modbus communications. Modbus addresses from 1 to 247 can be programmed into the controller using Standard bus communications when switch 4 is off. After the Modbus address is changed, all four DIP switches must be turned on (set to 8) for the new address to become available on the Modbus network.

Communications Parameter Name | Range | Modbus (less 400,001 offset) | Data Type & Read/Write
---|---|---|---
Address (when all four DIP switches are set to on) | * 1 to 247 | Map 1 Map 2 313 2052 | uint RW
Baud | * 9,600 (188) 19,200 (189) 38,400 (190) | Map 1 Map 2 314 2054 | uint RWE
Parity | Even (191) Odd (192) * None (61) | Map 1 Map 2 315 2056 | uint RWE
Word Order | * Lowhigh (1331) Highlow (1330) | Map 1 Map 2 317 2084 | uint RWE
Non-Volatile Save (ST Firmware 2 and higher) | * Yes (106) No (59) | Map 1 Map 2 317 2084 | uint RWE

* Defaults

Note:

Changing the Modbus parameters listed above must be done over Modbus using ST firmware release 2.0 and earlier. For firmware release 3.0 and above using either an RUI or EZ-ZONE Configurator software, navigate to the Setup Page and then to the Com (RUI representation) menu to change.

CAUTION:

Changes set over Modbus are immediate. Users will not be able to communicate with the controller after its address, parity or baud rate has been changed. The master device will need to be re-configured to the new settings.

Saving Settings to Nonvolatile Memory

When controller settings are entered using the optional RUI, changes are always saved to Non-volatile Memory (EEPROM). If the controller loses power or is switched off, its settings will be restored when it starts again.

The EEPROM will wear out after about 1,000,000 writes, which would not be a problem with changes made from the RUI. However, if the controller is receiving changing instructions from a PLC or a computer through a network connection, the EEPROM could, over time, wear out. The Non-volatile Memory Save parameter allows the user to save settings made over the network to either volatile or non-volatile memory.

By default, settings made through the network are saved to non-volatile memory.

Note:

Changing Non-volatile Memory Save must be done over the network using ST firmware release 2.0 and earlier. For firmware release 3.0 and above using either an RUI or EZ-ZONE Configurator software, navigate to the Setup Page and then to the Com (RUI representation) menu to change.
**Watlow Standard Bus Controller Address**

The address of an EZ-ZONE ST controller using Standard Bus exclusively (ST_ - - A _ - - _ _ ) ranges from 1 to 16, where up to 16 controllers can be connected on the Standard Bus network.

<table>
<thead>
<tr>
<th>Zone</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>off</td>
<td>off</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>2</td>
<td>on</td>
<td>off</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>3</td>
<td>off</td>
<td>on</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>4</td>
<td>on</td>
<td>on</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>5</td>
<td>off</td>
<td>on</td>
<td>off</td>
<td>on</td>
</tr>
<tr>
<td>6</td>
<td>on</td>
<td>off</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td>7</td>
<td>off</td>
<td>on</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td>8</td>
<td>on</td>
<td>on</td>
<td>on</td>
<td>off</td>
</tr>
<tr>
<td>*9</td>
<td>off</td>
<td>off</td>
<td>off</td>
<td>on</td>
</tr>
<tr>
<td>*10</td>
<td>on</td>
<td>off</td>
<td>off</td>
<td>on</td>
</tr>
<tr>
<td>*11</td>
<td>off</td>
<td>on</td>
<td>off</td>
<td>on</td>
</tr>
<tr>
<td>*12</td>
<td>on</td>
<td>on</td>
<td>off</td>
<td>on</td>
</tr>
<tr>
<td>*13</td>
<td>off</td>
<td>on</td>
<td>on</td>
<td>off</td>
</tr>
<tr>
<td>*14</td>
<td>on</td>
<td>on</td>
<td>on</td>
<td>off</td>
</tr>
<tr>
<td>*15</td>
<td>off</td>
<td>on</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td>*16</td>
<td>on</td>
<td>on</td>
<td>on</td>
<td>on</td>
</tr>
</tbody>
</table>

---

**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 addresses when 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>
</tbody>
</table>

---

**If Using Optional RUI (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>Range</th>
<th>1 = 1</th>
<th>0 = 0</th>
<th>i = i</th>
<th>r = r</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 = A</td>
<td>3 = b</td>
<td>4 = c</td>
<td>5 = d</td>
</tr>
<tr>
<td></td>
<td>6 = E</td>
<td>7 = F</td>
<td>8 = g</td>
<td>9 = h</td>
</tr>
<tr>
<td></td>
<td>n = n</td>
<td>o = o</td>
<td>p = p</td>
<td>q = q</td>
</tr>
</tbody>
</table>

---

**Modbus Relative Address**

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 (instance 1). To turn the sensor off using Modbus simply write the value of 62 (off) to register 400043 (Map 1) or register 400369 (Map 2) and send...
that value to the control.

Communication Protocols

All EZ-ZONE ST controllers come standard with the Standard Bus protocol. As a option it can also be delivered with the Modbus protocol as well. The Standard Bus protocol is used primarily for communications to other EZ-ZONE products to include the RUI and EZ-ZONE Configurator software (free download from Watlow’s web site (http://www.watlow.com). Other protocols that can be used to communicate with the ST are available when used in conjunction with the optional Remote User Interface/Gateway (RUI/GTW).

- Modbus RTU 232/485
- EtherNet/IP, Modbus TCP
- DeviceNet
- Profibus DP

If interested in learning more about the RUI/GTW download the RUI/Gateway User Manual by pointing your browser to:
http://www.watlow.com/literature/pti_search.cfm?dltype=5

Once there move to the bottom of the page and enter EZ-ZONE into the Keyword field and then click the search button.

Modbus RTU & Modbus TCP Protocols

All Modbus registers are 16-bits and as displayed in this manual are relative addresses (actual). Some legacy software packages limit available Modbus registers to 40001 to 49999 (5 digits). Many applications today require access to all available Modbus registers which range from 400001 to 465536 (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 19 (instance 1, Map 1) and register 360 (instance 1, Map 2). Because this parameter is a float instance 1 Map 1 is actually represented by registers 19 (low order bytes) and 20 (high order bytes), likewise, instance 1 Map 2 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 [lohi] to high/low [hilo].

Note:
With the release of firmware revision 3.00 and above new capabilities (phase angle control, user programmable memory blocks, etc...) where introduced into this product line. With the introduction of these new capabilities there was a repacking of Modbus registers. Notice in the column identified as Modbus the reference to Map 1 and Map 2 registers for each of the various parameters. If the new capabilities are to be used, be certain to select Map 2 Modbus registers. If the new functions of this product line are not to be used, Map 1 (legacy ST controls) Modbus registers will be sufficient. The Modbus register mapping [map] can be changed in the Setup Page under the [map] Menu. This setting will apply across the control.

It should also be noted that some of the cells in the Modbus column as well as the RUI/GTW Modbus column contain wording pertaining to an offset. Several parameters in the control contain more than one instance; such as, profiles (4), alarms (2), analog inputs (2), etc... The Modbus register shown always represents instance one. Take for example the Step Type [styp] parameter found in the Profile Page. Instance one, Map 1, is shown as address 500 and +20 is identified as the offset to the next instance. If there was a desire to read or write to instance 3 simply add 40 to 500 to find its address. In this case, the instance 3 address for Step Type is 540.

The ST control, when equipped with Modbus has user programmable memory blocks. To learn more about this feature click on the link or turn to the Features section and look for the section entitled “Modbus - User Programmable Memory Blocks”.

Data Types Used with Modbus

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>unsigned</td>
<td>= Unsigned 16 bit integer</td>
</tr>
<tr>
<td>signed</td>
<td>= Signed 16-bit</td>
</tr>
<tr>
<td>float</td>
<td>= Float, IEEE 754 32-bit</td>
</tr>
<tr>
<td>long</td>
<td>= 32 bit unsigned integer</td>
</tr>
<tr>
<td>sint</td>
<td>= Signed 8 bits , byte</td>
</tr>
</tbody>
</table>

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

Common Industrial Protocol (CIP)

DeviceNet & Ethernet/IP

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

The ST control has a feature that allows for implicit messaging when used in conjunction with an RUI/GTW equipped with a DeviceNet or EtherNet/IP card. To learn more about this feature click on the link or turn to the Features section and look for the section entitled “CIP - Communications Capabilities”.

Watlow EZ-ZONE® ST • 28 • Chapter 2 Install and Wire
Data Types Used with CIP

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>uint</td>
<td>Unsigned 16 bit integer</td>
</tr>
<tr>
<td>int</td>
<td>Signed 16-bit</td>
</tr>
<tr>
<td>dint</td>
<td>Signed 32-bits, long</td>
</tr>
<tr>
<td>real</td>
<td>Float, IEEE 754 32-bit</td>
</tr>
<tr>
<td>string</td>
<td>ASCII, 8 bits per character</td>
</tr>
<tr>
<td>sint</td>
<td>Signed 8 bits, byte</td>
</tr>
</tbody>
</table>

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

Profibus DP

To accommodate for Profibus DP addressing the following menus contain a column identified as Profibus Index. Data types used in conjunction with Profibus DP can be found in the table below. For more information pertaining to the use of this protocol with the ST control download the RUI/Gateway User Manual by pointing your browser to:


Once there move to the bottom of the page and enter EZ-ZONE into the Keyword field and then click the search button.

Data Types Used with Profibus DP

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word</td>
<td>Unsigned 16 bit</td>
</tr>
<tr>
<td>INT</td>
<td>Signed 16-bit Integer</td>
</tr>
<tr>
<td>dint</td>
<td>Signed 32-bit Integer</td>
</tr>
<tr>
<td>REAL</td>
<td>Float, IEEE 754 32-bit</td>
</tr>
<tr>
<td>CHAR</td>
<td>ASCII, 8 bits per character</td>
</tr>
<tr>
<td>BYTE</td>
<td>8 bits</td>
</tr>
</tbody>
</table>

To learn more about the Profibus DP protocol point your browser to [http://www.profibus.org](http://www.profibus.org)
Chapter 3: Operations Pages

Control Module Operation Page Parameters

To go to the Operations Page from the Home Page, press both the Up ø and Down ø keys for three seconds. œ will appear in the upper display and œ will appear in the lower display.

- Press the Up ø or Down ø 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 ø or Down ø key to select and then press the Advance Key ‼ to enter.
- Press the Infinity Key ð for two seconds to return to the Home Page.
- Press and hold the Infinity Key ð for two seconds to return to the Home Page.

```
    Analog Input Menu
     R  Analog Input 1
     Rn Process Value
     Fr Error Status
     Fr Calibration Offset
```

```
    Digital Input/Output Menu
     d  Digital Input/Output 1
     ds Output State
     ds Event State
```

```
    Limit Menu
     L  Limit 1
     Ls Low Set Point
     Lh High Set Point
```

```
    Monitor Menu
     M  Monitor 1
     Mf Control Mode Active
     Mf Heat Power
     Mf Cool Power
     Ms Closed Loop Working Set Point
     Mf Process Value Active
```

```
    Loop Menu
     L  Loop 1
     Lf Control Mode
     Ls Autotune Set Point
     Lv Autotune Request
     Ls Closed Loop Set Point
     Ls Idle Set Point
     hpb Heat Proportional Band
     hy Heat Hysteresis
     lpb Cool Proportional Band
```

```
    Cool Hysteresis
    k  Time Integral
    k  Time Derivative
    db Dead Band
    osp Open Loop Set Point
```

```
    Alarm Menu
     ALM Alarm 1
     ALM Low Set Point
     ALM High Set Point
```

```
    Current Menu
     Cur Current 1
     Cur High Set Point
     Cur Low Set Point
     Cur Read
     Cer Error
     hcer Heater Error
```

```
    Profile Status Menu
     Psr Profile Status 1
     Psr Profile Start
     Psr Profile Request
     Sp Active Step
     Sp Active Step Type
     Lsp Target Set Point Loop 1
     Lsp Produced Set Point 1
     hour Hours Remaining
     min Minutes Remaining
     sec Seconds Remaining
     eko Active Event Output 1
     enk Active Event Output 2
     jk Jump Count Remaining
```

Watlow EZ-ZONE® ST • 30 • Chapter 3 Operations Page
### Analog Input Menu

<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 Instance Attribute hex (dec)</th>
<th>Pro DP Index</th>
<th>Par ID</th>
<th>RUI/GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Analog Input (1 to 2) Process Value</td>
<td>View the process value.</td>
<td>-1,999.000 to 9,999.000°F or units</td>
<td>0x68(104)</td>
<td>1 to 2 1</td>
<td></td>
<td>0</td>
<td>4001</td>
<td>Inst. 1</td>
<td>360</td>
</tr>
<tr>
<td>[Ain]</td>
<td></td>
<td></td>
<td>-1,128.000 to 5,537.000°C</td>
<td></td>
<td>360</td>
<td></td>
<td></td>
<td></td>
<td>Inst. 2</td>
<td>520</td>
</tr>
<tr>
<td>No Display</td>
<td>Analog Input (1 to 2) Filtered Process Value</td>
<td>View the filtered process value.</td>
<td>-1,999.000 to 9,999.000°F or units</td>
<td>0x68(104)</td>
<td>1 to 2 2</td>
<td></td>
<td>0</td>
<td>4022</td>
<td>Inst. 1</td>
<td>402</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-1,128.000 to 5,537.000°C</td>
<td></td>
<td>402</td>
<td></td>
<td></td>
<td></td>
<td>Inst. 2</td>
<td>562</td>
</tr>
<tr>
<td>No Display</td>
<td>Analog Input (1) Ambient Temperature</td>
<td>View ambient temperature.</td>
<td>-1,999.000 to 9,999.000°F or units</td>
<td>0x68(104)</td>
<td>1 to 2 4</td>
<td></td>
<td>0</td>
<td>4004</td>
<td>Inst. 1</td>
<td>402</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-1,128.000 to 5,537.000°C</td>
<td></td>
<td>400</td>
<td></td>
<td></td>
<td></td>
<td>Inst. 2</td>
<td>562</td>
</tr>
<tr>
<td>-</td>
<td>Analog Input (1 to 2) Error Status</td>
<td>View the cause of the most recent error. If the message is ( \text{Error} 1 ) or ( \text{Error} 2 ), this parameter will display the cause of the input error.</td>
<td>None (61) Open (65) Shorted (127) Measurement Error (149) Bad Calibration Data (139) Ambient Error (9) RTD Error (141) Fail (32) Not Sourced (146) None</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>4002</td>
<td>Inst. 1</td>
<td>362</td>
</tr>
<tr>
<td>[i.Er]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>41</td>
<td></td>
<td></td>
<td></td>
<td>Inst. 2</td>
<td>522</td>
</tr>
<tr>
<td>No Display</td>
<td>Analog Input (1) Clear Latched Input Error</td>
<td>Clear latched input.</td>
<td>Clear (0) No Change (255)</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>4029</td>
<td>Inst. 1</td>
<td>416</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>68</td>
<td></td>
<td></td>
<td></td>
<td>Inst. 2</td>
<td>542</td>
</tr>
<tr>
<td>-</td>
<td>Analog Input (1 to 2) Calibration Offset</td>
<td>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.</td>
<td>-1,999.000.000 to 9,999.000°F or units</td>
<td>0x68(104)</td>
<td>1 to 2 2</td>
<td></td>
<td>0</td>
<td>4012</td>
<td>Inst. 1</td>
<td>382</td>
</tr>
<tr>
<td>[i.CA]</td>
<td></td>
<td></td>
<td>-1,110.555 to 5,555.000°C</td>
<td></td>
<td>51</td>
<td></td>
<td></td>
<td></td>
<td>Inst. 2</td>
<td>542</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.

If there is only one instance of a menu, no submenus will appear.
<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)</th>
<th>Pro DP Index</th>
<th>Par ID</th>
<th>RU/GTW Mod &amp; Read/Write</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</td>
<td>View the state of this output.</td>
<td>Off (62)</td>
<td>On (63)</td>
<td><strong>Instance 1</strong> Map 1 Map 2 175 1072 <strong>Instance 2</strong> Map 1 Map 2 188 1102</td>
<td>0x6A (106) 5 to 6 7</td>
<td>90</td>
<td>6007</td>
<td>Inst. 5 1012</td>
</tr>
<tr>
<td></td>
<td>Digital Input (5 to 6) Event Status</td>
<td>View this event input state.</td>
<td>Off (62)</td>
<td>On (63)</td>
<td><strong>Instance 1</strong> Map 1 Map 2 32 1298 <strong>Instance 2</strong> Map 1 Map 2 33 1318</td>
<td>0x6E (110) 1 to 2 5</td>
<td>140</td>
<td>10005</td>
<td>Inst. 1 1408</td>
</tr>
<tr>
<td>Limit Menu</td>
<td>Limit (1) Low Set Point</td>
<td>Set the low process value that will trigger the limit.</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><strong>Instance 1</strong> Map 1 Map 2</td>
<td>0x70 (112) 1 3</td>
<td>38</td>
<td>12003</td>
<td>Inst. 1 684</td>
</tr>
<tr>
<td></td>
<td>Limit (1) High Set Point</td>
<td>Set the high process value that will trigger the limit.</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><strong>Instance 1</strong> Map 1 Map 2</td>
<td>0x70 (112) 1 4</td>
<td>39</td>
<td>12004</td>
<td>Inst. 1 686</td>
</tr>
<tr>
<td></td>
<td>Limit (1) Limit Status</td>
<td>Clear limit once limit condition is cleared.</td>
<td>Safe (1667) Fail (32)</td>
<td>- - - -</td>
<td><strong>Instance 1</strong> Map 1 Map 2</td>
<td>- - - - 744</td>
<td>- - - -</td>
<td>- - - -</td>
<td>Inst. 1 - - - -</td>
</tr>
<tr>
<td></td>
<td>Limit (1) Output Value</td>
<td>Current state of limit output.</td>
<td>Off (62) On (63)</td>
<td>- - - -</td>
<td><strong>Instance 1</strong> Map 1 Map 2</td>
<td>- - - - 732</td>
<td>0x70 (112) 1 7</td>
<td>- - - -</td>
<td>Inst. 1 - - - -</td>
</tr>
<tr>
<td></td>
<td>Limit (1) Limit State</td>
<td>Clear limit once limit condition is cleared.</td>
<td>Off (62) None (61) Limit High (51) Limit Low (52) Error (225)</td>
<td>- - - -</td>
<td><strong>Instance 1</strong> Map 1 Map 2</td>
<td>0x70 (112) 1 6</td>
<td>- - - -</td>
<td>- - - -</td>
<td>Inst. 1 690</td>
</tr>
<tr>
<td></td>
<td>Limit (1) Limit Clear Request</td>
<td>Clear limit once limit condition is cleared.</td>
<td>Clear (0) No Change (255)</td>
<td>- - - -</td>
<td><strong>Instance 1</strong> Map 1 Map 2</td>
<td>0x70 (112) 1 1</td>
<td>- - - -</td>
<td>- - - -</td>
<td>Inst. 1 680</td>
</tr>
<tr>
<td>Monitor Menu</td>
<td>Monitor (1) Control Mode Active</td>
<td>View the current control mode.</td>
<td>Off (62)</td>
<td>Auto (10) Manual (54)</td>
<td><strong>Instance 1</strong> Map 1 Map 2</td>
<td>0x97 (151) 1 2</td>
<td>- - - -</td>
<td>8002</td>
<td>Inst. 1 1880</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.

If there is only one instance of a menu, no submenus will appear.
### 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 DP Index</th>
<th>Par ID</th>
<th>RU/GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="hPr" /> <img src="image" alt="h.Pr" /></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 2 236 1774</td>
<td>0x97 (151) 1 0xD (13)</td>
<td>- - - - -</td>
<td>8011</td>
<td>Inst. 1</td>
<td>float R</td>
</tr>
<tr>
<td><img src="image" alt="CPr" /> <img src="image" alt="C.Pr" /></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 2 242 1776</td>
<td>0x97 (151) 1 0xE (14)</td>
<td>- - - - -</td>
<td>8014</td>
<td>Inst. 1</td>
<td>float R</td>
</tr>
<tr>
<td><img src="image" alt="CSP" /> <img src="image" alt="C.SP" /></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</td>
<td>0x97 (108) 1 0x1D (29)</td>
<td>- - - - -</td>
<td>8029</td>
<td>Inst. 1</td>
<td>float R</td>
</tr>
<tr>
<td><img src="image" alt="PvR" /> <img src="image" alt="Pv.R" /></td>
<td>Monitor (1) Process Value Active View the active process value.</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 19</td>
<td>0x97 (108) 1 0x1F (31)</td>
<td>- - - - -</td>
<td>8031</td>
<td>Inst. 1</td>
<td>float R</td>
</tr>
</tbody>
</table>

#### Loop Menu

| ![CM](image) ![C.M](image) | Control Loop (1) Control Mode Select the method that this loop will use to control. | ![off](image) Off (62) ![AUto](image) Auto (10) ![Man](image) Manual (54) | Auto | Instance 1 Map 1 Map 2 221 1750 | 0x97 (151) 1 1 | 63 | 8001 | Inst. 1 | uint RWES |
| ![AdSP](image) ![A.tSP](image) | Control Loop (1) Autotune Set Point Set the set point that the autotune will use, as a percentage of the current set point. | 50.0 to 200.0% | 90.0 | Instance 1 Map 1 Map 2 260 1788 | 0x97 (151) 1 0x14 (20) | - - - - - | 8025 | Inst. 1 | float RWES |
| ![AtU](image) ![AUt](image) | Control Loop (1) Autotune Request Start an autotune. While the autotune is active, the Home Page will display ![Attn](image) ![tUn1](image) When the autotune is complete, the message will clear automatically. | ![No](image) No ![Yes](image) Yes | No | Instance 1 Map 1 Map 2 262 1790 | 0x97 (151) 1 0x15 (21) | 64 | 8026 | Inst. 1 | uint RW |
| ![CSP](image) ![C.SP](image) | Control Loop (1) Closed Loop Set Point Set the set point that the controller will automatically control. | Low Set Point to High Set Point (Setup Page) | 75.0°F or units 24.0°C | Instance 1 Map 1 Map 2 21 1890 | 0x6B (107) 1 1 | 49 | 7001 | Inst. 1 | float RWES |
| ![idS](image) ![id.S](image) | Control Loop (1) Idle Set Point Set a closed loop set point that can be triggered by an event state. | Low Set Point to High Set Point (Setup Page) | 75.0°F or units 24.0°C | Instance 1 Map 1 Map 2 207 1906 | 0x6B (107) 1 1 | 50 | 7009 | Inst. 1 | float 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.
### 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 DP Index</th>
<th>Par ID</th>
<th>RU/GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ hPb</td>
<td>Control Loop (1)</td>
<td></td>
<td></td>
<td></td>
<td>Instance 1</td>
<td></td>
<td></td>
<td>Inst. 1</td>
<td>float RWES</td>
</tr>
<tr>
<td>[ h.Pb]</td>
<td>Heat Proportional Band</td>
<td>0.001 to 9,999.000°F or units, -110.555 to 5,555,000°C</td>
<td>25.0°F or units 14.0°C</td>
<td>Instance 1</td>
<td>Map 1 Map 2</td>
<td>0x97 (151)</td>
<td>1 6</td>
<td>8009</td>
<td>Inst. 1</td>
</tr>
<tr>
<td>□ hY</td>
<td>Control Loop (1)</td>
<td></td>
<td></td>
<td></td>
<td>Instance 1</td>
<td></td>
<td></td>
<td>Inst. 1</td>
<td>float RWES</td>
</tr>
<tr>
<td>[ h.Y]</td>
<td>Heat Hysteresis</td>
<td>0.001 to 9,999.000°F or units, -110.555 to 5,555,000°C</td>
<td>3.0°F or units 2.0°C</td>
<td>Instance 1</td>
<td>Map 1 Map 2</td>
<td>0x97 (151)</td>
<td>1 0xB (11)</td>
<td>8010</td>
<td>Inst. 1</td>
</tr>
<tr>
<td>□ Cpb</td>
<td>Control Loop (1)</td>
<td></td>
<td></td>
<td></td>
<td>Instance 1</td>
<td></td>
<td></td>
<td>Inst. 1</td>
<td>float RWES</td>
</tr>
<tr>
<td>[ c.Pb]</td>
<td>Cool Proportional Band</td>
<td>0.001 to 9,999.000°F or units, -110.555 to 5,555,000°C</td>
<td>25.0°F or units 14.0°C</td>
<td>Instance 1</td>
<td>Map 1 Map 2</td>
<td>0x97 (151)</td>
<td>1 7</td>
<td>8012</td>
<td>Inst. 1</td>
</tr>
<tr>
<td>□ cY</td>
<td>Control Loop (1)</td>
<td></td>
<td></td>
<td></td>
<td>Instance 1</td>
<td></td>
<td></td>
<td>Inst. 1</td>
<td>float RWES</td>
</tr>
<tr>
<td>[ c.Y]</td>
<td>Cool Hysteresis</td>
<td>0.001 to 9,999.000°F or units, -110.555 to 5,555,000°C</td>
<td>3.0°F or units 2.0°C</td>
<td>Instance 1</td>
<td>Map 1 Map 2</td>
<td>0x97 (151)</td>
<td>1 0xC (12)</td>
<td>8013</td>
<td>Inst. 1</td>
</tr>
<tr>
<td>□ t</td>
<td>Control Loop (1)</td>
<td></td>
<td></td>
<td></td>
<td>Instance 1</td>
<td></td>
<td></td>
<td>Inst. 1</td>
<td>float RWES</td>
</tr>
<tr>
<td>[ t]</td>
<td>Time Integral</td>
<td>0 to 9,999 seconds per repeat</td>
<td>180.0 seconds per repeat</td>
<td>Instance 1</td>
<td>Map 1 Map 2</td>
<td>0x97 (151)</td>
<td>1 8</td>
<td>8006</td>
<td>Inst. 1</td>
</tr>
<tr>
<td>□ t</td>
<td>Control Loop (1)</td>
<td></td>
<td></td>
<td></td>
<td>Instance 1</td>
<td></td>
<td></td>
<td>Inst. 1</td>
<td>float RWES</td>
</tr>
<tr>
<td>[ td]</td>
<td>Time Derivative</td>
<td>0 to 9,999 seconds</td>
<td>0.0 seconds</td>
<td>Instance 1</td>
<td>Map 1 Map 2</td>
<td>0x97 (151)</td>
<td>1 9</td>
<td>8007</td>
<td>Inst. 1</td>
</tr>
<tr>
<td>□ db</td>
<td>Control Loop (1)</td>
<td></td>
<td></td>
<td></td>
<td>Instance 1</td>
<td></td>
<td></td>
<td>Inst. 1</td>
<td>float RWES</td>
</tr>
<tr>
<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</td>
<td>Map 1 Map 2</td>
<td>0x97 (151)</td>
<td>1 0xA (10)</td>
<td>8008</td>
<td>Inst. 1</td>
</tr>
<tr>
<td>□ aSp</td>
<td>Control Loop (1)</td>
<td></td>
<td></td>
<td></td>
<td>Instance 1</td>
<td></td>
<td></td>
<td>Inst. 1</td>
<td>float RWES</td>
</tr>
<tr>
<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</td>
<td>Map 1 Map 2</td>
<td>0x6B (107)</td>
<td>1 2</td>
<td>7002</td>
<td>Inst. 1</td>
</tr>
</tbody>
</table>

No Display

- **Control Loop (1)**
  - **Loop Error**
    - Open Loop (1274)
    - Reversed Sensor (1275)
- **Control Loop (1)**
  - **Clear Loop Error**
    - Clear (129)
    - Ignore (204)

**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.**
<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 DP Index</th>
<th>Par ID</th>
<th>RU/ GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>![ALM] A.Lo</td>
<td>Alarm (1 to 2) Low Set Point</td>
<td>-1,999.00 to 9,999.000°F or units -1,128.00 to 5,537.000°C</td>
<td>32.0°F or units 0.0°C</td>
<td>Instance 1 Map 1 Map 2 99 1452</td>
<td>Instance 2 Map 1 Map 2 115 1512</td>
<td>0x6D (109) 1 to 2 2</td>
<td>18</td>
<td>9002</td>
<td>Inst. 1 1482</td>
</tr>
<tr>
<td>![ALM] A.hi</td>
<td>Alarm (1 to 2) High Set Point</td>
<td>-1,999.00 to 9,999.000°F or units -1,128.00 to 5,537.000°C</td>
<td>300.0°F or units 150.0°C</td>
<td>Instance 1 Map 1 Map 2 97 1450</td>
<td>Instance 2 Map 1 Map 2 113 1510</td>
<td>0x6D (109) 1 to 2 1</td>
<td>19</td>
<td>9001</td>
<td>Inst. 1 1480</td>
</tr>
<tr>
<td>![ALM]</td>
<td>Alarm (1 to 2) 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 29 1466</td>
<td>Instance 2 Map 1 Map 2 30 1526</td>
<td>0x6D (109) 1 to 2 9</td>
<td>- - -</td>
<td>9009</td>
<td>Inst. 1 1496</td>
</tr>
<tr>
<td>![ALM]</td>
<td>Alarm (1 to 2) Alarm Clearable</td>
<td>No (59) Yes (106)</td>
<td>None</td>
<td>Instance 1 Map 1 Map 2 - - - 1472</td>
<td>Instance 2 Map 1 Map 2 - - - 1532</td>
<td>0x6D (109) 1 to 2 0xC (12)</td>
<td>- - -</td>
<td>9012</td>
<td>Inst. 1 1502</td>
</tr>
<tr>
<td>![ALM]</td>
<td>Alarm (1 to 2) Alarm Clear Request</td>
<td>Clear (0) No Change (255)</td>
<td>None</td>
<td>Instance 1 Map 1 Map 2 108 1474</td>
<td>Instance 2 Map 1 Map 2 124 1534</td>
<td>0x6D (109) 1 to 2 0xD (13)</td>
<td>32</td>
<td>9013</td>
<td>Inst. 1 1504</td>
</tr>
<tr>
<td>![ALM]</td>
<td>Alarm (1 to 2) Alarm Silence Request</td>
<td>Clear (0) No Change (255)</td>
<td>None</td>
<td>Instance 1 Map 1 Map 2 109 1476</td>
<td>Instance 2 Map 1 Map 2 125 1536</td>
<td>0x6D (109) 1 to 2 0xE (14)</td>
<td>33</td>
<td>9014</td>
<td>Inst. 1 1506</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.

If there is only one instance of a menu, no submenus will appear.
### 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 DP Index</th>
<th>Par ID</th>
<th>RUI/ GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Display</td>
<td>Alarm (1 to 2)</td>
<td>Yes (106)</td>
<td>Instance 1</td>
<td>1500 1900</td>
<td>0x6D (109) 1 to 4 0x0B (11)</td>
<td>- - -</td>
<td>9011</td>
<td>Inst. 1</td>
<td>1500</td>
</tr>
<tr>
<td>No Display</td>
<td>Alarm Silenced</td>
<td>No (59)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Inst. 2</td>
</tr>
<tr>
<td>No Display</td>
<td>Alarm Latched</td>
<td>Yes (106)</td>
<td>Instance 1</td>
<td>1498 1898</td>
<td>0x6D (109) 1 to 4 0x0A (10)</td>
<td>- - -</td>
<td>9010</td>
<td>Inst. 1</td>
<td>1498</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No (59)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Inst. 2</td>
</tr>
<tr>
<td>Current Menu</td>
<td>Current (1) High Set Point</td>
<td>-1,999.000 to 9,999.000</td>
<td>50.0</td>
<td>Instance 1</td>
<td>286 1254</td>
<td>0x73 (115) 1 8</td>
<td>- - -</td>
<td>15008</td>
<td>Inst. 1</td>
</tr>
<tr>
<td></td>
<td>Current (1) Low Set Point</td>
<td>-1,999.000 to 9,999.000</td>
<td>0.0</td>
<td>Instance 1</td>
<td>288 1256</td>
<td>0x73 (115) 1 9</td>
<td>- - -</td>
<td>15009</td>
<td>Inst. 1</td>
</tr>
<tr>
<td></td>
<td>Current (1) Read</td>
<td>-1,999.000 to 9,999.000</td>
<td></td>
<td>Instance 1</td>
<td>38 1240</td>
<td>0x73 (115) 1 1</td>
<td>- - -</td>
<td>15001</td>
<td>Inst. 1</td>
</tr>
<tr>
<td></td>
<td>Current (1) SSR Error</td>
<td>None (61)</td>
<td>None</td>
<td>Instance 1</td>
<td>40 1242</td>
<td>0x73 (115) 1 2</td>
<td>- - -</td>
<td>15002</td>
<td>Inst. 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shorted (127)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Inst. 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Open (65)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Inst. 1</td>
</tr>
<tr>
<td></td>
<td>Current (1) Heater Error</td>
<td>None (61)</td>
<td>None</td>
<td>Instance 1</td>
<td>282 1244</td>
<td>0x73 (115) 1 3</td>
<td>- - -</td>
<td>15003</td>
<td>Inst. 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High (37)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Inst. 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low (53)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Inst. 1</td>
</tr>
<tr>
<td>No Display</td>
<td>Error Status</td>
<td>None (61)</td>
<td></td>
<td>Instance 1</td>
<td>1160 1400</td>
<td>0x73 (115) 1 21</td>
<td>- - -</td>
<td>15021</td>
<td>Inst. 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fail (32)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Inst. 1</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.

If there is only one instance of a menu, no submenus will appear.
## 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 hex (dec)</th>
<th>Pro DP Index</th>
<th>Par ID</th>
<th>RU/GTWModbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P5E•r</strong></td>
<td>Profile Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>[P:Str]</strong></td>
<td><strong>Profile Start</strong></td>
<td>1 to 40</td>
<td>1</td>
<td></td>
<td></td>
<td>204</td>
<td>22001</td>
<td></td>
<td>uint RWE</td>
</tr>
<tr>
<td><strong>PAC•r</strong></td>
<td><strong>Action Request</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>[PACr]</strong></td>
<td><strong>Profile Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SEP•r</strong></td>
<td><strong>Active Step</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>[SEP]</strong></td>
<td><strong>Profile Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SYP•r</strong></td>
<td><strong>Active Step Type</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>[S:typ]</strong></td>
<td><strong>Profile Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EsP•r</strong></td>
<td><strong>Profile Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>[tag:SP]</strong></td>
<td><strong>Target Set Point Loop 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PsP•r</strong></td>
<td><strong>Produced Set Point 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>hour•r</strong></td>
<td><strong>Hours Remaining</strong></td>
<td>0 to 99</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Min•r</strong></td>
<td><strong>Minutes Remaining</strong></td>
<td>0 to 59</td>
<td>0.0</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.
- If there is only one instance of a menu, no submenus will appear.

*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.

---

**Profile Status Menu**

- **Relative Address**
- **Class**
- **Instance**
- **Attribute**
- **hex (dec)**
- **Index**
- **Par ID**
- **RU/GTWModbus**
- **Data Type Read/Write**

**Profile Status**

- **Profile Start**
- **Profile Index**
- **Profile**
- **Map**
- **Profile ID**
- **Offset**
- **Response Type**

**Active Step**

- **Instance**
- **Map**
- **Profile ID**
- **Offset**
- **Response Type**

**Active Step Type**

- **Instance**
- **Map**
- **Profile ID**
- **Offset**
- **Response Type**

**Target Set Point Loop 1**

- **Current Set Point**
- **Target Set Point**
- **Units**
- **Real-Time**

**Produced Set Point 1**

- **Current Set Point**
- **Target Set Point**
- **Units**
- **Real-Time**
<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 Instance Attribute hex (dec)</th>
<th>Pro DP Index</th>
<th>Par ID</th>
<th>RU/ GTW Modbus</th>
<th>Data Type &amp; Read/ Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>[SE]</td>
<td>Profile Status</td>
<td>Seconds Remaining</td>
<td>0 to 59</td>
<td>0.0</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x7A (122) 1 2</td>
<td>- - - -</td>
<td>22076</td>
<td>- - - -</td>
<td>- - - -</td>
</tr>
<tr>
<td>No Display</td>
<td>Profile Status</td>
<td>Profile State</td>
<td>Off (62) Running (149) Pause (146)</td>
<td>Off</td>
<td>Instance 1 Map 1 Map 2 294 3802</td>
<td>22002 Inst. 1 2902 Offset + 80</td>
<td>init R</td>
<td></td>
<td>R: Read W: Write E: EE PROM S: User Set</td>
<td></td>
</tr>
<tr>
<td>No Display</td>
<td>Profile Status</td>
<td>Active File</td>
<td>0 to 4 0</td>
<td>0</td>
<td>Instance 1 Map 1 Map 2 295 3804</td>
<td>22003 Inst. 1 2904 Offset + 80</td>
<td>init R</td>
<td></td>
<td>R: Read W: Write E: EE PROM S: User Set</td>
<td></td>
</tr>
<tr>
<td>No Display</td>
<td>Profile Status</td>
<td>Total Step Time Remaining</td>
<td>0.0 to 9999.000</td>
<td>0.0</td>
<td>Instance 1 Map 1 Map 2 303 3816</td>
<td>22009 Inst. 1 2916 Offset + 80</td>
<td>float RW</td>
<td></td>
<td>R: Read W: Write E: EE PROM S: User Set</td>
<td></td>
</tr>
<tr>
<td>[En]</td>
<td>Profile Status</td>
<td>*Active Event Output 1</td>
<td>Off (62) On (63)</td>
<td>Off</td>
<td>Instance 1 Map 1 Map 2 303 3816</td>
<td>22014 Inst. 1 2926 Offset + 80</td>
<td>usint RW</td>
<td></td>
<td>R: Read W: Write E: EE PROM S: User Set</td>
<td></td>
</tr>
<tr>
<td>[En]</td>
<td>Profile Status</td>
<td>*Active Event Output 2</td>
<td>Off (62) On (63)</td>
<td>Off</td>
<td>Instance 1 Map 1 Map 2 305 3818</td>
<td>22015 Inst. 1 2928 Offset + 80</td>
<td>usint RW</td>
<td></td>
<td>R: Read W: Write E: EE PROM S: User Set</td>
<td></td>
</tr>
<tr>
<td>[JC]</td>
<td>Profile Status</td>
<td>Jump Count Remaining</td>
<td>0 to 9,999</td>
<td>0</td>
<td>Instance 1 Map 1 Map 2 305 3818</td>
<td>22010 Inst. 1 2918 Offset + 80</td>
<td>uint R</td>
<td></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.

If there is only one instance of a menu, no submenus will appear.
Chapter 4: Setup Pages

Control Module Setup Page Parameters

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.
- Press the Up or Down key to move through available menu prompts.
- Press the Infinity Key to move backwards through the levels: parameter to submenu; submenu to menu; menu to Home Page.

Press and hold the Infinity Key for two seconds to return to the Home Page.

Digital Input/Output Menu

Analog Input Menu

Limit Menu

Control Loop Menu

Alarm 1 (to 2)

Type

Source

Instance

Hysteresis

Logic

Sides

Blocking

Silencing

Display

Delay

Gain

Peltier Delay

User Failure Action

Input Error Failure

Manual Power

Open Loop Detect Enable

Open Loop Detect Time

Open Loop Detect Deviation

Ramp Action

Ramp Scale

Ramp Rate

High Power Scale

Open Loop Detect Deviation

Ramp Scale

Ramp Rate

High Power Scale

Process Error Enable

Process Error Low

Error Latching

Filter

Direction

Output Function

Function Instance

Control

Time Base

Active Level

Function Instance

Output (1 to 4)

Function Instance

Function

Output Function

Function Instance

Output Function

Function Instance

Set Point Limit High

Hysteresis

Set Point Limit High

Set Point Limit Low

Limit Integrate

Heat Algorithm

Cool Algorithm

Sides

Profile Start Type

Guaranteed Soak Enable

Guaranteed Soak Deviation

Display Pairs

User Settings Save

User Settings Restore

Communications Menu

Modbus Address

Baud Rate

Parity

Modbus Word Order

Display Units

Data Map

Non-Volatile Save

Watlow EZ-ZONE® ST  •  39  •  Chapter 4 Setup Page
To go to the Setup Page from the Home Page, press both the Up 和 Down keys for six seconds. 将会出现在上显示屏和 将会出现在下显示屏。

- Press the Up 或 Down key to move through the menus.
- Press the Advance Key to move to a submenu.
- Press the Up 或 Down key to move through the submenus.
- Press the Advance Key to move through the parameters of the menu or submenu.

### 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>Instance Attribute (hex (dec))</th>
<th>Pro DP Index</th>
<th>Par ID</th>
<th>RU/ GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>Off</td>
<td>Analog Input (1 to 2) Sensor Type</td>
<td></td>
<td></td>
<td>0x68 (104)</td>
<td></td>
<td>Instance 1</td>
<td>Map 1 Map 2</td>
<td>3</td>
<td>4005</td>
<td>Inst. 1 368 Inst. 2 528</td>
</tr>
<tr>
<td>E</td>
<td>Thermocouple</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Instance 2</td>
<td>Map 1 Map 2</td>
<td>4</td>
<td>4006</td>
<td>Inst. 1 370 Inst. 2 530</td>
<td>uint RWES</td>
</tr>
<tr>
<td>T</td>
<td>Millivolts</td>
<td></td>
<td>55</td>
<td></td>
<td></td>
<td>Instance 1</td>
<td>Map 1 Map 2</td>
<td>6</td>
<td>4007</td>
<td>Inst. 1 372 Inst. 2 532</td>
<td>uint RWES</td>
</tr>
<tr>
<td>L</td>
<td>Milliamps</td>
<td></td>
<td>104</td>
<td></td>
<td></td>
<td>Instance 2</td>
<td>Map 1 Map 2</td>
<td>7</td>
<td>4042</td>
<td>- - -</td>
<td>uint RWES</td>
</tr>
<tr>
<td>H</td>
<td>RTD 100 Ω</td>
<td></td>
<td>113</td>
<td></td>
<td>Instance 1</td>
<td>Map 1 Map 2</td>
<td>8</td>
<td>4043</td>
<td>- - -</td>
<td>uint RWES</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>RTD 1,000 Ω</td>
<td></td>
<td>114</td>
<td></td>
<td>Instance 2</td>
<td>Map 1 Map 2</td>
<td>- - -</td>
<td>- - -</td>
<td>- - -</td>
<td>uint RWES</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Off</td>
<td>Analog Input (1 to 2) RTD Leads</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>Instance 1</td>
<td>Map 1 Map 2</td>
<td>368</td>
<td>1 to 2</td>
<td>Inst. 1 368 Inst. 2 528</td>
<td>uint RWES</td>
</tr>
<tr>
<td>J</td>
<td>Off</td>
<td>Analog Input (1 to 2) Units</td>
<td></td>
<td></td>
<td></td>
<td>Instance 2</td>
<td>Map 1 Map 2</td>
<td>528</td>
<td>1 to 2</td>
<td>Inst. 1 368 Inst. 2 528</td>
<td>uint RWES</td>
</tr>
</tbody>
</table>

### Note:

- Press the Infinity Key to move backwards through the levels: parameter to submenu; submenu to menu; menu to Home Page.
- Press and hold the Infinity Key for two seconds to return to the Home Page.

R: Read
W: Write
E: EEPROM
S: User Set

Sometimes 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.
## 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>Pro DP Index</th>
<th>Par ID</th>
<th>RU/GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="S.Lo" /></td>
<td>Analog Input (1 to 2) Scale Low</td>
<td>-100.0 to 1,000.0</td>
<td>0.0</td>
<td>Instance 1</td>
<td>0x68 (104)</td>
<td>6</td>
<td>4015</td>
<td>Inst. 1 388</td>
<td>Inst. 2 548</td>
</tr>
<tr>
<td><img src="image2" alt="S.hi" /></td>
<td>Analog Input (1 to 2) Scale High</td>
<td>-100.0 to 1,000.0</td>
<td>20.0</td>
<td>Instance 1</td>
<td>0x68 (104)</td>
<td>7</td>
<td>4016</td>
<td>Inst. 1 390</td>
<td>Inst. 2 550</td>
</tr>
<tr>
<td><img src="image3" alt="r.Lo" /></td>
<td>Analog Input (1 to 2) Range Low</td>
<td>-1,999,000 to 9,999,000</td>
<td>0.0</td>
<td>Instance 1</td>
<td>0x68 (104)</td>
<td>8</td>
<td>4017</td>
<td>Inst. 1 392</td>
<td>Inst. 2 552</td>
</tr>
<tr>
<td><img src="image4" alt="r.hi" /></td>
<td>Analog Input (1 to 2) Range High</td>
<td>-1,999,000 to 9,999,000</td>
<td>9,999</td>
<td>Instance 1</td>
<td>0x68 (104)</td>
<td>9</td>
<td>4018</td>
<td>Inst. 1 394</td>
<td>Inst. 2 554</td>
</tr>
<tr>
<td><img src="image5" alt="P.EL" /></td>
<td>Analog Input (1 to 2) Process Error Enable</td>
<td>Off</td>
<td>Instance 1</td>
<td>0x68 (104)</td>
<td>10</td>
<td>4030</td>
<td>- - -</td>
<td>uint RWES</td>
<td></td>
</tr>
<tr>
<td><img src="image6" alt="P.EE" /></td>
<td>Analog Input (1 to 2) Process Error Low</td>
<td>Low</td>
<td>Instance 1</td>
<td>0x68 (104)</td>
<td>11</td>
<td>4031</td>
<td>- - -</td>
<td>float RWES</td>
<td></td>
</tr>
<tr>
<td><img src="image7" alt="FiL" /></td>
<td>Analog Input (1 to 2) Filter</td>
<td>0.0 to 60.0 seconds</td>
<td>0.5</td>
<td>Instance 1</td>
<td>0x68 (104)</td>
<td>12</td>
<td>4014</td>
<td>Inst. 1 386</td>
<td>Inst. 2 546</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.
If there is only one instance of a menu, no submenus will appear.
## 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>Pro DP Index</th>
<th>Par ID</th>
<th>RU/ GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>Er</code>[i, Er]</td>
<td>Analog Input (1 to 2) Error Latching</td>
<td><code>OFF</code> Off (62) <code>ON</code> On (63)</td>
<td>Off</td>
<td><strong>Instance 1</strong> Map 1 Map 2 67 414 <strong>Instance 2</strong> Map 1 Map 2 95 504</td>
<td>0x68 (104) 1 to 2 0x1C (28)</td>
<td>- - - -</td>
<td>4028</td>
<td>Inst. 1 414</td>
<td>Inst. 2 574</td>
</tr>
<tr>
<td><code>EC</code>[dEC]</td>
<td>Analog Input (1 to 2) Display Precision</td>
<td><code>Whole</code> Whole (105) <code>Tenths</code> Tenths (94) <code>Hundredths</code> Hundredths (40) <code>Thousandths</code> Thousandths (96)</td>
<td>Whole</td>
<td><strong>Instance 1</strong> Map 1 Map 2 65 410 <strong>Instance 2</strong> Map 1 Map 2 93 500</td>
<td>0x68 (104) 1 to 2 0x14 (20)</td>
<td>- - - -</td>
<td>4020</td>
<td>Inst. 1 398</td>
<td>Inst. 2 558</td>
</tr>
<tr>
<td><code>A</code>[S.hA]</td>
<td>Analog Input (1 to 2) Sensor Backup</td>
<td><code>OFF</code> Off (62) <code>ON</code> On (63)</td>
<td>Off</td>
<td><strong>Instance 1</strong> Map 1 Map 2 65 410 <strong>Instance 2</strong> Map 1 Map 2 93 500</td>
<td>0x68 (104) 1 to 2 0x1A (26)</td>
<td>- - - -</td>
<td>4026</td>
<td>Inst. 1 410</td>
<td>Inst. 2 570</td>
</tr>
</tbody>
</table>

### Digital Input/Output Menu

| dir| Digital Input/Output (5 or 6) Direction | Output (68) | Input Voltage (193) | Output Dry Contact (44) | Output | **Instance 5** Map 1 Map 2 169 1060 **Instance 6** Map 1 Map 2 182 1090 | 0x6A (106) 5 to 6 1 | 82 | 6001 | Inst. 5 1000 | Inst. 6 1030 | Inst. 1000 RWES |
|Fn| Digital Output (5 or 6) Function | `OFF` Off (62) `Heat` Heat, Control Loop (36) `Cool` Cool, Control Loop (20) `Ent` Profile Event Out A (233) `Entb` Profile Event Out B (234) `Limit` Limit (126) `Alarm` Alarm (6) | 0x6A (106) 5 to 6 5 | 83 | 6005 | Inst. 5 1008 | Inst. 6 1068 |
|Fi| Digital Output (5 or 6) Function Instance | 1 or 2 | 1 | **Instance 5** Map 1 Map 2 174 1070 **Instance 6** Map 1 Map 2 187 1100 | 0x6A (106) 5 to 6 6 | 84 | 6006 | Inst. 5 1010 | Inst. 6 1040 |
|Ct| Digital Output (5 or 6) Control | `Fixed` Fixed Time Base (34) `Variable` Variable Time Base (103) | Fixed Time Base | **Instance 5** Map 1 Map 2 170 1062 **Instance 6** Map 1 Map 2 183 1092 | 0x6A (106) 5 to 6 2 | 85 | 6002 | Inst. 5 1002 | Inst. 6 1032 |

### 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.
<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</th>
<th>Par ID</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.b.</td>
<td>Digital Output (5 or 6) Time Base</td>
<td>0.1 for Fast and Bi-Directional outputs, 5.0 for Slow outputs to 60</td>
<td></td>
<td>Instance 5 Map 1 Map 2 171 1064 Instance 6 Map 1 Map 2 184 1094</td>
<td></td>
<td>86</td>
<td>6003</td>
<td>Inst. 5 1004 Inst. 6 1034</td>
</tr>
<tr>
<td>a.o.</td>
<td>Digital Output (5 or 6) Low Power Scale</td>
<td>0.0 to 100.0</td>
<td>0.0</td>
<td>Instance 5 Map 1 Map 2 178 1076 Instance 6 Map 1 Map 2 191 1106</td>
<td></td>
<td>87</td>
<td>6009</td>
<td>Inst. 5 1016 Inst. 6 1046</td>
</tr>
<tr>
<td>a.h.</td>
<td>Digital Output (5 or 6) High Power Scale</td>
<td>0.0 to 100.0</td>
<td>100.0</td>
<td>Instance 5 Map 1 Map 2 180 1078 Instance 6 Map 1 Map 2 193 1108</td>
<td></td>
<td>88</td>
<td>6010</td>
<td>Inst. 5 1018 Inst. 6 1048</td>
</tr>
<tr>
<td>L.E.</td>
<td>Digital Input (5 or 6) Level</td>
<td>High (37) Low (53)</td>
<td>High</td>
<td>Instance 5 Map 1 Map 2 264 1290 Instance 6 Map 1 Map 2 268 1310</td>
<td></td>
<td>137</td>
<td>10001</td>
<td>Inst. 5 1400 Inst. 6 1420</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.

If there is only one instance of a menu, no submenus will appear.

**Setup Page**

Watlow EZ-ZONE® ST • 43 • Chapter 4 Setup Page
### Digital Input (5)

**Function Instance**
Select which instance of the Event Function that will be triggered by a true state.

<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>Pro DP Index</th>
<th>Par ID</th>
<th>RUI/ GTW Mod-bus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>♂ ♂ ♂</td>
<td>Digital Input (5) Function Instance</td>
<td>0 to 4</td>
<td>0</td>
<td>Instance 1</td>
<td>Map 1 Map 2 267 1296</td>
<td>0x6E (110) 1 4</td>
<td>139</td>
<td>10004</td>
<td>Inst. 5 1406 Inst. 6 1426</td>
</tr>
</tbody>
</table>

### Limit Menu

#### Limit (1) Sides
Select which side or sides of the process value will be monitored.

<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>Pro DP Index</th>
<th>Par ID</th>
<th>RUI/ GTW Mod-bus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>♂ ♂ ♂</td>
<td>Limit (1) Sides</td>
<td>Both (13) High (37) Low (53)</td>
<td>Both</td>
<td>Instance 1</td>
<td>Map 1 Map 2 279 728</td>
<td>0x70 (112) 1 5</td>
<td>40</td>
<td>12005</td>
<td>Inst. 688</td>
</tr>
</tbody>
</table>

#### Limit (1) Hysteresis
Set the hysteresis for the limit function. This determines how far into the safe range the process value must move before the limit can be cleared.

<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>Pro DP Index</th>
<th>Par ID</th>
<th>RUI/ GTW Mod-bus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>♂ ♂ ♂</td>
<td>Limit (1) Hysteresis</td>
<td>0.001 to 9,999.000°F or units 0.001 to 5,555,000°C</td>
<td>3.0°F or units 2.0°C</td>
<td>Instance 1</td>
<td>Map 1 Map 2 273 722</td>
<td>0x70 (112) 1 2</td>
<td>41</td>
<td>12002</td>
<td>Inst. 682</td>
</tr>
</tbody>
</table>

### Control Loop Menu

#### Control Loop (1) Heat Algorithm
Set the heat control method.

<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>Pro DP Index</th>
<th>Par ID</th>
<th>RUI/ GTW Mod-bus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>♂ ♂ ♂</td>
<td>Control Loop (1) Heat Algorithm</td>
<td>Off (62) PID (71) On-Off (64)</td>
<td>PID</td>
<td>Instance 1</td>
<td>Map 1 Map 2 223 1754</td>
<td>0x97 (151) 1 3</td>
<td>72</td>
<td>8003</td>
<td>Inst. 1884</td>
</tr>
</tbody>
</table>

#### Control Loop (1) Cool Algorithm
Set the cool control method.

<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>Pro DP Index</th>
<th>Par ID</th>
<th>RUI/ GTW Mod-bus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>♂ ♂ ♂</td>
<td>Control Loop (1) Cool Algorithm</td>
<td>Off (62) PID (71) On-Off (64)</td>
<td>Off</td>
<td>Instance 1</td>
<td>Map 1 Map 2 224 1756</td>
<td>0x97 (151) 1 4</td>
<td>73</td>
<td>8004</td>
<td>Inst. 1886</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.
If there is only one instance of a menu, no submenus will appear.
<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 Attribute hex (dec)</th>
<th>Pro DP Index</th>
<th>Par ID</th>
<th>RU/GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td>Control Loop (1)</td>
<td>TRU-TUNE™ Enable</td>
<td>No (59)</td>
<td>No</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x97 (151) 1 10 (16)</td>
<td>- - - -</td>
<td>8022</td>
<td>1922</td>
<td>Inst. 1 uint RWES</td>
</tr>
<tr>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td>Control Loop (1)</td>
<td>TRU-TUNE™ Band</td>
<td>0 to 100</td>
<td>0</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x97 (151) 1 0x11 (17)</td>
<td>- - - -</td>
<td>8034</td>
<td>1946</td>
<td>Inst. 1 uint RWES</td>
</tr>
<tr>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td>Control Loop (1)</td>
<td>TRU-TUNE™ Gain</td>
<td>1 to 6</td>
<td>3</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x97 (151) 1 0x12 (18)</td>
<td>- - - -</td>
<td>8035</td>
<td>1948</td>
<td>Inst. 1 uint RWES</td>
</tr>
<tr>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td>Control Loop (1)</td>
<td>Autotune Aggressiveness</td>
<td>Under damped (99)</td>
<td>Critical</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x97 (151) 1 0x13 (19)</td>
<td>- - - -</td>
<td>8024</td>
<td>1926</td>
<td>Inst. 1 uint RWES</td>
</tr>
<tr>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td>Control Loop (1)</td>
<td>User Failure Action</td>
<td>Off (62)</td>
<td>User</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x6B (107) 1 0x1C (12)</td>
<td>- - - -</td>
<td>7012</td>
<td>2182</td>
<td>Inst. 1 uint RWES</td>
</tr>
<tr>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td>Control Loop (1)</td>
<td>Input Error Failure</td>
<td>Off (62)</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>2184</td>
<td>Inst. 1 uint 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.
- If there is only one instance of a menu, no submenus will appear.
## 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</th>
<th>Instance &amp; Attribute hex (dec)</th>
<th>Pro DP Index</th>
<th>Par ID</th>
<th>RU/GTW Modbus Address</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>[MAn]</td>
<td><strong>Control Loop (1)</strong> Manual Power</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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Set Point Open Loop Limit Low to Set Point Open Loop Limit High (Setup Page)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[L.dE]</td>
<td>Open Loop Detect Enable</td>
<td>Turn on the open-loop detect feature to monitor a closed-loop operation for the appropriate response.</td>
<td>No (59)</td>
<td></td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x97 (151) 1 0x16 (22)</td>
<td>74</td>
<td>8039</td>
<td></td>
<td>uint RWES</td>
</tr>
<tr>
<td>[L.dE]</td>
<td><strong>Open Loop Detect Time</strong></td>
<td>The Open Loop Detect Deviation value must occur for this time period to trigger an open-loop error.</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>75</td>
<td>8040</td>
<td></td>
<td>uint RWES</td>
</tr>
<tr>
<td>[L.dd]</td>
<td><strong>Open Loop Detect Deviation</strong></td>
<td>Set the value that the process must deviate from the set point to trigger an open-loop error.</td>
<td>-1,999.000 to 9,999.000°F or units</td>
<td>10.0°F or units</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x97 (151) 1 0x18 (24)</td>
<td>76</td>
<td>8041</td>
<td></td>
<td>float RWES</td>
</tr>
<tr>
<td>[L.dd]</td>
<td><strong>Control Loop (1) Ramp Action</strong></td>
<td>Select when the controller’s set point will ramp to the defined end set point.</td>
<td>Off (62)</td>
<td></td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x6B (107) 1 0xE (14)</td>
<td>56</td>
<td>7014</td>
<td>Inst. 1 2186</td>
<td>uint RWES</td>
</tr>
<tr>
<td>[L.d]</td>
<td><strong>Ramp Scale</strong></td>
<td>Select the scale of the ramp rate.</td>
<td>Hours (39)</td>
<td>Minutes (57)</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x6B (107) 1 0xF (15)</td>
<td>57</td>
<td>7015</td>
<td>Inst. 1 2188</td>
<td>uint RWES</td>
</tr>
<tr>
<td>[L.r]</td>
<td><strong>Ramp Rate</strong></td>
<td>Set the rate for the set point ramp.</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</td>
<td>0x6B (107) 1 0x11 (17)</td>
<td>58</td>
<td>7017</td>
<td>Inst. 1 2192</td>
<td>float RWES</td>
</tr>
<tr>
<td>[LSP]</td>
<td><strong>Set Point Closed Limit Low</strong></td>
<td>Set the low end of the set point range.</td>
<td>-1,999.000 to 9,999.000°F or units</td>
<td>-1,128°F or units</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x6B (107) 1 3</td>
<td>52</td>
<td>7003</td>
<td>Inst. 1 2164</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.

If there is only one instance of a menu, no submenus will appear.
### 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>Pro DP Index</th>
<th>Par ID</th>
<th>RU/GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>h.SP</td>
<td>Control Loop (1) Set Point Closed Limit 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°F or units 5,537°C</td>
<td>Instance 1 Map 1 Map 2 197 1896</td>
<td>0x6B (107) 1 4</td>
<td>53</td>
<td>7004</td>
<td>Inst. 2166</td>
<td>1 Doaat RWES</td>
</tr>
<tr>
<td></td>
<td>[h.SP]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[SP.Lo]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control Loop (1) Set Point Open Limit Low</td>
<td>-100.0 to 100.0%</td>
<td>-100</td>
<td>Instance 1 Map 1 Map 2 199 1898</td>
<td>0x6B (107) 1 5</td>
<td>54</td>
<td>7005</td>
<td>Inst. 2168</td>
<td>1 Doaat RWES</td>
</tr>
<tr>
<td></td>
<td>[SP.Lo]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control Loop (1) Set Point Open Limit High</td>
<td>-100.0 to 100.0%</td>
<td>100</td>
<td>Instance 1 Map 1 Map 2 201 1900</td>
<td>0x6B (107) 1 6</td>
<td>55</td>
<td>7006</td>
<td>Inst. 2170</td>
<td>1 Doaat RWES</td>
</tr>
<tr>
<td></td>
<td>[SP.hi]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Output (1 to 4) Function</td>
<td>off</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[Fn]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Output (1 to 4) Function Instance</td>
<td>1 to 4</td>
<td>1</td>
<td>Instance 1 Map 1 Map 2 134 948</td>
<td>0x6A (106) 1 to 4 5</td>
<td>83</td>
<td>6005</td>
<td>Inst. 1 888</td>
<td>uint RWES Offset + 30</td>
</tr>
<tr>
<td></td>
<td>[Fi]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Output (1 to 4) Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[o.Ct]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fixed Time Base (34)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Variable Time Base (103)</td>
<td></td>
<td></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.
- If there is only one instance of a menu, no submenus will appear.
## 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>Pro DP Index</th>
<th>Par ID</th>
<th>RUI/GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>![tb]</td>
<td>Output (1 to 4) Time Base</td>
<td>0.1 to 60.0 seconds (solid-state relay or switched dc) 5.0 to 60.0 seconds (mechanical relay or no-arc power control)</td>
<td>0.1 sec. [SSR &amp; sw dc] 20.0 sec. [mech, relay, no-arc]</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x6A (106) 1 to 4 3</td>
<td>86</td>
<td>6003</td>
<td>Inst. 1 884 Offset + 30</td>
<td>Float RWES</td>
</tr>
<tr>
<td>![Lo]</td>
<td>Output (1 to 4) Low Power Scale</td>
<td>0.0 to 100.0%</td>
<td>0.0%</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x6A (106) 1 to 4 9</td>
<td>87</td>
<td>6009</td>
<td>Inst. 1 896 Offset + 30</td>
<td>Float RWES</td>
</tr>
<tr>
<td>![hi]</td>
<td>Output (1 to 4) High Power Scale</td>
<td>0.0 to 100.0%</td>
<td>100.0%</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x6A (106) 1 to 4 0xA (10)</td>
<td>88</td>
<td>6010</td>
<td>Inst. 1 898 Offset + 30</td>
<td>Float RWES</td>
</tr>
<tr>
<td>![Fn]</td>
<td>Output (1) Function</td>
<td>Off (62) Heat, Control Loop (36) Cool, Control Loop (20)</td>
<td>off</td>
<td>Instance 1 Map 1 Map 2</td>
<td>- - - 782</td>
<td>- - -</td>
<td>18002</td>
<td>- - -</td>
<td>uint RWES</td>
</tr>
<tr>
<td>![ti]</td>
<td>Output (1) Soft Start Time</td>
<td>0.0 to 1000.0 seconds</td>
<td>0</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x76 (118) 1 0x15 (21)</td>
<td>- - -</td>
<td>18021</td>
<td>- - -</td>
<td>float RWES</td>
</tr>
</tbody>
</table>

### 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 hex (dec)</th>
<th>Pro DP Index</th>
<th>Par ID</th>
<th>RUI/GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>![ty]</td>
<td>Alarm (1 to 2) Type</td>
<td>Off (62) Process Alarm (76) Deviation Alarm (24)</td>
<td>Off</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x6D (109) 1 to 2 0xF (15)</td>
<td>20</td>
<td>9015</td>
<td>Inst. 1 1508 Inst. 2 1558</td>
<td>uint RWES</td>
</tr>
<tr>
<td>![A]</td>
<td>Alarm (1 to 2) Source Function A</td>
<td>Analog Input (142) Current (22) Power, Control Loop (73)</td>
<td>Analog</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x6D (109) 1 to 2 0x11 (17)</td>
<td>21</td>
<td>9017</td>
<td>Inst. 1 1512 Inst. 2 1562</td>
<td>uint 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.

If there is only one instance of a menu, no submenus will appear.
<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 DP Index</th>
<th>Par ID</th>
<th>RU/GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Image" /></td>
<td>Alarm (1 to 2) Source Instance A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image2" alt="Image" /></td>
<td>Hysteresis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image3" alt="Image" /></td>
<td>Logic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image4" alt="Image" /></td>
<td>Sides</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image5" alt="Image" /></td>
<td>Latching</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image6" alt="Image" /></td>
<td>Blocking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image7" alt="Image" /></td>
<td>Silencing</td>
<td></td>
<td></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.

If there is only one instance of a menu, no submenus will appear.
### 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>Pro DP Index</th>
<th>Par ID</th>
<th>RU/GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>RdSP</td>
<td>Alarm (1 to 2) Display</td>
<td></td>
<td>Off (62)</td>
<td>Instance 1</td>
<td>0x6D (109) 1 to 2 0x10 (16)</td>
<td>30</td>
<td>9016</td>
<td>Inst. 1</td>
<td>uint RWES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Map 1 Map 2</td>
<td></td>
<td></td>
<td></td>
<td>Inst. 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- - - 1480</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>On (63)</td>
<td>Instance 2</td>
<td>0x6D (109) 1 to 2 0x15 (21)</td>
<td>31</td>
<td>9021</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Map 1 Map 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- - - 1540</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- - - 1550</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RdL</td>
<td>Alarm (1 to 2) Delay</td>
<td>0 to 9,999 seconds</td>
<td>0</td>
<td>Instance 1</td>
<td>30</td>
<td>9016</td>
<td>Inst. 1</td>
<td>uint RWES</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Map 1 Map 2</td>
<td></td>
<td></td>
<td></td>
<td>Inst. 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- - - 1490</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Instance 2</td>
<td>31</td>
<td>9021</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Map 1 Map 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- - - 1560</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ce</td>
<td>Current Menu</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Csd</td>
<td>Current (1) Sides</td>
<td></td>
<td>Off (62)</td>
<td>Instance 1</td>
<td>0x73 (115) 1 5</td>
<td>145</td>
<td>15005</td>
<td>Inst. 1</td>
<td>uint RWES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Map 1 Map 2</td>
<td></td>
<td></td>
<td></td>
<td>Inst. 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- - - 1248</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current (1) Message Enable</td>
<td></td>
<td>Yes (106)</td>
<td>Instance 1</td>
<td>0x73 (115) 1 4</td>
<td>146</td>
<td>15004</td>
<td>Inst. 1</td>
<td>uint RWES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Map 1 Map 2</td>
<td></td>
<td></td>
<td></td>
<td>Inst. 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- - - 1246</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLE</td>
<td>Current (1) Current Limit Trip Enable</td>
<td></td>
<td>No (59)</td>
<td>Instance 1</td>
<td>0x73 (115) 1 6</td>
<td>- - - -</td>
<td>15006</td>
<td>Inst. 1</td>
<td>uint RWES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Map 1 Map 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- - - 1250</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CoFS</td>
<td>Current (1) Heater Offset</td>
<td>-9,999.000 to 9,999.000</td>
<td>0.0</td>
<td>Instance 1</td>
<td>0x73 (115) 1 1 0xB (11)</td>
<td>149</td>
<td>15011</td>
<td>Inst. 1</td>
<td>float RWE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Map 1 Map 2</td>
<td></td>
<td></td>
<td></td>
<td>Inst. 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- - - 1260</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current (1) Current Gain</td>
<td>-1,999.000 to 9,999.000</td>
<td>100.0</td>
<td>Instance 1</td>
<td>0x73 (115) 1 1 0xA (10)</td>
<td>- - - -</td>
<td>- - - -</td>
<td>Inst. 1</td>
<td>float RWE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Map 1 Map 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- - - 1258</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.

If there is only one instance of a menu, no submenus will appear.
### Function Key

#### Digital Input Function

Program the EZ Key to trigger an action. Functions respond to a level state change or an edge level change.

<table>
<thead>
<tr>
<th>Function Key (1 to 2)</th>
<th>Digital Input Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None (61)</td>
</tr>
<tr>
<td>Limit Reset, edge triggered</td>
<td>Limit Reset, edge triggered (82)</td>
</tr>
<tr>
<td>Profile Start/Stop, level triggered (208)</td>
<td>Profile Start/Stop, level triggered (208)</td>
</tr>
<tr>
<td>Profile Start Number, edge triggered (196)</td>
<td>Profile Start Number, edge triggered (196)</td>
</tr>
<tr>
<td>Profile Hold/Resume, level triggered (207)</td>
<td>Profile Hold/Resume, level triggered (207)</td>
</tr>
<tr>
<td>Profile Disable, level triggered (206)</td>
<td>Profile Disable, level triggered (206)</td>
</tr>
<tr>
<td>TRU-TUNE⁺® Disable, level triggered (219)</td>
<td>TRU-TUNE⁺® Disable, level triggered (219)</td>
</tr>
<tr>
<td>Switch Control Loop Off, level triggered (90)</td>
<td>Switch Control Loop Off, level triggered (90)</td>
</tr>
<tr>
<td>Manual/Auto Mode, level triggered (54)</td>
<td>Manual/Auto Mode, level triggered (54)</td>
</tr>
<tr>
<td>Tune, edge triggered (98)</td>
<td>Tune, edge triggered (98)</td>
</tr>
<tr>
<td>Idle Set Point Enable, level triggered (107)</td>
<td>Idle Set Point Enable, level triggered (107)</td>
</tr>
<tr>
<td>Force Alarm, level triggered (218)</td>
<td>Force Alarm, level triggered (218)</td>
</tr>
<tr>
<td>Alarm Outputs &amp; Control Loop Off, level triggered (220)</td>
<td>Alarm Outputs &amp; Control Loop Off, level triggered (220)</td>
</tr>
<tr>
<td>Silence Alarms, edge triggered (108)</td>
<td>Silence Alarms, edge triggered (108)</td>
</tr>
<tr>
<td>Alarm Reset, edge triggered (6)</td>
<td>Alarm Reset, edge triggered (6)</td>
</tr>
<tr>
<td>Restore User Settings, edge triggered (227)</td>
<td>Restore User Settings, edge triggered (227)</td>
</tr>
</tbody>
</table>

#### Instance

Select which instance the EZ Key will affect. If only one instance is available, any selection will affect it.

<table>
<thead>
<tr>
<th>Instance (1 to 2)</th>
<th>1 to 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instance 1</td>
<td>0x96 (110)</td>
</tr>
<tr>
<td>Instance 2</td>
<td>0x73 (106)</td>
</tr>
</tbody>
</table>

#### No Display

Function Key (1 to 2)

<table>
<thead>
<tr>
<th>State</th>
<th>On (63)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off (62)</td>
<td>0</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.

If there is only one instance of a menu, no submenus will appear.
## 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>Pro DP Index</th>
<th>Par ID</th>
<th>RU/GTW Modbus</th>
<th>Data Type Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Display</strong></td>
<td><a href="#">Global Menu</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Global Display Units</strong></td>
<td>Select which scale to use for temperature.</td>
<td>°F (30)</td>
<td>°F</td>
<td>Instance 1</td>
<td>- - -</td>
<td>110</td>
<td>3005</td>
<td>- - -</td>
</tr>
<tr>
<td></td>
<td><strong>AC Line Frequency</strong></td>
<td>Set the frequency to the applied ac line power source.</td>
<td>50 Hz (3)</td>
<td>60 Hz (4)</td>
<td>Instance 1</td>
<td>0x65 (101)</td>
<td>1</td>
<td>0x22 (34)</td>
<td>- - -</td>
</tr>
<tr>
<td></td>
<td><strong>Profile StartType</strong></td>
<td>Set the profile startup to be based on a set point or a process value.</td>
<td>Off (62)</td>
<td>On (63)</td>
<td>Instance 1</td>
<td>0x7A (122)</td>
<td>1</td>
<td>6</td>
<td>- - -</td>
</tr>
<tr>
<td></td>
<td><strong>Guaranteed Soak Enable</strong></td>
<td>Enables the guaranteed soak deviation function in profiles.</td>
<td>Off</td>
<td>Off (62)</td>
<td>Instance 1</td>
<td>0x7A (122)</td>
<td>1</td>
<td>6</td>
<td>- - -</td>
</tr>
<tr>
<td></td>
<td><strong>Guaranteed Soak Deviation 1</strong></td>
<td>Set the value of the deviation band that will be used in all profile step types. The process value must enter the deviation band before the step can proceed.</td>
<td>0.0 to 9,999.000°F or units 10.0°F or units 6.0°C</td>
<td>Instance 1</td>
<td>0x7A (122)</td>
<td>1</td>
<td>7</td>
<td>- - -</td>
<td>Inst. 1 2907 float RWE</td>
</tr>
<tr>
<td></td>
<td><strong>Ramping Type</strong></td>
<td>Defines whether profiles will use time or rate</td>
<td>Rate (81)</td>
<td>Time (143)</td>
<td>Instance 1</td>
<td>0x7A (122)</td>
<td>1</td>
<td>0x26 (38)</td>
<td>- - -</td>
</tr>
<tr>
<td></td>
<td><strong>Display Pairs</strong></td>
<td>Defines the number of Display Pairs.</td>
<td>1 to 10</td>
<td>2</td>
<td>Instance 1</td>
<td>- - -</td>
<td>1744</td>
<td>- - -</td>
<td>3028 uint RWES</td>
</tr>
<tr>
<td></td>
<td><strong>User Settings Save</strong></td>
<td>Save all of this controller’s settings to the selected set.</td>
<td>User Set 1 (101)</td>
<td>User Set 2 (102)</td>
<td>None (61)</td>
<td>None</td>
<td>0x101</td>
<td>1</td>
<td>0xE (14)</td>
</tr>
<tr>
<td></td>
<td><strong>User Restore Settings</strong></td>
<td>Replace all of this controller’s settings with another set.</td>
<td>Factory (31)</td>
<td>None (61)</td>
<td>User Set 1 (101)</td>
<td>User Set 2 (102)</td>
<td>None</td>
<td>0x65 (101)</td>
<td>1</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.

If there is only one instance of a menu, no submenus will appear.
## 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>Pro DP Index</th>
<th>Par ID</th>
<th>RU/ GTW Modbus</th>
<th>Data Type &amp; Read/ Write</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communications Menu</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| **AdM** | *Communications (1) Address Modbus* | 1 to 247 | 1 | **Instance 1**  
Map 1  
Map 2  
313  
2052 | 0x96 (150)  
1  
2 | - - - | 17007 | Inst. 1  
2320 | uint RWE |
| **baUd** | *Communications Baud Rate* | 9,600 (188)  
19,200 (189)  
38,400 (190) | 9,600 | **Instance 1**  
Map 1  
Map 2  
314  
2054 | 0x96 (150)  
1  
3 | - - - | 17002 | Inst. 1  
2322 | uint RWE |
| **Par** | *Communications Parity* | None (61)  
Even (191)  
Odd (192) | None | **Instance 1**  
Map 1  
Map 2  
315  
2056 | 0x96 (150)  
1  
4 | - - - | 17003 | Inst. 1  
2324 | uint RWE |
| **m.hL** | *Communications Modbus Word Order* | *h.La* Word High Low (1330)  
*Lah* Word Low High (1331) | *Low High* | **Instance 1**  
Map 1  
Map 2  
- - -  
2058 | 0x96 (150)  
1  
5 | - - - | 17043 | - - - | uint RWE |
| **C_F** | *Communications Display Units* | °F (30)  
°C (15) | °F | **Instance 1**  
Map 1  
Map 2  
- - -  
2060 | 0x96 (150)  
1  
6 | 199 | 17050 | - - - | uint RWE |
| **Map** | *Communications (1) Data Map* | 1 to 2 | 1 | **Instance 1**  
Map 1  
Map 2  
- - -  
- - - | 0x96 (117)  
1  
0x3B (59) | - - - | 17059 | - - - | uint RWE |
| **nUS** | *Communications (1) Non-Volatile Save* | Yes (106)  
No (59) | Yes | **Instance 1**  
Map 1  
Map 2  
317  
2064 | 0x96 (150)  
1  
8 | 198 | 17051 | Inst. 1  
2420 | uint RWE |

**Note:**

Some values will be rounded off to fit in the four-character display.

Full values can be read with other interfaces.

If there is only one instance of a menu, no submenus will appear.
Chapter 5: Profiling Page

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 \( \bullet \) for three seconds, until \[\text{Prof}\] appears in the lower display and the profile number appears in the upper display. Press the Up \( \bigcirc \) or Down \( \bigcirc \) key to change to another profile.

- Press the Advance Key \( \bullet \) to move to the selected profile's first step.
- Press the Up \( \bigcirc \) or Down \( \bigcirc \) keys to move through the steps.
- Press the Advance Key \( \bullet \) to move through the selected step's settings.
- Press the Up \( \bigcirc \) or Down \( \bigcirc \) keys to change the step's settings.
- Press the Infinity Key \( ^{\infty} \) at any time to return to the step number prompt.
- Press the Infinity Key \( ^{\infty} \) again to return to the profile number prompt.
- From any point press and hold the Infinity Key \( ^{\infty} \) 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 \( \bullet \) repeatedly until Profile Start \[\text{P;ST}\] appears in the lower display.
2. Use the Up \( \bigcirc \) or Down \( \bigcirc \) key to choose the file or step number within a profile where you want the profile to begin running.
3. Press the Advance Key \( \bullet \). This takes you to Profile Action \[\text{P;AC}\], where you can select the appropriate action.

- \[\text{none}\] No action
- \[\text{Prof}\] Begin execution from first step of the specified profile number, whether it exists or not.
- \[\text{Paus}\] Pause the currently running profile.
- \[\text{Resu}\] Resume running the profile from the previously paused step.
- \[\text{End}\] End the profile.
- \[\text{Step}\] 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. Navigate to Setup Page under the Com menu and set prompt Non-volatile Save \[\text{nUS}\] to No.

Profiling Parameters

<table>
<thead>
<tr>
<th>Prof</th>
<th>Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 (to 10)</td>
<td>P 1</td>
</tr>
<tr>
<td>Step 11 (to 20)</td>
<td>P 2</td>
</tr>
<tr>
<td>Step 21 (to 30)</td>
<td>P 3</td>
</tr>
<tr>
<td>Step 31 (to 40)</td>
<td>P 4</td>
</tr>
<tr>
<td>Step Type</td>
<td>SEL</td>
</tr>
<tr>
<td>Target Set Point Loop 1</td>
<td>ESP</td>
</tr>
<tr>
<td>Hours</td>
<td>hhour</td>
</tr>
<tr>
<td>Minutes</td>
<td>mm</td>
</tr>
<tr>
<td>Seconds</td>
<td>sec</td>
</tr>
<tr>
<td>Rate</td>
<td>rate</td>
</tr>
<tr>
<td>Wait For Process 1</td>
<td>wP1</td>
</tr>
<tr>
<td>Wait Event 1</td>
<td>wE1</td>
</tr>
<tr>
<td>Wait Event 2</td>
<td>wE2</td>
</tr>
<tr>
<td>Jump Step</td>
<td>Jm</td>
</tr>
<tr>
<td>Jump Count</td>
<td>jn</td>
</tr>
<tr>
<td>End Type</td>
<td>En</td>
</tr>
<tr>
<td>Event 1</td>
<td>En1</td>
</tr>
<tr>
<td>Event 2</td>
<td>En2</td>
</tr>
</tbody>
</table>

Note:
This page appears only if 10th digit of part number is P ST _ _ _ _ _ _ _ _ _ _ P _ _
<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 DP Index</th>
<th>Par ID</th>
<th>RUI/GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step (1 to 40)</td>
<td>Step Type</td>
<td>Unused Step (50)</td>
<td>-</td>
<td>Unused</td>
<td>Instance 1  Map 1  Map 2</td>
<td>0x79 (121) 1 to (40)</td>
<td>- - - -</td>
<td>Inst. 1 2870</td>
<td>Offset RWE</td>
</tr>
<tr>
<td>Step (1 to 40)</td>
<td>Target Set Point Loop 1</td>
<td>Set the set point for this loop.</td>
<td>-1,999.000 to 9,999.000 °F or -1,128.000 to 5,537.000 °C</td>
<td>0.0</td>
<td>Instance 1  Map 1  Map 2</td>
<td>0x79 (121) 1 to (40)</td>
<td>- - - -</td>
<td>Inst. 1 2872</td>
<td>Offset RWE</td>
</tr>
<tr>
<td>Step (1 to 40)</td>
<td>Hours</td>
<td>Select the hours (plus Minutes and Seconds) for a timed step.</td>
<td>0 to 99</td>
<td>0</td>
<td>Instance 1  Map 1  Map 2</td>
<td>0x79 (121) 1 to (40)</td>
<td>- - - -</td>
<td>Inst. 1 2874</td>
<td>Offset RWE</td>
</tr>
<tr>
<td>Step (1 to 40)</td>
<td>Minutes</td>
<td>Select the minutes (plus Hours and Seconds) for a timed step.</td>
<td>0 to 59</td>
<td>0</td>
<td>Instance 1  Map 1  Map 2</td>
<td>0x79 (121) 1 to (40)</td>
<td>- - - -</td>
<td>Inst. 1 2876</td>
<td>Offset RWE</td>
</tr>
<tr>
<td>Step (1 to 40)</td>
<td>Seconds</td>
<td>Select the seconds (plus Hours and Minutes) for a timed step.</td>
<td>0 to 59</td>
<td>0</td>
<td>Instance 1  Map 1  Map 2</td>
<td>0x79 (121) 1 to (40)</td>
<td>- - - -</td>
<td>Inst. 1 2880</td>
<td>Offset 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.

If there is only one instance of a menu, no submenus will appear.
### Display Parameter Name Description | Range | Default | Modbus Relative Address | CIP Class Instance Attribute hex (dec) | Pro DP Index | Par ID | RU/ GTW Modbus | Data Type & Read/Write |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="1" alt="Modbus" /> <img src="2" alt="Relative" /> <img src="3" alt="Address" /></td>
<td><img src="4" alt="CIP Class" /> <img src="5" alt="Instance" /> <img src="6" alt="Attribute" /> <img src="7" alt="hex (dec)" /></td>
<td><img src="8" alt="Pro DP Index" /> <img src="9" alt="Par ID" /> <img src="10" alt="RU/ GTW Modbus" /></td>
<td><img src="11" alt="Data Type" /> <img src="12" alt="Read/Write" /></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="13" alt="Wait For Process 1" /></td>
<td><img src="14" alt="Step (1 to 40)" /> <img src="15" alt="Wait" /> <img src="16" alt="Process 1" /></td>
<td><img src="17" alt="Range" /> <img src="18" alt="or units" /> <img src="19" alt="-1,999.000 to 9,999.000°F" /> <img src="20" alt="or units" /> <img src="21" alt="-1,128.000 to 5,537.000°C" /></td>
<td><img src="22" alt="Default" /> <img src="23" alt="0.0°F or units" /> <img src="24" alt="18.0°C" /></td>
<td><img src="25" alt="Instance 1" /> <img src="26" alt="Map 1 Map 2" /> <img src="27" alt="512 4020" /></td>
<td><img src="28" alt="0x79 (121)" /> <img src="29" alt="1 to (40)" /> <img src="30" alt="0xB (11)" /></td>
<td><img src="31" alt="RUI/ GTW Offset +80" /></td>
<td><img src="32" alt="float" /> <img src="33" alt="RWE" /></td>
<td></td>
</tr>
<tr>
<td><img src="34" alt="Wait Event 1" /></td>
<td><img src="35" alt="Step (1 to 40)" /> <img src="36" alt="Wait" /> <img src="37" alt="Event 1" /></td>
<td><img src="38" alt="Range" /> <img src="39" alt="or units" /> <img src="40" alt="-1,128.000 to 5,537.000°C" /></td>
<td><img src="41" alt="default" /> <img src="42" alt="0.0°F or units" /> <img src="43" alt="18.0°C" /></td>
<td><img src="44" alt="Instance 1" /> <img src="45" alt="Map 1 Map 2" /> <img src="46" alt="510 4016" /></td>
<td><img src="47" alt="0x79 (121)" /> <img src="48" alt="1 to (40)" /> <img src="49" alt="0xA (10)" /></td>
<td><img src="50" alt="RUI/ GTW Offset +80" /></td>
<td><img src="51" alt="uint" /> <img src="52" alt="RWE" /></td>
<td></td>
</tr>
<tr>
<td><img src="53" alt="Wait Event 2" /></td>
<td><img src="54" alt="Step (1 to 40)" /> <img src="55" alt="Wait" /> <img src="56" alt="Event 2" /></td>
<td><img src="57" alt="Range" /> <img src="58" alt="or units" /> <img src="59" alt="-1,128.000 to 5,537.000°C" /></td>
<td><img src="60" alt="default" /> <img src="61" alt="0.0°F or units" /> <img src="62" alt="18.0°C" /></td>
<td><img src="63" alt="Instance 1" /> <img src="64" alt="Map 1 Map 2" /> <img src="65" alt="514 4022" /></td>
<td><img src="66" alt="0x79 (121)" /> <img src="67" alt="1 to (40)" /> <img src="68" alt="0xC (12)" /></td>
<td><img src="69" alt="RUI/ GTW Offset +80" /></td>
<td><img src="70" alt="uint" /> <img src="71" alt="RWE" /></td>
<td></td>
</tr>
<tr>
<td><img src="72" alt="Jump Step" /></td>
<td><img src="73" alt="Step (1 to 40)" /> <img src="74" alt="Jump" /> <img src="75" alt="Step" /></td>
<td><img src="76" alt="Range" /></td>
<td><img src="77" alt="default" /></td>
<td><img src="78" alt="Instance 1" /> <img src="79" alt="Map 1 Map 2" /> <img src="80" alt="512 4020" /></td>
<td><img src="81" alt="0x79 (121)" /> <img src="82" alt="1 to (40)" /> <img src="83" alt="0xB (11)" /></td>
<td><img src="84" alt="RUI/ GTW Offset +80" /></td>
<td><img src="85" alt="float" /> <img src="86" alt="RWE" /></td>
<td></td>
</tr>
<tr>
<td><img src="87" alt="Jump Count" /></td>
<td><img src="88" alt="Step (1 to 40)" /> <img src="89" alt="Jump" /> <img src="90" alt="Count" /></td>
<td><img src="91" alt="Range" /></td>
<td><img src="92" alt="default" /></td>
<td><img src="93" alt="Instance 1" /> <img src="94" alt="Map 1 Map 2" /> <img src="95" alt="512 4020" /></td>
<td><img src="96" alt="0x79 (121)" /> <img src="97" alt="1 to (40)" /> <img src="98" alt="0xC (12)" /></td>
<td><img src="99" alt="RUI/ GTW Offset +80" /></td>
<td><img src="100" alt="uint" /> <img src="101" alt="RWE" /></td>
<td></td>
</tr>
<tr>
<td><img src="102" alt="End Type" /></td>
<td><img src="103" alt="Step (1 to 40)" /> <img src="104" alt="End" /> <img src="105" alt="Type" /></td>
<td><img src="106" alt="Range" /></td>
<td><img src="107" alt="default" /></td>
<td><img src="108" alt="Instance 1" /> <img src="109" alt="Map 1 Map 2" /> <img src="110" alt="512 4020" /></td>
<td><img src="111" alt="0x79 (121)" /> <img src="112" alt="1 to (40)" /> <img src="113" alt="0xE (14)" /></td>
<td><img src="114" alt="RUI/ GTW Offset +80" /></td>
<td><img src="115" alt="uint" /> <img src="116" alt="RWE" /></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.

If there is only one instance of a menu, no submenus will appear.
### Display Parameters

<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 DP Index</th>
<th>Par ID</th>
<th>RUI/GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Ent1" alt="Ent1" /></td>
<td><strong>Step (1 to 40)</strong> Event 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Select whether Event Output 1 is on, unchanged or off during this step.</td>
<td><img src="on" alt="on" /> On (63)</td>
<td><img src="off" alt="off" /> Off (62)</td>
<td><img src="unchanged" alt="unchanged" /> Unchanged (1557)</td>
<td></td>
<td>0x79 (121) 1 to (40)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="Ent2" alt="Ent2" /></td>
<td><strong>Step (1 to 40)</strong> Event 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Select whether Event Output 2 is on, unchanged or off during this step.</td>
<td><img src="on" alt="on" /> On (63)</td>
<td><img src="off" alt="off" /> Off (62)</td>
<td><img src="unchanged" alt="unchanged" /> Unchanged (1557)</td>
<td></td>
<td>0x79 (121) 1 to (40)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Display</td>
<td><strong>Step (1 to 40)</strong> Event Input 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current state of digital input 5.</td>
<td>Off (62)</td>
<td>On (63)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Display</td>
<td><strong>Step (1 to 40)</strong> Event Input 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current state of digital input 6.</td>
<td>Off (62)</td>
<td>On (63)</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.

If there is only one instance of a menu, no submenus will appear.

### Parameters in Step Type

<table>
<thead>
<tr>
<th>Display</th>
<th>Step Type Description</th>
<th>Parameters in Step Type</th>
</tr>
</thead>
</table>
| ![k.t](k.t) | **Time** | ![k95p](k95p) Target Set Point  
 ![hoUr](hoUr) Hours  
 ![Min](Min) Minutes  
 ![SEC](SEC) Seconds  
 ![on](on) Event Output 1  
 ![off](off) Event Output 2 |
| ![r.REE](r.REE) | **Rate** | ![k95p](k95p) Target Set Point  
 ![rREE](rREE) Rate  
 ![on](on) Event Output 1  
 ![off](off) Event Output 2 |
| ![u.WE](u.WE) | **Wait For Event** | ![uWE](uWE) Wait Event 1 (digital input 5)  
 ![uWE2](uWE2) Wait Event 2 (digital input 6)  
 ![on](on) Event Output 1  
 ![off](off) Event Output 2 |
| ![u.Pr](u.Pr) | **Wait For Process** | ![uPc](uPc) Wait For Process Instance  
 ![uP](uP) Wait For Process Value  
 ![on](on) Event Output 1  
 ![off](off) Event Output 2 |
| ![u.bo](u.bo) | **Wait For Both** | ![uP](uP) Wait For Process Value  
 ![uWE](uWE) Wait Event 1 (digital input 5)  
 ![uWE2](uWE2) Wait Event 2 (digital input 6)  
 ![on](on) Event Output 1  
 ![off](off) Event Output 2 |
<table>
<thead>
<tr>
<th>Display</th>
<th>Step Type Description</th>
<th>Parameters in Step Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>JL</td>
<td><strong>Jump Loop</strong></td>
<td>JL, JC, Event Output 1, Event Output 2</td>
</tr>
<tr>
<td></td>
<td><strong>Description</strong></td>
<td>A Jump Loop step will jump to the Jump Step the number of times designated in Jump Count. Loops can be nested up to four deep.</td>
</tr>
<tr>
<td>End</td>
<td><strong>End</strong></td>
<td>End Type</td>
</tr>
<tr>
<td></td>
<td><strong>Description</strong></td>
<td>An End Step will end the profile. If a profile doesn’t include an End Step, control will move to the next step. If no End Step is confronted, after step 40 control will default to the set point in effect before the profile started.</td>
</tr>
<tr>
<td>USnP</td>
<td><strong>Unused Step</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Description</strong></td>
<td>This is an empty step that can be used to, in effect, erase a step in a profile.</td>
</tr>
</tbody>
</table>
Chapter 6: Factory Pages

Control Module Factory Page Parameters

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

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

Calculating the Modbus Register

The tables below list only the register of the first instance of each parameter. To find the register of the other instances, use the formula: instance (n) register = instance 1 register + ((n - 1) * offset).

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

**Parameter Name**

- **Custom Parameter 1 to 20**
  - Select the parameters that will appear in the Home Page.
  - The Parameter 1 value will appear in the upper display of the Home Page. It cannot be changed with the Up and Down Keys in the Home Page.
  - The Parameter 2 value will appear in the lower display in the Home Page. It can be changed with the Up and Down Keys, if the parameter is a writable one.

Scroll through the other Home Page parameters with the Advance Key ( ).

### Security Setting Menu

**Security Setting Operations Page**

- Change the security level of the Operations Page.

Note:

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

If there is only one instance of a menu, no submenus will appear.
### Control Module • 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</th>
<th>Pro DP Index</th>
<th>Par ID</th>
<th>RUI/GTW Modbus</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>Instance 1 Map 1 Map 2</td>
<td>- - -</td>
<td>- - - - -</td>
<td>- - -</td>
<td>- - - - -</td>
<td>uint RWE</td>
</tr>
<tr>
<td>LoC.P</td>
<td>Security Setting Password Enable</td>
<td>Off</td>
<td>Off</td>
<td>Instance 1 Map 1 Map 2</td>
<td>- - -</td>
<td>- - - - -</td>
<td>- - -</td>
<td>- - - - -</td>
<td>uint RWE</td>
</tr>
<tr>
<td>LoC.L</td>
<td>Security Setting Read Lock</td>
<td>1 to 5</td>
<td>5</td>
<td>Instance 1 Map 1 Map 2</td>
<td>- - -</td>
<td>- - - - -</td>
<td>- - -</td>
<td>- - - - -</td>
<td>uint RWE</td>
</tr>
<tr>
<td>LoC.L</td>
<td>Security Setting Write Security</td>
<td>0 to 5</td>
<td>5</td>
<td>Instance 1 Map 1 Map 2</td>
<td>- - -</td>
<td>- - - - -</td>
<td>- - -</td>
<td>- - - - -</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>Instance 1 Map 1 Map 2</td>
<td>- - -</td>
<td>- - - - -</td>
<td>- - -</td>
<td>- - - - -</td>
<td>uint RWE</td>
</tr>
<tr>
<td>roLL</td>
<td>Security Setting Rolling Password</td>
<td>Off</td>
<td>Off</td>
<td>Instance 1 Map 1 Map 2</td>
<td>- - -</td>
<td>- - - - -</td>
<td>- - -</td>
<td>- - - - -</td>
<td>uint RWE</td>
</tr>
<tr>
<td>PAS.u</td>
<td>Security Setting User Password</td>
<td>10 to 999</td>
<td>63</td>
<td>Instance 1 Map 1 Map 2</td>
<td>- - -</td>
<td>- - - - -</td>
<td>- - -</td>
<td>- - - - -</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 another interface.

If there is only one instance of a menu, no submenus will appear.
## Parameter Name Description

<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>Pro DP Index</th>
<th>Par ID</th>
<th>RUI/GTW Modbus</th>
<th>Data Type &amp; Read/Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ppas</td>
<td>Security Setting Administrator Password</td>
<td>10 to 999</td>
<td>156</td>
<td>Instance 1 Map 1 Map 2</td>
<td>- - - -</td>
<td>- - - - - - - - - - - - - -</td>
<td>- - - -</td>
<td>- - -</td>
<td>RWE</td>
<td>uint</td>
</tr>
<tr>
<td>LODE</td>
<td>Security Setting Public Key</td>
<td>Customer Specific</td>
<td>0</td>
<td>Instance 1 Map 1 Map 2</td>
<td>- - - -</td>
<td>- - - - - - - - - - - - - -</td>
<td>- - - -</td>
<td>- - -</td>
<td>RWE</td>
<td>uint</td>
</tr>
<tr>
<td>PASS</td>
<td>Security Setting Password</td>
<td>-1999 to 9999</td>
<td>0</td>
<td>Instance 1 Map 1 Map 2</td>
<td>- - - -</td>
<td>- - - - - - - - - - - - - -</td>
<td>- - - -</td>
<td>- - -</td>
<td>RWE</td>
<td>uint</td>
</tr>
<tr>
<td>Pn</td>
<td>Diagnostics Model Number</td>
<td>14</td>
<td>- - -</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x65</td>
<td>(101) 1 9</td>
<td>116</td>
<td>1009</td>
<td>- - - - - - - -</td>
<td>dint R</td>
</tr>
<tr>
<td>REW</td>
<td>Diagnostics Firmware Revision</td>
<td>5</td>
<td>- - -</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x65</td>
<td>(101) 1 0x11 (17)</td>
<td>- - - -</td>
<td>- - -</td>
<td>1003</td>
<td>dint 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</td>
<td>0x65</td>
<td>(101) 1 0x20 (32)</td>
<td>- - - -</td>
<td>- - -</td>
<td>1005</td>
<td>dint R</td>
</tr>
<tr>
<td>SN</td>
<td>Diagnostics Serial Number</td>
<td>0 to 2,147,483,647</td>
<td>- - -</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x65</td>
<td>(101) 1 8</td>
<td>- - - -</td>
<td>- - -</td>
<td>1032</td>
<td>string R</td>
</tr>
<tr>
<td>DateE</td>
<td>Diagnostics Date of Manufacture</td>
<td>0 to 2,147,483,647</td>
<td>- - -</td>
<td>Instance 1 Map 1 Map 2</td>
<td>0x65</td>
<td>(101) 1 8</td>
<td>- - - -</td>
<td>- - -</td>
<td>1088</td>
<td>dint R</td>
</tr>
</tbody>
</table>

**Note:**
- Some values will be rounded off to fit in the four-character display. Full values can be read with another interface.
- If there is only one instance of a menu, no submenus will appear.
<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 DP Index</th>
<th>Par ID</th>
<th>RUI/ GTW Modbus</th>
<th>Data Type &amp; Read/ Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Display</td>
<td><strong>Diagnostics</strong> Hardware ID</td>
<td>17 or 31</td>
<td></td>
<td>Instance 1 Map 1 Map 2 0 0</td>
<td>0x65 (101) 1 1</td>
<td>- - -</td>
<td>Inst. 1</td>
<td>- - -</td>
<td>dint R</td>
</tr>
<tr>
<td>No Display</td>
<td><strong>Diagnostics</strong> Software ID</td>
<td>0 to 2147483647</td>
<td></td>
<td>Instance 1 Map 1 Map 2 2 2</td>
<td>0x65 (101) 1 2</td>
<td>- - -</td>
<td>Inst. 1</td>
<td>- - -</td>
<td>dint R</td>
</tr>
<tr>
<td>No Display</td>
<td><strong>Diagnostics</strong> Device Name</td>
<td>0 or 32</td>
<td></td>
<td>EZ-ZONE ST</td>
<td>0x65 (101) 0x0B (11)</td>
<td>- - -</td>
<td>Inst. 1</td>
<td>- - -</td>
<td>string RWE</td>
</tr>
<tr>
<td>No Display</td>
<td><strong>Diagnostics</strong> Device Status</td>
<td>OK (138) FAIL (32)</td>
<td></td>
<td>Instance 1 Map 1 Map 2 18 30</td>
<td>0x65 (101) 0x0A (10)</td>
<td>- - -</td>
<td>Inst. 1</td>
<td>- - -</td>
<td>dint R</td>
</tr>
</tbody>
</table>

### Calibration Menu

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Range</th>
<th>Default</th>
<th>Modbus Relative Address</th>
<th>CIP Class Instance Attribute hex (dec)</th>
<th>Pro DP Index</th>
<th>Par ID</th>
<th>RUI/ GTW Modbus</th>
<th>Data Type &amp; Read/ Write</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EL,o</strong></td>
<td>Electrical Measurement</td>
<td>-3.4e38 to 3.4e38</td>
<td></td>
<td>Instance 1 Map 1 Map 2 309 400</td>
<td>0x68 (104) 1 2 0x15 (21)</td>
<td>- - -</td>
<td>Inst. 1</td>
<td>400</td>
<td>float R</td>
</tr>
<tr>
<td><strong>EL,o</strong></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 47 378</td>
<td>0x68 (104) 1 2 0xA (10)</td>
<td>- - -</td>
<td>Inst. 1</td>
<td>378</td>
<td>float RWES</td>
</tr>
<tr>
<td><strong>EL,s</strong></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 49 380</td>
<td>0x68 (104) 1 2 0xB (11)</td>
<td>- - -</td>
<td>Inst. 1</td>
<td>380</td>
<td>float RWES</td>
</tr>
<tr>
<td><strong>EL,o</strong></td>
<td>Electrical Output Offset</td>
<td>-1,999.000 to 9,999.000</td>
<td>0.0</td>
<td>Instance 1 Map 1 Map 2 77 470</td>
<td>0x76 (118) 1 5</td>
<td>- - -</td>
<td>Inst. 1</td>
<td>18005</td>
<td>float RWES</td>
</tr>
<tr>
<td><strong>EL,s</strong></td>
<td>Electrical Output Slope</td>
<td>-1,999.000 to 9,999.000</td>
<td>1.0</td>
<td>Instance 1 Map 1 Map 2 78 480</td>
<td>0x76 (118) 1 6</td>
<td>- - -</td>
<td>Inst. 1</td>
<td>18006</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 another interface.
- If there is only one instance of a menu, no submenus will appear.
Chapter 7: Features

Saving and Restoring User Settings ................................................................. 65
Tuning the PID Parameters ............................................................................. 65
Manual Tuning ............................................................................................... 65
Autotuning with TRU-TUNE<sup>®</sup> ............................................................... 66
Inputs .............................................................................................................. 66
Calibration Offset ........................................................................................... 66
Calibration ....................................................................................................... 67
Filter Time Constant ..................................................................................... 67
Sensor Selection .............................................................................................. 67
Set Point Low Limit and High Limit ............................................................... 68
Scale High and Scale Low ............................................................................... 68
Range High and Range Low ........................................................................... 68
Control Methods .......................................................................................... 68
Output Configuration ..................................................................................... 68
Auto (closed loop) and Manual (open loop) Control ..................................... 68
On-Off Control ............................................................................................... 69
Proportional Control ..................................................................................... 69
Proportional plus Integral (PI) Control .......................................................... 70
Proportional plus Integral plus Derivative (PID) Control .............................. 70
Dead Band ...................................................................................................... 70
Variable Time Base ...................................................................................... 71
Phase Angle ................................................................................................... 71
Soft Start Time ............................................................................................... 71
Single Set Point Ramping .............................................................................. 71
Alarms ............................................................................................................. 72
Process and Deviation Alarms ...................................................................... 72
Alarm Set Points ............................................................................................. 72
Alarm Hysteresis ............................................................................................ 72
Alarm Latching ............................................................................................... 72
Alarm Silencing ............................................................................................... 73
Alarm Blocking .............................................................................................. 73
Using Lockout to Hide Pages and Menus ..................................................... 73
Using Password Security ............................................................................... 74
Modbus - Using Programmable Memory Blocks ....................................... 75
CIP - Communications Capabilities ............................................................. 75
Software Configuration .................................................................................. 76

Note:
In the following chapter, there will be many visual references to prompts as related to the features and as seen on the face of the Remote User Interface (RUI) which is optional hardware. To learn more about the RUI point your browser to: http://www.watlow.com/literature/pti_search.cfm?dltype=5 and type in EZ-ZONE in the search field at the bottom of the page to find and download the RUI/Gateway User Manual.
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 RUI 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.

Tuning the PID Parameters

Autotuning

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

For example, if the active set point is 200° and Autotune Set Point [A.tSP] (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 controllers. In addition, changing the active set point in previous controllers causes the autotune function to restart; where with the EZ-ZONE ST changing the set point after an autotune has been started has no affect.

A new feature in EZ-ZONE ST 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 [``AUt] 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 [``AUt] (Setup Page, Loop Menu). Select under damped [``d] 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 [C Pb] 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 _t;Un_ (Setup Page, Loop Menu).

Use TRU-TUNE+ Band _t;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 _t;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** _t;SEn_ (Setup Page, Analog Input Menu), and scaling, if required;
- **Function** _t;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** _t;CA_ (Operations Page, Analog Input Menu).
Calibration

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

<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>
</tbody>
</table>

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 [ELi;o] (Factory Page, Calibration Menu) for this input to the offset value.
5. Check the Electrical Measurement to see whether it now matches the signal. If it doesn’t match, adjust Electrical Offset again.
6. 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 [ELi;S] (Factory Page, Calibration Menu) for this input to the calculated gain value.
10. Check the Electrical Measurement to see whether it now matches the signal. If it doesn’t match, adjust Electrical Input Slope again.

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

Filter Time Constant

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

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

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

Sensor Selection

You need to configure the controller to match the input device, which is normally a thermocouple, RTD or process transmitter.
Select the sensor type with Sensor Type \( \text{SE}_n \) (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 \( \text{LS}_P \) and High Set Point \( \text{hSP} \) (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.

![](image)

**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 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 measurable 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 \( r_{Lo} \) and Scale High \( r_{h} \). Select the displayed range with Range Low \( r_{Lo} \) and Range High \( r_{fh} \) (Setup Page, Analog Input Menu).

**Range High and Range Low**

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

Select the low and high values with Range Low \( r_{Lo} \) and Range High \( r_{h} \) (Setup Page, Analog Input Menu).

**Control Methods**

**Output Configuration**

Each controller output (1, 2 and 3) 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 \( \text{FA}_L \) (Setup Page, Loop Menu). The manual mode only allows open-loop control. The EZ-ZONE ST 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 \( \text{Rt}_{k} \) in the lower display and respond to the failure according to the setting of Input Error Failure \( \text{FA}_L \). You can configure the controller to perform a “bumpless” transfer \( \text{bPL}_{5} \), switch power to output a preset fixed level \( \text{fP}_{R} \), 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 \( \text{[ERR]} \) (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 \( \bullet \) then the Up Key \( \circ \).

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

To transfer to manual mode from auto mode, press the Advance Key \( \bullet \) until \( \text{[CF]} \) appears in the lower display. The upper display will display \( \text{[Aut]} \) for auto mode. Use the Up \( \circ \) or Down \( \circ \) 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 \( \bullet \) until \( \text{[CF]} \) appears in the lower display. The upper display will display \( \text{[Man]} \) for manual mode. Use the Up \( \circ \) or Down \( \circ \) keys to select \( \text{[Aut]} \). 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 \( \bullet \) or the Infinity Key \( \circ \).

**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 \( \text{[hR]} \) or Cool Algorithm \( \text{[cR]} \) (Setup Page, Loop Menu).

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

**Note:**

Input Error Failure Mode \( \text{[ER]} \) 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 \( hPb \) or Cool Proportional Band \( cPb \) (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 startup or when the set point is changed. Too much integral action will make the system unstable. Integral is cleared when the process value is outside of the proportional band.

Adjust the integral with Time Integral \( ti \) (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 \( td \) (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.

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

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

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

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

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

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

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

100 percent output
10 ON, 0 OFF

50 percent output
3 ON, 3 OFF

66 percent output
6 ON, 3 OFF

Phase Angle

The phase angle control method gates a limited portion of the line voltage cycle to the load based on the percentage power selected. Phase angle control is variable inside the sine wave. This control method provides a variable voltage output with soft start capabilities as well.

Soft Start Time

Soft start is an additional feature of phase angle control executed whenever a power increase is called for. The output will gradually increase in power until the final selected power output is reached. The soft start time is the time it takes to go from 0 to 100 percent power.

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.
- `[StPr]` ramp at startup.
- `[SEPr]` 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).

Set Point
Temperature reaches Set Point quickly
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 (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 and High Set Point (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 (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 in the lower display.

Push the Advance Key to display 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 or Silence . Then push the Advance or Infinity key to execute the action.

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

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

Turn alarm latching on or off with Latching (Setup Page, Alarm Menu).
Alarm Silencing
If alarm silencing is on the controller 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 in the lower display.

Push the Advance Key to display 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 or Silence. 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 Setting by the Security level. (default: 2)

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 ST 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 Setting by the Security level. (default: 2)

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 \( \text{LoCo} \) 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 \( \text{LoCP} \) sets the security level for the Profiling Page. (default: 3)

- Password Security Enable \( \text{Pase} \) will turn on or off the Password security feature. (default: off)

- Read Lockout Security \( \text{rLoC} \) determines which pages can be accessed. The user can access the selected level and all lower levels. (default: 5)

- Set Lockout Security \( \text{sLoC} \) determines which parameters within accessible pages can be written to. The user can write to the selected level and all lower levels. (default: 5)

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

| Lockout Security \( \text{sLoC} \) & \( \text{rLoC} \) |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Lockout Level   | 0               | 1               | 2               | 3               | 4               | 5               |
| Home Page       | Y               | Y               | Y               | Y               | Y               | Y               |
| Operations Page | N               | N               | Y               | Y               | Y               | Y               |
| Setup Page      | N               | N               | N               | N               | Y               | Y               |
| Profile Page    | N               | N               | N               | Y               | Y               | Y               |

Factory Page
| Custom Menu     | N               | N               | N               | N               | N               | Y               |
| Diagnostic Menu | N               | Y               | Y               | Y               | Y               | Y               |
| Calibration Menu| N               | N               | N               | N               | N               | Y               |

Lockout Menu

| \( \text{LoCo} \)        | N               | Y               | Y               | Y               | Y               |
| \( \text{LoCP} \)        | N               | Y               | Y               | Y               | Y               |
| \( \text{Pase} \)        | N               | Y               | Y               | Y               | Y               |
| \( \text{rLoC} \)        | Y               | Y               | Y               | Y               | Y               |
| \( \text{sLoC} \)        | Y               | Y               | Y               | Y               | Y               |

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

1. You can lock out access to the Operations Page but allow an operator access to the Profile Menu, by changing the default Profile Page and Operations Page security levels. Change Lock Operations Page \( \text{LoCo} \) to 3 and Lock Profiling Page \( \text{LoCP} \) to 2. If Set Lockout Security \( \text{sLoC} \) is set to 2 or higher and the Read Lockout Security \( \text{rLoC} \) is set to 2, the Profiling Page and Home Pages can be accessed, and all writable parameters can be written to. Pages with security levels greater than 2 will be locked out (unaccessible).

2. If Set Lockout Security \( \text{sLoC} \) is set to 0 and Read Lockout Security \( \text{rLoC} \) is set to 5, all pages will be accessible, however, changes will not be allowed on any pages or menus, with one exception: Set Lockout Security \( \text{sLoC} \) can be changed to a higher level.

3. The operator wants to read all the menus and not allow any parameters to be changed.

In the Factory Page, Lockout Menu, set Read
Lockout Security \([\text{rLoC}]\) to 5 and Set Lockout Security \([\text{SLoC}]\) to 0.

4. The operator wants to read and write to the Home Page and Profiling Page, and lock all other pages and menus.

   In the Factory Page, Lockout Menu, set Read Lockout Security \([\text{rLoC}]\) to 2 and Set Lockout Security \([\text{SLoC}]\) to 2.

   In the Factory Page, Lockout Menu, set Lock Operations Page \([\text{LoCP}]\) to 3 and Lock Profiling Page \([\text{LoCP}]\) to 2.

5. The operator wants to read the Operations Page, Setup Page, Profiling Page, Diagnostics Menu, Lock Menu, Calibration Menu and Custom Menus. The operator also wants to read and write to the Home Page.

   In the Factory Page, Lockout Menu, set Read Lockout Security \([\text{rLoC}]\) to 1 and Set Lockout Security \([\text{SLoC}]\) to 5.

   In the Factory Page, Lockout Menu, set Lock Operations Page \([\text{LoCP}]\) to 2 and Lock Profiling Page \([\text{LoCP}]\) to 3.

---

Using Password Security

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

How to Enable Password Security

Go to the Factory Page by holding down the Infinity \(\infty\) key and the Advance \(\triangle\) key for approximately six seconds. Once there, push the Down \(\downarrow\) key one time to get to the \([\text{LoC}]\) menu. Again push the Advance \(\triangle\) key until the Password Enabled \([\text{PASE}]\) prompt is visible. Lastly, push either the up or down key to turn it on. Once on, 4 new prompts will appear:

1. \([\text{LoCL}]\), Locked Access Level (1 to 5) corresponding to the lockout table above.
2. \([\text{rLoL}]\), Rolling Password will change the Customer Code every time power is cycled.
3. \([\text{PASU}]\), User Password which is needed for a User to acquire access to the control.
4. \([\text{PASA}]\), Administrator Password which is needed to acquire administrative access to the control.

The Administrator can either change the User and/or Administrator password or leave them in the default state. Once Password Security is enabled they will no longer be visible to anyone other than the Administrator. As can be seen in the formula that follows either the User or Administrator will need to know what those passwords are to acquire a higher level of access to the control. Back out of this menu by pushing the Infinity \(\infty\) 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 \([\text{ULoC}]\) menu. Once there follow the steps below:

**Note:**

If Password Security (Password Enabled \([\text{PASE}]\) 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 setup the control.

1. Acquire either the User Password \([\text{PASU}]\) or the Administrator Password \([\text{PASA}]\).

2. Push the Advance \(\triangle\) key one time where the Code \([\text{Code}]\) prompt will be visible.

**Note:**

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

b. If the Rolling Password \([\text{rROLL}]\) was turned on proceed on through steps 3 - 9.

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

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

5. Enter the result of the calculation in the upper display by using the Up \(\uparrow\) or Down \(\downarrow\) arrow keys or use EZ-ZONE Configurator Software.

6. Exit the Factory Page by pushing and holding the Infinity \(\infty\) 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 \([\text{rROLL}]\) is Off, Password \([\text{PASS}]\) equals User Password \([\text{PASU}]\).
b. If Rolling Password [roll] is On, Password [PASS] equals:
(PASS x code) Mod 929 + 70
8. Administrator
a. If Rolling Password [roll] is Off, Password [PASS] equals User Password [PASS].
b. If Rolling Password [roll] is On, Password [PASS] equals:
(PASS x code) Mod 997 + 1000

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

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

Modbus - Using Programmable Memory Blocks

When using the Modbus protocol, the ST 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.

Note:
To use the User Programmable Memory Blocks feature, Map 2 must be selected. Change the mapping [map] via the Setup Page under the [Com] Menu.

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.

CIP - Communications Capabilities

CIP Communications Methodology

To communicate with the ST using CIP an RUI/GTW must be used. Reading or writing when using CIP can be accomplished via explicit and or implicit communications. Explicit communications usually requires the use of a message instruction but there are other ways to do this as well. Implicit communications is also commonly referred to as polled communications. When using implicit communications there is an I/O assembly that would be read or written to; the assemblies are embedded into the ST firmware. Watlow refers to these assemblies as the T to O (Target to Originator) and the O to T (Originator to Target) assemblies where the Target is always the ST and the Originator is the PLC or master on the network. The O to T assembly is made up of 20 (32 bit) members that are user configurable where the T to O assembly consists of 21 (32 bit) members. The first member of the T to O assembly is called the Device Status and cannot be changed. However, the 20 members that follow it are user configurable (See Appendix: CIP Implicit O to T (Originator to Target) Assembly Structure and CIP Implicit T to O (Target to Originator) Assembly Structure).

To change any given member of either assembly simply write the new class, instance and attribute to the member location of choice. As an example, if it were desired to change the 14th member of the O to T assembly from the default parameter (Heat Proportional Band) to Limit Clear Request (see Operations Page, Limit Menu) write the value of 0x70, 0x01 and 0x01 (Class, Instance and Attribute respectively) to 0x77, 0x01 and 0x0E. Once executed, writing a value of zero to this member will reset a limit assuming the condition that caused it is no longer present.
Software Configuration

Using EZ-ZONE® Configurator Software

To enable a user to configure the ST 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 sub-folder "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 ST control click the next button to go on-line.

Note:

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

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

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

The available options allow the user to select "Try them all" or to use a specific known communications port. After installation of your converter if you are not sure which communications port was allocated select "Try them all" and then click next. The screen to follow shows that the software is scanning for devices on the network and that progress is being made.

When complete the software will display all of the available devices found on the network as shown below.

Watlow EZ-ZONE® ST • 76 • Chapter 7 Features
In the previous screen shot the ST 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. 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 (yellow highlight added for emphasis). When multiple EZ-ZONE devices are on the network it is important that the part number be noted prior to configuring so as to avoid making unwanted configuration changes to another control.

Looking closely at the left hand column (Parameter Menus) notice that it displays all of the available menus and associated parameters within the control. The menu structure as laid out within this software follows:
- Setup
- Operations
- Factory
- Profile

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 ST 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 then 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.
### Chapter 8: Appendix

#### Troubleshooting

<table>
<thead>
<tr>
<th>Indication</th>
<th>Description</th>
<th>Possible Cause(s)</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 control 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. |
| Fire 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. |
| 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. |
| 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. |
| Error Input | Sensor does not provide a valid signal to controller | • Sensor improperly wired or open  
  • Incorrect setting of sensor type  
  • Calibration corrupt | • Correct wiring or replace sensor.  
  • Match setting to sensor used.  
  • Check calibration of controller. |
| Limit won’t clear or reset | Limit will not clear or reset with keypad or digital input | • Sensor input is out of limit set point range  
  • Limit set point is incorrect  
  • Digital input function is incorrect | • Correct cause of sensor input out of limit range.  
  • Set limit set point to correct trip point.  
  • Set digital input function and source instance. |
| Limit Error | Limit state cannot be determined due to lack of sensor input, limit will trip | • Sensor improperly wired or open  
  • Incorrect setting of sensor type  
  • Calibration corrupt | • Correct wiring or replace sensor.  
  • Match setting to sensor used.  
  • Check calibration of controller. |
<table>
<thead>
<tr>
<th>Indication</th>
<th>Description</th>
<th>Possible Cause(s)</th>
<th>Corrective Action</th>
</tr>
</thead>
</table>
| **Li;L1**  | Limit Low   | Sensor input below low limit set point | • Temperature is less than limit set point  
• Limit outputs latch and require reset  
• Incorrect alarm set point | • Check cause of under temperature.  
• Clear limit.  
• Establish correct limit set point. |
| **Li;h1**  | Limit High  | Sensor input above high limit set point | • Temperature is greater than limit set point  
• Limit outputs latch and require reset  
• Incorrect alarm set point | • Check cause of over temperature.  
• Clear limit.  
• Establish correct limit set point. |
| **L.P.o1** | 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 with PID power at 100%. | • 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 |
| **L.P.r1** | Loop Reversed Error | Open Loop Detect is active and the process value is headed in the wrong direction when the output is activated based on deviation value and user-selected value. | • Setting of Open Loop Detect Time incorrect  
• Setting of Open Loop Detect Deviation incorrect  
• Output programmed for incorrect function  
• Thermocouple sensor wired in reverse polarity | • Set correct Open Loop Detect Time for application  
• Set correct Open Loop Deviation value for application  
• Set output function correctly  
• Wire thermocouple correctly, (red wire is negative) |
| **rP**     | Ramping     | Controller is ramping to new set point | • Ramping feature is activated | • Disable ramping feature if not required. |
| **tUNE**   | Autotuning  | 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 RUI (Remote User Interface) 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 Cause(s)</th>
<th>Corrective Action</th>
</tr>
</thead>
</table>
| Process doesn’t control to set point | Process is unstable or never reaches set point | • Controller not tuned correctly  
• Control mode is incorrectly set  
• Control set point is incorrect | • Perform autotune or manually tune system.  
• Set control mode appropriately (Open vs Closed Loop).  
• Set control set point in appropriate control mode and check source of set point: remote, idle, profile, closed loop, open loop. |
| Temperature runway        | Process value continues to increase or decrease past set point.             | • Controller output incorrectly programmed  
• Thermocouple reverse wired  
• Controller output wired incorrectly  
• Short in heater  
• Power controller connection to controller defective  
• Controller output defective | • Verify output function is correct (heat or cool).  
• Correct sensor wiring (red wire negative).  
• Verify and correct wiring.  
• Replace heater.  
• Replace or repair power controller. |
| `100` Device Error        | Controller displays internal malfunction message at power up.               | • Controller defective                                                                 | • Replace or repair controller. |
| `hEr` Heater Error        | Heater Error                                                                 | • Current through load is above current trip set point  
• Current through load is below current trip set point | • Check that the load current is proper.  
Correct cause of overcurrent and/or ensure current trip set point is correct.  
• Check that the load current is proper.  
Correct cause of undercurrent and/or ensure current trip set point is correct. |
| `C;Er` Current Error      | Load current incorrect.                                                      | • Shorted solid-state or mechanical relay  
• Open solid-state or mechanical relay  
• Defective current transformer or controller  
• Noisy electrical lines | • Replace relay.  
• Replace relay.  
• Replace or repair sensor or controller.  
• Route wires appropriately, check for loose connections, add line filters. |
| Menus inaccessible        | Unable to access `SEt`, `oPEr`, `FCTy`, or `PrOF` menus or particular prompts in Home Page | • Security set to incorrect level  
• Digital input set to lockout keypad  
• Custom parameters incorrect | • Check lockout setting in Factory Page.  
• Change state of digital input.  
• Change custom parameters in Factory Page. |
| EZ-Key doesn’t work        | EZ-Key does not activate required function                                   | • EZ-Key function incorrect  
• EZ-Key function instance not correct  
• Keypad malfunction | • Verify EZ-Key function in Setup Menu.  
• Check that the function instance is correct.  
• Replace or repair controller. |
| ```no` upper display      | The RUI (Remote User Interface) will not communicate with the controller at the selected zone. | • Communications wired incorrectly  
• Communications wires routed with power wires  
• Zone address set out of range  
• RUI or controller defective | • Check and correct wiring.  
• Check and correct wiring.  
• Check zone range and address.  
• Replace or repair RUI or controller. |
| `dEu` lower display       | Value cannot be displayed                                                     | • Scaling is out of range | • Check scaling.  
• Call technical support. |
### Modbus - Programmable Memory Blocks

**Assembly Definition Addresses and Assembly Working Addresses**

<table>
<thead>
<tr>
<th>Assembly Definition Addresses</th>
<th>Assembly Working Addresses</th>
<th>Assembly Definition Addresses</th>
<th>Assembly Working Addresses</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 &amp; 41</td>
<td>200 &amp; 201</td>
<td>80 &amp; 81</td>
<td>240 &amp; 241</td>
</tr>
<tr>
<td>42 &amp; 43</td>
<td>202 &amp; 203</td>
<td>82 &amp; 83</td>
<td>242 &amp; 243</td>
</tr>
<tr>
<td>44 &amp; 45</td>
<td>204 &amp; 205</td>
<td>84 &amp; 85</td>
<td>244 &amp; 245</td>
</tr>
<tr>
<td>46 &amp; 47</td>
<td>206 &amp; 207</td>
<td>86 &amp; 87</td>
<td>246 &amp; 247</td>
</tr>
<tr>
<td>48 &amp; 49</td>
<td>208 &amp; 209</td>
<td>88 &amp; 89</td>
<td>248 &amp; 249</td>
</tr>
<tr>
<td>50 &amp; 51</td>
<td>210 &amp; 211</td>
<td>90 &amp; 91</td>
<td>250 &amp; 251</td>
</tr>
<tr>
<td>52 &amp; 53</td>
<td>212 &amp; 213</td>
<td>92 &amp; 93</td>
<td>252 &amp; 253</td>
</tr>
<tr>
<td>54 &amp; 55</td>
<td>214 &amp; 215</td>
<td>94 &amp; 95</td>
<td>254 &amp; 255</td>
</tr>
<tr>
<td>56 &amp; 57</td>
<td>216 &amp; 217</td>
<td>96 &amp; 97</td>
<td>256 &amp; 257</td>
</tr>
<tr>
<td>58 &amp; 59</td>
<td>218 &amp; 219</td>
<td>98 &amp; 99</td>
<td>258 &amp; 259</td>
</tr>
<tr>
<td>60 &amp; 61</td>
<td>220 &amp; 221</td>
<td>100 &amp; 101</td>
<td>260 &amp; 261</td>
</tr>
<tr>
<td>62 &amp; 63</td>
<td>222 &amp; 223</td>
<td>102 &amp; 103</td>
<td>262 &amp; 263</td>
</tr>
<tr>
<td>64 &amp; 65</td>
<td>224 &amp; 225</td>
<td>104 &amp; 105</td>
<td>264 &amp; 265</td>
</tr>
<tr>
<td>66 &amp; 67</td>
<td>226 &amp; 227</td>
<td>106 &amp; 107</td>
<td>266 &amp; 267</td>
</tr>
<tr>
<td>68 &amp; 69</td>
<td>228 &amp; 229</td>
<td>108 &amp; 109</td>
<td>268 &amp; 269</td>
</tr>
<tr>
<td>70 &amp; 71</td>
<td>230 &amp; 231</td>
<td>110 &amp; 111</td>
<td>270 &amp; 271</td>
</tr>
<tr>
<td>72 &amp; 73</td>
<td>232 &amp; 233</td>
<td>112 &amp; 113</td>
<td>272 &amp; 273</td>
</tr>
<tr>
<td>74 &amp; 75</td>
<td>234 &amp; 235</td>
<td>114 &amp; 115</td>
<td>274 &amp; 275</td>
</tr>
<tr>
<td>76 &amp; 77</td>
<td>236 &amp; 237</td>
<td>116 &amp; 117</td>
<td>276 &amp; 277</td>
</tr>
<tr>
<td>78 &amp; 79</td>
<td>238 &amp; 239</td>
<td>118 &amp; 119</td>
<td>278 &amp; 279</td>
</tr>
</tbody>
</table>

### Modbus Default Assembly Structure 40-79

#### Assembly Definition Addresses

- **Default Pointers**
  - Pointer 1 = 1880 & 1881
  - Pointer 2 = 2160 & 2161
  - Pointer 3 = 2162 & 2163
  - Pointer 4 = 1480 & 1481
  - Pointer 5 = 1482 & 1483
  - Pointer 6 = 1530 & 1531
  - Pointer 7 = 1532 & 1533
  - Pointer 8 = 1580 & 1581
  - Pointer 9 = 1582 & 1583
  - Pointer 10 = 1630 & 1631

#### Assembly Working Addresses

- **Value of Pointer 1**
- **Value of Pointer 2**
- **Value of Pointer 3**
- **Value of Pointer 4**
- **Value of Pointer 5**
- **Value of Pointer 6**
- **Value of Pointer 7**
- **Value of Pointer 8**
- **Value of Pointer 9**
- **Value of Pointer 10**

#### Assembly Definition Addresses

- **Default Pointers**
  - Pointer 11 = 1632 & 1633
  - Pointer 12 = 2540 & 2541
  - Pointer 13 = 2520 & 2521
  - Pointer 14 = 1890 & 1891
  - Pointer 15 = 1892 & 1893
  - Pointer 16 = 1894 & 1895
  - Pointer 17 = 1896 & 1897
  - Pointer 18 = 1898 & 1899

#### Assembly Working Addresses

- **Value of Pointer 11**
- **Value of Pointer 12**
- **Value of Pointer 13**
- **Value of Pointer 14**
- **Value of Pointer 15**
- **Value of Pointer 16**
- **Value of Pointer 17**
- **Value of Pointer 18**
Modbus Default Assembly Structure 80-119

Assembly Definition
Addresses
Default Pointers

Assembly Working
Addresses

Registers 80 & 81
Pointer 21 = 360 & 361
Analog Input 1 Process Value

Registers 240 & 241
Value of Pointer 21

Registers 82 & 83
Pointer 22 = 362 & 363
Analog Input 1 Error Status

Registers 242 & 243
Value of Pointer 22

Registers 84 & 85
Pointer 23 = 440 & 441
Analog Input 2 Process Value

Registers 244 & 245
Value of Pointer 23

Registers 86 & 87
Pointer 24 = 442 & 443
Analog Input 2 Error Status

Registers 246 & 247
Value of Pointer 24

Registers 88 & 89
Pointer 25 = 1496 & 1497
Alarm 1 State

Registers 248 & 249
Value of Pointer 25

Registers 90 & 91
Pointer 26 = 1546 & 1547
Alarm 2 State

Registers 250 & 251
Value of Pointer 26

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

Registers 252 & 253
Value of Pointer 27

Registers 94 & 95
Pointer 28 = 1646 & 1647
Alarm 4 State

Registers 254 & 255
Value of Pointer 28

Registers 96 & 97
Pointer 29 = 1328 & 1329
Digital Input 5 Status

Registers 256 & 257
Value of Pointer 29

Registers 98 & 99
Pointer 30 = 1348 & 1349
Digital Input 6 Status

Registers 258 & 259
Value of Pointer 30

Assembly Definition
Registers
Default Pointers

Assembly Working
Registers

Registers 100 & 101
Pointer 31 = 1882 & 1883
Control Mode Active

Registers 260 & 261
Value of Pointer 31

Registers 102 & 103
Pointer 32 = 1904 & 1905
Heat Power

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 = 2529 & 2530
Profile Action Request

Registers 268 & 269
Value of Pointer 35

Registers 110 & 111
Pointer 36 = 2540 & 2541
Active File

Registers 270 & 271
Value of Pointer 36

Registers 112 & 113
Pointer 37 = 2524 & 2525
Active Step

Registers 272 & 273
Value of Pointer 37

Registers 114 & 115
Pointer 38 = 2526 & 2527
Active Set Point

Registers 274 & 275
Value of Pointer 38

Registers 116 & 117
Pointer 39 = 2528 & 2529
Step Time Remaining

Registers 276 & 277
Value of Pointer 39

Registers 118 & 119
Pointer 40 = 2536 & 2537
Step Time Remaining

Registers 278 & 279
Value of Pointer 40
### CIP Implicit O to T (Originator to Target) Assembly Structure

<table>
<thead>
<tr>
<th>Assembly Members</th>
<th>ST Assembly Class, Instance, Attribute</th>
<th>ST Data Type</th>
<th>Parameter</th>
<th>Parameter Class, Instance, Attribute</th>
<th>PLC Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0x77, 0x01, 0x01</td>
<td>DINT</td>
<td>Loop Control Mode</td>
<td>0x97, 0x01, 0x01</td>
<td>DINT</td>
</tr>
<tr>
<td>2</td>
<td>0x77, 0x01, 0x02</td>
<td>DINT</td>
<td>Closed Loop Set Point</td>
<td>0x6B, 0x01, 0x01</td>
<td>REAL</td>
</tr>
<tr>
<td>3</td>
<td>0x77, 0x01, 0x03</td>
<td>DINT</td>
<td>Open Loop Set Point</td>
<td>0x6B, 0x01, 0x02</td>
<td>REAL</td>
</tr>
<tr>
<td>4</td>
<td>0x77, 0x01, 0x04</td>
<td>DINT</td>
<td>Alarm 1 - Alarm High Set Point</td>
<td>0x6D, 0x01, 0x01</td>
<td>REAL</td>
</tr>
<tr>
<td>5</td>
<td>0x77, 0x01, 0x05</td>
<td>DINT</td>
<td>Alarm 1 - Alarm Low Set Point</td>
<td>0x6D, 0x01, 0x02</td>
<td>REAL</td>
</tr>
<tr>
<td>6</td>
<td>0x77, 0x01, 0x06</td>
<td>DINT</td>
<td>Alarm 2 - Alarm High Set Point</td>
<td>0x6D, 0x02, 0x01</td>
<td>REAL</td>
</tr>
<tr>
<td>7</td>
<td>0x77, 0x01, 0x07</td>
<td>DINT</td>
<td>Alarm 2 - Alarm Low Set Point</td>
<td>0x6D, 0x02, 0x02</td>
<td>REAL</td>
</tr>
<tr>
<td>8</td>
<td>0x77, 0x01, 0x08</td>
<td>DINT</td>
<td>Alarm 3 - Alarm High Set Point</td>
<td>0x6D, 0x03, 0x01</td>
<td>REAL</td>
</tr>
<tr>
<td>9</td>
<td>0x77, 0x01, 0x09</td>
<td>DINT</td>
<td>Alarm 3 - Alarm Low Set Point</td>
<td>0x6D, 0x03, 0x02</td>
<td>REAL</td>
</tr>
<tr>
<td>10</td>
<td>0x77, 0x01, 0x0A</td>
<td>DINT</td>
<td>Alarm 4 - Alarm High Set Point</td>
<td>0x6D, 0x04, 0x01</td>
<td>REAL</td>
</tr>
<tr>
<td>11</td>
<td>0x77, 0x01, 0x0B</td>
<td>DINT</td>
<td>Alarm 4 - Alarm Low Set Point</td>
<td>0x6D, 0x04, 0x02</td>
<td>REAL</td>
</tr>
<tr>
<td>12</td>
<td>0x77, 0x01, 0x0C</td>
<td>DINT</td>
<td>Profile Action Request</td>
<td>0x7A, 0x01, 0x0B</td>
<td>DINT</td>
</tr>
<tr>
<td>13</td>
<td>0x77, 0x01, 0x0D</td>
<td>DINT</td>
<td>Profile Start</td>
<td>0x7A, 0x01, 0x01</td>
<td>DINT</td>
</tr>
<tr>
<td>14</td>
<td>0x77, 0x01, 0x0E</td>
<td>DINT</td>
<td>Heat Proportional Band</td>
<td>0x97, 0x01, 0x06</td>
<td>REAL</td>
</tr>
<tr>
<td>15</td>
<td>0x77, 0x01, 0x0F</td>
<td>DINT</td>
<td>Cool Proportional Band</td>
<td>0x97, 0x01, 0x07</td>
<td>REAL</td>
</tr>
<tr>
<td>16</td>
<td>0x77, 0x01, 0x10</td>
<td>DINT</td>
<td>Time Integral</td>
<td>0x97, 0x01, 0x08</td>
<td>REAL</td>
</tr>
<tr>
<td>17</td>
<td>0x77, 0x01, 0x11</td>
<td>DINT</td>
<td>Time Derivative</td>
<td>0x97, 0x01, 0x09</td>
<td>REAL</td>
</tr>
<tr>
<td>18</td>
<td>0x77, 0x01, 0x12</td>
<td>DINT</td>
<td>Heat Hysteresis</td>
<td>0x97, 0x01, 0x0B</td>
<td>REAL</td>
</tr>
<tr>
<td>19</td>
<td>0x77, 0x01, 0x13</td>
<td>DINT</td>
<td>Cool Hysteresis</td>
<td>0x97, 0x01, 0x0C</td>
<td>REAL</td>
</tr>
<tr>
<td>20</td>
<td>0x77, 0x01, 0x14</td>
<td>DINT</td>
<td>Dead Band</td>
<td>0x97, 0x01, 0x0A</td>
<td>REAL</td>
</tr>
</tbody>
</table>

### CIP Implicit T to O (Target to Originator) Assembly Structure

<table>
<thead>
<tr>
<th>Assembly Members</th>
<th>ST Assembly Class, Instance, Attribute</th>
<th>ST Data Type</th>
<th>Parameter</th>
<th>Parameter Class, Instance, Attribute</th>
<th>PLC Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Can not be changed</td>
<td>none</td>
<td>Device Status</td>
<td>none</td>
<td>DINT</td>
</tr>
<tr>
<td>2</td>
<td>0x77, 0x02, 0x01</td>
<td>DINT</td>
<td>Analog Input 1, Analog Input Value</td>
<td>0x68, 0x01, 0x01</td>
<td>REAL</td>
</tr>
<tr>
<td>3</td>
<td>0x77, 0x02, 0x02</td>
<td>DINT</td>
<td>Analog Input 1, Input Error</td>
<td>0x68, 0x01, 0x02</td>
<td>DINT</td>
</tr>
<tr>
<td>4</td>
<td>0x77, 0x02, 0x03</td>
<td>DINT</td>
<td>Analog Input 2, Analog Input Value</td>
<td>0x68, 0x02, 0x01</td>
<td>REAL</td>
</tr>
<tr>
<td>5</td>
<td>0x77, 0x02, 0x04</td>
<td>DINT</td>
<td>Analog Input 2, Input Error</td>
<td>0x68, 0x02, 0x02</td>
<td>DINT</td>
</tr>
<tr>
<td>6</td>
<td>0x77, 0x02, 0x05</td>
<td>DINT</td>
<td>Alarm 1, Alarm State</td>
<td>0x6D, 0x01, 0x09</td>
<td>DINT</td>
</tr>
<tr>
<td>7</td>
<td>0x77, 0x02, 0x06</td>
<td>DINT</td>
<td>Alarm 2, Alarm State</td>
<td>0x6D, 0x02, 0x09</td>
<td>DINT</td>
</tr>
<tr>
<td>8</td>
<td>0x77, 0x02, 0x07</td>
<td>DINT</td>
<td>Alarm 3, Alarm State</td>
<td>0x6D, 0x03, 0x09</td>
<td>DINT</td>
</tr>
<tr>
<td>9</td>
<td>0x77, 0x02, 0x08</td>
<td>DINT</td>
<td>Alarm 4, Alarm State</td>
<td>0x09, 0x04, 0x09</td>
<td>DINT</td>
</tr>
<tr>
<td>10</td>
<td>0x77, 0x02, 0x09</td>
<td>DINT</td>
<td>Event Status</td>
<td>0x6E, 0x01, 0x05</td>
<td>DINT</td>
</tr>
<tr>
<td>11</td>
<td>0x77, 0x02, 0x0A</td>
<td>DINT</td>
<td>Event Status</td>
<td>0x6E, 0x02, 0x05</td>
<td>DINT</td>
</tr>
<tr>
<td>12</td>
<td>0x77, 0x02, 0x0B</td>
<td>DINT</td>
<td>Control Mode Active</td>
<td>0x97, 0x01, 0x02</td>
<td>DINT</td>
</tr>
<tr>
<td>13</td>
<td>0x77, 0x02, 0x0C</td>
<td>DINT</td>
<td>Heat Power</td>
<td>0x97, 0x01, 0x0D</td>
<td>REAL</td>
</tr>
<tr>
<td>14</td>
<td>0x77, 0x02, 0x0D</td>
<td>DINT</td>
<td>Cool Power</td>
<td>0x97, 0x01, 0x0E</td>
<td>REAL</td>
</tr>
<tr>
<td>15</td>
<td>0x77, 0x02, 0x0E</td>
<td>DINT</td>
<td>Limit State</td>
<td>0x70, 0x01, 0x06</td>
<td>DINT</td>
</tr>
<tr>
<td>16</td>
<td>0x77, 0x02, 0x0F</td>
<td>DINT</td>
<td>Profile Start</td>
<td>0x74, 0x01, 0x01</td>
<td>DINT</td>
</tr>
<tr>
<td>17</td>
<td>0x77, 0x02, 0x10</td>
<td>DINT</td>
<td>Profile Action Request</td>
<td>0x74, 0x01, 0x0B</td>
<td>DINT</td>
</tr>
<tr>
<td>18</td>
<td>0x77, 0x02, 0x11</td>
<td>DINT</td>
<td>Current Profile</td>
<td>0x74, 0x01, 0x03</td>
<td>DINT</td>
</tr>
<tr>
<td>19</td>
<td>0x77, 0x02, 0x12</td>
<td>DINT</td>
<td>Current Step</td>
<td>0x74, 0x01, 0x04</td>
<td>DINT</td>
</tr>
<tr>
<td>20</td>
<td>0x77, 0x02, 0x13</td>
<td>DINT</td>
<td>Active Set Point</td>
<td>0x74, 0x01, 0x05</td>
<td>REAL</td>
</tr>
<tr>
<td>21</td>
<td>0x77, 0x02, 0x14</td>
<td>DINT</td>
<td>Step Time Remaining</td>
<td>0x74, 0x01, 0x09</td>
<td>REAL</td>
</tr>
</tbody>
</table>
Specifications

Line Voltage/Power
- 85 to 264V~ (ac), 47 to 63Hz
- 20 to 26V~(ac/dc), 47 to 63Hz
- 12VA maximum power consumption without mechanical contactor in system
- 50VA maximum power consumption with mechanical contactor in system
- 140VA maximum power consumption with external contactor
- Data retention upon power failure via nonvolatile memory

Environment (See Derating Curves in Declaration of Conformity)
- -18 to 70°C (0 to 158°F) operating temperature
- -40 to 85°C (-40 to 185°F) storage temperature
- 0 to 90 percent RH, non-condensing

Accuracy
- Calibration accuracy and sensor conformity: ±0.1 percent 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: 25°C, ±3°C (77°F, ±5°F)
- Accuracy span: 540°C (1000°F) minimum
- Temperature stability: ±0.1°C/°C (±0.1°F/°F) rise in ambient maximum

Agency Approvals
- UL® 508 file E102269, cULus, CE, RoHS, W.E.E.E.
- Product is UL recognized when purchased as components. Product is UL listed when purchased as a complete assembly.
- CSA approved C22.2#14 file 158031
- Limit version features FM approval

Controller
- Microprocessor-based, user-selectable control modes
- PID module: Single universal input, 2 outputs
- Limit module: Single universal input, 2 outputs
- Two additional digital input/outputs shared between PID and limit functions
- Control sampling rates: input 10 Hz, outputs 10 Hz
- Isolated EIA 485 Modbus® RTU serial communications

Wiring Termination Touch-Safe Terminals
- Input, power and controller output terminals touch safe removable 4 to 0.34 mm² (12 to 22 AWG), 7.0 lb-in. torque.
- Power load terminals 3.3 to 0.324 mm² (6 to 12 AWG) STR 90°C (194°F) copper conductor only, 3.96 Nm (35 lb-in) torque
- Temperature rating for line and lug loads 90°C (194°F)

Universal Input
- Thermocouple, grounded or ungrounded sensors
- RTD 2- or 3-wire, platinum, 100 Ω @ 0°C calibration to DIN curve (0.00385 Ω/Ω/°C)
- Process, 0 to 20 mA @ 100 Ω, or 0 to 10V= (dc) @ 20 kΩ input impedance; scalable, 0 to 50 mV
- Inverse scaling
- >20 MΩ input impedance
- Maximum of 20 kΩ source resistance
- Maximum of 20 Ω lead resistance for an RTD
- 42V= (dc) isolation voltage for input 2

Digital Input
- Update rate 1 Hz
- Dry contact or dc voltage

DC voltage
- Maximum input 36V at 3 mA
- Minimum high state 3V at 0.25 mA
- Maximum low state 2V

Dry contact
- Maximum short circuit 13 mA
- Minimum open resistance 500 Ω

Current Measurement
- Nominal operating frequency 50 to 60 Hz.
- Accuracy ±15% of displayed value
- Accuracy range 5 to 50 A
- Operating range 2 to 50 A

Digital Output
- Update rate 10 Hz
- Output voltage 24V, current limit 10 mA

Input Accuracy Span Ranges
Type J: 0 to 815°C or 32 to 1500°F
Type K: -200 to 1370°C or -328 to 2500°F
Type T: -200 to 400°C or -328 to 750°F
Type N: 0 to 1300°C or 32 to 2372°F
Type E: -200 to 800°C or -328 to 1470°F
Type C: 0 to 2315°C or 32 to 4200°F
Type D: 0 to 2315°C or 32 to 4200°F
Type F: 0 to 1395°C or 32 to 2543°F
Type R: 0 to 1760°C or 32 to 3200°F
Type S: 0 to 1760°C or 32 to 3200°F
Type B: 0 to 1816°C or 32 to 3300°F
RTD (DIN): -200 to 800°C or -328 to 1472°F
Process: -1999 to 9999 units

Output Hardware
- User selectable for heat-cool as on-off, P, PI, PD, PID, alarm or limit action.
- Output 1: SSR drive 20 to 28V= (dc) low side open collector switch
- Output 2: SSR, Form A, 0.5 A @ 24V~ (ac) minimum, 264V~ (ac) maximum, optically isolated, without contact suppression
- Output 4: Electromechanical relay. Form A, rated 2 A, 125VA, pilot duty, 120/240V~ (ac); 25VA, 24V~ (ac)
- Output 2: Electromechanical relay. Form A, rated 5 A, 125VA, pilot duty, 120/240V~ (ac); 25VA, 24V~ (ac)
- Output 3: Electromechanical relay. Form C, rated 5 A, 125VA, pilot duty, 120/240V~ (ac); 25VA, 24V~ (ac)

Weight:
- 40 A heat sink assembly only, 431 g (0.95 lb)
- 25 A heat sink assembly only, 340 g (0.75 lb)
- solid-state relay controller only, 171 g (0.39 lb)
- solid-state relay controller only with base without heat sink, 345g (0.76 lb)
- full system with 25 A heat sink, 1.134 kg (2.5 lb)

Note:
These specifications are subject to change without prior notice.
Ordering Information
Model Numbers for EZ-ZONE® ST

EZ-ZONE ST Integrated Control Loop

- Output 1 is dedicated to controlling the internal SSR.
- If 75A heat sink is selected below 1 Digital Input (6) will be factory set and fixed as the SSR over temperature Digital Input.

Output 2, Digital I/O and Current Measurement

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>0.5 A solid-state relay</td>
</tr>
<tr>
<td>B</td>
<td>0.5 A solid-state relay with 2 digital i/o points</td>
</tr>
<tr>
<td>P</td>
<td>0.5 A solid-state relay with current measurement</td>
</tr>
<tr>
<td>E</td>
<td>0.5 A solid-state relay with 2 digital i/o points and current measurement</td>
</tr>
<tr>
<td>H</td>
<td>5 A mechanical relay form A</td>
</tr>
<tr>
<td>D</td>
<td>5 A mechanical relay form A, 2 digital i/o points</td>
</tr>
<tr>
<td>J</td>
<td>5 A mechanical relay form A, current measurement</td>
</tr>
<tr>
<td>C</td>
<td>5 A mechanical relay form A, 2 digital i/o points, current measurement</td>
</tr>
</tbody>
</table>

Integrated Limit Controller

1 universal input and 2 outputs

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>None</td>
</tr>
<tr>
<td>L</td>
<td>Limit control module (output 3, 5A, Form C mech. relay; output 4, 2A, Form A mech. relay)</td>
</tr>
<tr>
<td>B</td>
<td>Terminal block access to mechanical contactor coil contacts</td>
</tr>
</tbody>
</table>

Mechanical Contactor and Power Supply

If the limit controller was ordered, the contactor will come internally connected to output 4 on the limit module. The contactor has external contacts available for daisy chaining to other branch circuit components.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AH</td>
<td>No contactor and universal high voltage power supply 100 to 240V ac/dc</td>
</tr>
<tr>
<td>AL</td>
<td>No contactor and universal low voltage power supply 24 to 28V ac/dc</td>
</tr>
<tr>
<td>B1</td>
<td>Single pole, 40 A Watlow contactor, 24V ac power supply</td>
</tr>
<tr>
<td>B2</td>
<td>Single pole, 40 A Watlow contactor, 110 / 120V ac power supply</td>
</tr>
<tr>
<td>B3</td>
<td>Single pole, 40 A Watlow contactor, 208 / 240V ac power supply</td>
</tr>
<tr>
<td>F1</td>
<td>Dual pole, 40 A Watlow contactor, 24V ac power supply</td>
</tr>
<tr>
<td>F2</td>
<td>Dual pole, 40 A Watlow contactor, 110 / 120V ac power supply</td>
</tr>
<tr>
<td>F3</td>
<td>Dual pole, 40 A Watlow contactor, 208 / 240V ac power supply</td>
</tr>
</tbody>
</table>

Communications

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Standard software to connect to pc software, remote user interface (RUI) and other EZ-ZONE devices</td>
</tr>
<tr>
<td>M</td>
<td>Modbus™ RTU communication port to connect to non-ST products</td>
</tr>
</tbody>
</table>

Solid-State Relay

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Zero Cross 10 A, 24 to 240V~ (ac) output</td>
</tr>
<tr>
<td>C</td>
<td>Zero Cross 25 A, 24 to 240V~ (ac) output</td>
</tr>
<tr>
<td>D</td>
<td>Zero Cross 40 A, 24 to 240V~ (ac) output</td>
</tr>
<tr>
<td>*E</td>
<td>Zero Cross 50 A, 24 to 240V~ (ac) output</td>
</tr>
<tr>
<td>*K</td>
<td>Zero Cross 75 A, 24 to 240V~ (ac) output</td>
</tr>
<tr>
<td>*F</td>
<td>Zero Cross 90 A, 24 to 240V~ (ac) output</td>
</tr>
<tr>
<td>G</td>
<td>Zero Cross 25 A, 48 to 600V~ (ac) output</td>
</tr>
<tr>
<td>H</td>
<td>Zero Cross 40 A, 48 to 600V~ (ac) output</td>
</tr>
</tbody>
</table>

Heat Sinks

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>None (no DIN-rail mount)</td>
</tr>
<tr>
<td>B</td>
<td>25A</td>
</tr>
<tr>
<td>C</td>
<td>40A</td>
</tr>
<tr>
<td>D</td>
<td>75A, 24V dc fan cooled</td>
</tr>
<tr>
<td>E</td>
<td>75A, 115V ac fan cooled</td>
</tr>
<tr>
<td>F</td>
<td>75A, 240V ac fan cooled</td>
</tr>
</tbody>
</table>

Note: If heat sink option D, E or F is selected the integrated PID controller options B, E, D or C must also be ordered.

The 75A heat sink includes an SSR over-temperature thermostat shut-down feature factory connected to Digital Input 6.

Firmware

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Standard Watlow</td>
</tr>
<tr>
<td>P</td>
<td>Profile ramp and soak (4 profiles, 40 steps)</td>
</tr>
<tr>
<td>S</td>
<td>Custom</td>
</tr>
</tbody>
</table>

Customization (logo, parameters, hardware, firmware)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>Standard</td>
</tr>
<tr>
<td>XX</td>
<td>(letters to be determined, consult factory)</td>
</tr>
</tbody>
</table>
**EZ-ZONE ST Replacement Modules**

**STRC-0** *(Series ST Replacement Control Module)*
- Output 1 is dedicated to controlling the internal Solid-State Relay.
- Includes 1 universal input and 2 outputs for heat, cool or alarm

**Output 2, Digital I/O and Current Measurement**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>0.5 A solid-state relay</td>
</tr>
<tr>
<td>B</td>
<td>0.5 A solid-state relay with 2 digital i/o points</td>
</tr>
<tr>
<td>P</td>
<td>0.5 A solid-state relay with current measurement</td>
</tr>
<tr>
<td>E</td>
<td>0.5 A solid-state relay with 2 digital i/o points and current measurement</td>
</tr>
<tr>
<td>H</td>
<td>5 A mechanical relay form A</td>
</tr>
<tr>
<td>D</td>
<td>5 A mechanical relay form A, 2 digital i/o points</td>
</tr>
<tr>
<td>J</td>
<td>5 A mechanical relay form A, current measurement</td>
</tr>
<tr>
<td>C</td>
<td>5 A mechanical relay form A, 2 digital i/o points, current measurement</td>
</tr>
</tbody>
</table>

**Integrated Limit Controller**
- 1 universal input and 2 outputs

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>None</td>
</tr>
<tr>
<td>L</td>
<td>Limit control module (output 3, 5A, Form C mech. relay; out. 4, 2A, Form A mech. relay)</td>
</tr>
<tr>
<td>B</td>
<td>Terminal block access to mechanical contactor coil contacts</td>
</tr>
</tbody>
</table>

**Power Supply for Mechanical Contactor**
- L - For use with mechanical contactor options AL, B1 and F1
- H - For use with mechanical contactor options AH, B2, B3, F2 and F3

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Low voltage power supply 24 to 28V (ac/dc)</td>
</tr>
<tr>
<td>H</td>
<td>High voltage power supply 100 to 240V (ac/dc)</td>
</tr>
</tbody>
</table>

**Communications**
- A - Standard software to connect to pc software, remote user interface (RUI) and other EZ-ZONE devices
- M - Modbus™ RTU communication port to connect to non-ST products

**Firmware**

<table>
<thead>
<tr>
<th>Options</th>
<th>Original Model Includes a Phase Angle SSR SSR = M, N, P, R, S or T</th>
<th>Original Model Includes a 75A Heat Sink Heat Sink = D, E or F</th>
<th>Original Model Includes Profile Ramp &amp; Soak Firmware = P</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>C</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>D</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>E</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>F</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>G</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>H</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>J</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Customization (logo, parameters, hardware, firmware)**

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>Standard</td>
</tr>
<tr>
<td>XX</td>
<td>(letters to be determined, consult factory)</td>
</tr>
</tbody>
</table>
## Ordering Information for EZ-ZONE ST Replacement Base

<table>
<thead>
<tr>
<th>Code Number</th>
<th>S T R T - B A S E - _ _ _ _</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Series ST Replacement Base</strong></td>
</tr>
</tbody>
</table>

### Integrated Mechanical Controller
- **0000** Compact base version (no space for mechanical contactor)
- **DPB1** Base housing with single-pole, 40 A Watlow contactor, 24V~ (ac) power supply
- **DPB2** Base housing with single-pole, 40 A Watlow contactor, 110/120V~ (ac) power supply
- **DPB3** Base housing with single-pole, 40 A Watlow contactor, 208/240V~ (ac) power supply
- **DPF1** Base housing with dual-pole, 40 A Watlow contactor, 24V~ (ac) power supply
- **DPF2** Base housing with dual-pole, 40 A Watlow contactor, 110/120V~ (ac) power supply
- **DPF3** Base housing with dual-pole, 40 A Watlow contactor, 208/240V~ (ac) power supply

## Ordering Information for EZ-ZONE® ST Replacement Heat Sink

<table>
<thead>
<tr>
<th>Code Number</th>
<th>S T R T - H S - _ _ _ _ _ _</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Series ST Replacement Heat Sink</strong></td>
</tr>
</tbody>
</table>

### Heat Sink Base Configuration (Integrated Mechanical Contactor)
- **AA** Heat sink for mounting to compact base with no mechanical contactor (ordered separately STRT-BASE-_ _ _ _ )
- **CB** Heat sink for mounting to large base with integrated mechanical contactor (base and contactor ordered separately under STRT-BASE-_ _ _ _ )

### Heat Sink Amperage Rating
- **B** 25A
- **C** 40A
- **D** 75A 24V= (dc) fan cooled
- **E** 75A 115V~ (ac) fan cooled
- **F** 75A 240V~ (ac) fan cooled

## Ordering Information for EZ-ZONE ST Replacement Solid State Relays (SSRs)

<table>
<thead>
<tr>
<th>Code Number</th>
<th>Relay Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0003-0214-0000</td>
<td>Zero Cross 10A and 25A replacement (24 to 240V~ (ac) output)</td>
</tr>
<tr>
<td>0003-0215-0000</td>
<td>Zero Cross 40A and 50A replacement (24 to 240V~ (ac) output)**</td>
</tr>
<tr>
<td>0802-0952-0000</td>
<td>Zero Cross 75A and 90A replacement (24 to 240V~ (ac) output)**</td>
</tr>
<tr>
<td>0003-0216-0000</td>
<td>Zero Cross 25A replacement (48 to 600V~ (ac) output)</td>
</tr>
<tr>
<td>0003-0217-0000</td>
<td>Zero Cross 40A replacement (48 to 600V~ (ac) output)</td>
</tr>
<tr>
<td>0802-0951-0000</td>
<td>Zero Cross 75A and 90A replacement (48 to 600V~ (ac) output)**</td>
</tr>
<tr>
<td>0003-0256-0001</td>
<td>Phase Angle 25A (100-240V~ (ac) output)</td>
</tr>
<tr>
<td>0003-0256-0003</td>
<td>Phase Angle 40A (100-240V~ (ac) output)</td>
</tr>
<tr>
<td>0003-0256-0005</td>
<td>Phase Angle 75A (100-240V~ (ac) output)**</td>
</tr>
</tbody>
</table>
| 0003-0256-0003| Phase Angle 25A (260-600V~ (ac) output)                                            |**
| 0003-0256-0004| Phase Angle 40A (260-600V~ (ac) output)                                            |
| 0003-0256-0006| Phase Angle 75A (260-600V~ (ac) output)**                                         |

** EZ-ZONE ST contactor rated for maximum 40A
### Index

<table>
<thead>
<tr>
<th>Page</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>49</td>
<td>Alarm Blocking 49, 73</td>
</tr>
<tr>
<td>52</td>
<td>AC Line Frequency 52, 71</td>
</tr>
<tr>
<td>50</td>
<td>Alarm Display 50</td>
</tr>
<tr>
<td>35</td>
<td>Alarm High Set Point 35, 72</td>
</tr>
<tr>
<td>49</td>
<td>Alarm Logic 49</td>
</tr>
<tr>
<td>33</td>
<td>Alarm Menu 33, 65</td>
</tr>
<tr>
<td>36</td>
<td>Alarm Source Instance 36</td>
</tr>
<tr>
<td>50</td>
<td>Autotune Set Point 33, 65</td>
</tr>
<tr>
<td>72</td>
<td>Attention 72, 73</td>
</tr>
<tr>
<td>48</td>
<td>Autotune 33, 65</td>
</tr>
<tr>
<td>68</td>
<td>Baud Rate 53</td>
</tr>
<tr>
<td>44</td>
<td>Cool Algorithm 44, 69</td>
</tr>
<tr>
<td>63</td>
<td>Calibration Menu 63</td>
</tr>
<tr>
<td>36</td>
<td>Current Error 36</td>
</tr>
<tr>
<td>52</td>
<td>Display Units 52, 53</td>
</tr>
<tr>
<td>36</td>
<td>Cool Hysteresis 36</td>
</tr>
<tr>
<td>55</td>
<td>Cool Hysteresis 34, 69</td>
</tr>
<tr>
<td>60</td>
<td>Clear 72</td>
</tr>
<tr>
<td>66</td>
<td>Control Mode Active 32</td>
</tr>
<tr>
<td>74</td>
<td>Public Key 62</td>
</tr>
<tr>
<td>53</td>
<td>Unlock Code 74</td>
</tr>
<tr>
<td>47</td>
<td>Communications Menu 53</td>
</tr>
<tr>
<td>61</td>
<td>Cool Proportional Band 34, 65, 70</td>
</tr>
<tr>
<td>65</td>
<td>Cool Power 33, 65</td>
</tr>
<tr>
<td>33</td>
<td>Closed Loop Set Point 33</td>
</tr>
<tr>
<td>33</td>
<td>Closed Loop Working Set Point 33</td>
</tr>
<tr>
<td>36</td>
<td>Current Read 36</td>
</tr>
<tr>
<td>50</td>
<td>Current Menu 36, 50</td>
</tr>
<tr>
<td>62</td>
<td>Custom Setup 60</td>
</tr>
<tr>
<td>62</td>
<td>Date of Manufacture 62</td>
</tr>
<tr>
<td>48</td>
<td>Dead Band 34, 70</td>
</tr>
<tr>
<td>42</td>
<td>Decimal 42</td>
</tr>
<tr>
<td>42</td>
<td>Diagnostics Menu 62</td>
</tr>
<tr>
<td>52</td>
<td>Digital Input/Output Menu 42</td>
</tr>
<tr>
<td>44</td>
<td>Direction 42</td>
</tr>
<tr>
<td>32</td>
<td>Digital Output State 32</td>
</tr>
<tr>
<td>52</td>
<td>Display Pairs 52</td>
</tr>
<tr>
<td>32</td>
<td>Event Input Status 32</td>
</tr>
<tr>
<td>63</td>
<td>Electrical Input Offset 63, 67</td>
</tr>
<tr>
<td>67</td>
<td>Electrical Input Slope 63, 67</td>
</tr>
<tr>
<td>63</td>
<td>Electrical Output Offset 63</td>
</tr>
<tr>
<td>63</td>
<td>Electrical Output Slope 63</td>
</tr>
<tr>
<td>58</td>
<td>End 58</td>
</tr>
<tr>
<td>58</td>
<td>End Type 56</td>
</tr>
<tr>
<td>38</td>
<td>Active Event Output 1 38</td>
</tr>
<tr>
<td>57</td>
<td>Event Output 1 57</td>
</tr>
<tr>
<td>57</td>
<td>Event Output 2 57</td>
</tr>
<tr>
<td>45, 68</td>
<td>Input Error Failure 45, 68</td>
</tr>
<tr>
<td>44, 47</td>
<td>Digital Output Function Instance 42, 44</td>
</tr>
<tr>
<td>47</td>
<td>Output Function Instance 47</td>
</tr>
<tr>
<td>67</td>
<td>Filter 41</td>
</tr>
<tr>
<td>47, 48</td>
<td>Output Function 47, 48</td>
</tr>
<tr>
<td>51</td>
<td>Function Key Menu 51</td>
</tr>
<tr>
<td>52</td>
<td>Global Menu 52</td>
</tr>
<tr>
<td>52</td>
<td>Guaranteed Soak Deviation 52</td>
</tr>
<tr>
<td>52</td>
<td>Guaranteed Soak Enable 52</td>
</tr>
<tr>
<td>44</td>
<td>Heat Algorithm 44, 69</td>
</tr>
<tr>
<td>36</td>
<td>Heater Error 36</td>
</tr>
<tr>
<td>69</td>
<td>Heat Hysteresis 34, 69</td>
</tr>
<tr>
<td>68</td>
<td>Heat Algorithm 44, 69</td>
</tr>
<tr>
<td>46, 71</td>
<td>Heat Power 33, 65</td>
</tr>
<tr>
<td>47</td>
<td>Control Loop High Set Point 47</td>
</tr>
<tr>
<td>31, 66–67</td>
<td>Calibration Offset 31, 66–67</td>
</tr>
<tr>
<td>33</td>
<td>Idle Set Point 33</td>
</tr>
<tr>
<td>42</td>
<td>Input Error Latching 42</td>
</tr>
<tr>
<td>31</td>
<td>Input Error Status 31</td>
</tr>
<tr>
<td>52</td>
<td>Jump Count 52</td>
</tr>
<tr>
<td>56</td>
<td>Jump Count Remaining 38</td>
</tr>
<tr>
<td>56</td>
<td>Jump Step 56</td>
</tr>
<tr>
<td>46</td>
<td>Open Loop Detect Deviation 46</td>
</tr>
<tr>
<td>46</td>
<td>Open Loop Detect Enable 46</td>
</tr>
<tr>
<td>46</td>
<td>Open Loop Detect Time 46</td>
</tr>
<tr>
<td>44</td>
<td>Limit Hysteresis 44</td>
</tr>
<tr>
<td>32, 44</td>
<td>Limit Menu 32, 44</td>
</tr>
<tr>
<td>40</td>
<td>Linearization 40</td>
</tr>
<tr>
<td>32</td>
<td>Limit Low Set Point 32</td>
</tr>
<tr>
<td>60</td>
<td>Security Setting Menu 60, 62</td>
</tr>
<tr>
<td>74</td>
<td>Locked Access Level 74</td>
</tr>
<tr>
<td>74</td>
<td>Locked Access Level 74</td>
</tr>
<tr>
<td>61</td>
<td>Locked Access Level 61</td>
</tr>
<tr>
<td>73</td>
<td>Lock Operations page 73</td>
</tr>
<tr>
<td>60</td>
<td>Lock Operations Page 60, 73</td>
</tr>
<tr>
<td>62</td>
<td>Lock Profiling Page 61, 62, 73</td>
</tr>
<tr>
<td>44</td>
<td>Control Loop Menu 44</td>
</tr>
<tr>
<td>33</td>
<td>Loop Menu 33</td>
</tr>
<tr>
<td>44</td>
<td>Limit Sides 44</td>
</tr>
<tr>
<td>46</td>
<td>Loop Low Set Point 46</td>
</tr>
<tr>
<td>46</td>
<td>Manual Power 46</td>
</tr>
<tr>
<td>53</td>
<td>Modbus Word Order 53</td>
</tr>
<tr>
<td>55</td>
<td>Minutes 55</td>
</tr>
<tr>
<td>32</td>
<td>Monitor Menu 32</td>
</tr>
<tr>
<td>63, 67</td>
<td>Electrical Measurement 63, 67</td>
</tr>
<tr>
<td>53</td>
<td>Non-volatile Save 53</td>
</tr>
<tr>
<td>42, 47</td>
<td>Output Control 42, 47</td>
</tr>
<tr>
<td>66</td>
<td>Output Function 66</td>
</tr>
<tr>
<td>43, 48</td>
<td>Output High Power Scale 43, 48</td>
</tr>
<tr>
<td>43, 48</td>
<td>Output Low Power Scale 43, 48</td>
</tr>
<tr>
<td>34</td>
<td>Open Loop Set Point 34</td>
</tr>
<tr>
<td>43, 48</td>
<td>Output Time Base 43, 48</td>
</tr>
<tr>
<td>47</td>
<td>Output Menu 47</td>
</tr>
<tr>
<td>53</td>
<td>Parity 53</td>
</tr>
<tr>
<td>74</td>
<td>Administrator Password 62, 74</td>
</tr>
<tr>
<td>61</td>
<td>Administrator Password 74</td>
</tr>
<tr>
<td>61</td>
<td>Password Enable 61</td>
</tr>
<tr>
<td>73</td>
<td>Password Security Enable 73</td>
</tr>
<tr>
<td>61</td>
<td>Password 62, 74</td>
</tr>
<tr>
<td>61</td>
<td>User Password 61, 74</td>
</tr>
<tr>
<td>74</td>
<td>User Password 74</td>
</tr>
<tr>
<td>41</td>
<td>Process Error Enable 41</td>
</tr>
<tr>
<td>41</td>
<td>Process Error Low 41</td>
</tr>
<tr>
<td>37</td>
<td>Profile Status Menu 37</td>
</tr>
<tr>
<td>52</td>
<td>Profile Type 52</td>
</tr>
<tr>
<td>33</td>
<td>Process Value Active 33</td>
</tr>
<tr>
<td>55, 57</td>
<td>Rate 55, 57</td>
</tr>
<tr>
<td>68</td>
<td>Range High 41, 68</td>
</tr>
<tr>
<td>68</td>
<td>Range Low 41, 42, 68</td>
</tr>
<tr>
<td>61, 73</td>
<td>Read Lockout Security 61, 73</td>
</tr>
<tr>
<td>61</td>
<td>Rolling Password 61, 74</td>
</tr>
<tr>
<td>74</td>
<td>Rolling Password 74</td>
</tr>
<tr>
<td>46</td>
<td>Ramp Action 46, 71</td>
</tr>
<tr>
<td>46, 71</td>
<td>Ramp Rate 46, 71</td>
</tr>
<tr>
<td>46, 71</td>
<td>Ramp Scale 46, 71</td>
</tr>
<tr>
<td>40</td>
<td>RTD Leads 40</td>
</tr>
<tr>
<td>62</td>
<td>Software Build 62</td>
</tr>
<tr>
<td>55</td>
<td>Seconds 55</td>
</tr>
<tr>
<td>40, 66, 68</td>
<td>Sensor Type 40, 66, 68</td>
</tr>
<tr>
<td>62</td>
<td>Source Function A 48</td>
</tr>
<tr>
<td>41</td>
<td>Scale High 41, 68</td>
</tr>
<tr>
<td>62</td>
<td>Software ID 62</td>
</tr>
<tr>
<td>72</td>
<td>Silence 72</td>
</tr>
<tr>
<td>68</td>
<td>Scale Low 41, 68</td>
</tr>
<tr>
<td>61, 73</td>
<td>Set Lockout Security 61, 73</td>
</tr>
<tr>
<td>62</td>
<td>Serial Number 62</td>
</tr>
<tr>
<td>47</td>
<td>Set Point High Limit Open Loop 47</td>
</tr>
<tr>
<td>47</td>
<td>Set Point Low Limit Open Loop 47</td>
</tr>
<tr>
<td>62</td>
<td>Software Release 62</td>
</tr>
<tr>
<td>39, 48</td>
<td>Soft Start Time 39, 48</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>A</td>
<td>AC Line Frequency 52, 71</td>
</tr>
<tr>
<td></td>
<td>Active Event Output (1 or 2) 38</td>
</tr>
<tr>
<td></td>
<td>Active Step 37</td>
</tr>
<tr>
<td></td>
<td>Active Step Type 37</td>
</tr>
<tr>
<td></td>
<td>adaptive tuning 66</td>
</tr>
<tr>
<td></td>
<td>address</td>
</tr>
<tr>
<td></td>
<td>Modbus 26</td>
</tr>
<tr>
<td></td>
<td>Address Modbus 53</td>
</tr>
<tr>
<td></td>
<td>Address Standard Bus 53</td>
</tr>
<tr>
<td></td>
<td>Administrator Password 62, 74</td>
</tr>
<tr>
<td></td>
<td>agency approvals 3, 85</td>
</tr>
<tr>
<td></td>
<td>alarm blocking 73</td>
</tr>
<tr>
<td></td>
<td>Alarm Menu 35, 48</td>
</tr>
<tr>
<td></td>
<td>alarms 72</td>
</tr>
<tr>
<td></td>
<td>Blocking 49, 73</td>
</tr>
<tr>
<td></td>
<td>deviation 72</td>
</tr>
<tr>
<td></td>
<td>Display 50</td>
</tr>
<tr>
<td></td>
<td>Hysteresis 49, 72</td>
</tr>
<tr>
<td></td>
<td>Latching 49, 72</td>
</tr>
<tr>
<td></td>
<td>Logic 49</td>
</tr>
<tr>
<td></td>
<td>process 72</td>
</tr>
<tr>
<td></td>
<td>set points 72</td>
</tr>
<tr>
<td></td>
<td>Sides 49</td>
</tr>
<tr>
<td></td>
<td>Silencing 49, 73</td>
</tr>
<tr>
<td></td>
<td>Source 48</td>
</tr>
<tr>
<td></td>
<td>Type 48</td>
</tr>
<tr>
<td></td>
<td>Alarm Type 72</td>
</tr>
<tr>
<td></td>
<td>analog input 4</td>
</tr>
<tr>
<td></td>
<td>Analog Input Menu 31, 40</td>
</tr>
<tr>
<td></td>
<td>Assembly Definition</td>
</tr>
<tr>
<td></td>
<td>Addresses 82</td>
</tr>
<tr>
<td></td>
<td>Assembly Definition Addresses 75</td>
</tr>
<tr>
<td></td>
<td>Assembly Definition Addresses and Assembly Working Addresses 82</td>
</tr>
<tr>
<td></td>
<td>Bumpless transfer 68</td>
</tr>
<tr>
<td></td>
<td>Baud Rate 53</td>
</tr>
<tr>
<td></td>
<td>Baud 26</td>
</tr>
<tr>
<td></td>
<td>Bumpless transfer 68</td>
</tr>
<tr>
<td>C</td>
<td>calibrating an analog input 67</td>
</tr>
<tr>
<td></td>
<td>Calibration Menu 63</td>
</tr>
<tr>
<td></td>
<td>Calibration Offset 63–67</td>
</tr>
<tr>
<td></td>
<td>Chattering output 69</td>
</tr>
<tr>
<td></td>
<td>CIP - Communications Capabilities 75</td>
</tr>
<tr>
<td></td>
<td>CIP Communications Methodology 29</td>
</tr>
<tr>
<td></td>
<td>CIP Implicit O to T (Originator to Target) Assembly Structure 75, 84</td>
</tr>
<tr>
<td></td>
<td>CIP Implicit T to O (Target to Originator) Assembly Structure 84</td>
</tr>
<tr>
<td></td>
<td>Closed Loop Set Point 33</td>
</tr>
<tr>
<td></td>
<td>Closed Loop Working Set Point 33</td>
</tr>
<tr>
<td></td>
<td>Communication Protocols 28</td>
</tr>
<tr>
<td></td>
<td>Communications Menu 53</td>
</tr>
<tr>
<td></td>
<td>conceptual view 4</td>
</tr>
<tr>
<td></td>
<td>Control 42, 47</td>
</tr>
<tr>
<td></td>
<td>Control Loop Menu 44</td>
</tr>
<tr>
<td></td>
<td>control methods 68</td>
</tr>
<tr>
<td></td>
<td>Control Mode 33, 69</td>
</tr>
<tr>
<td></td>
<td>Control Mode Active 32</td>
</tr>
<tr>
<td></td>
<td>Control Module Factory Page 59</td>
</tr>
<tr>
<td></td>
<td>Control Module Menus</td>
</tr>
<tr>
<td></td>
<td>Factory Page</td>
</tr>
<tr>
<td></td>
<td>Calibration Menu 63</td>
</tr>
<tr>
<td></td>
<td>Custom Setup Menu 60</td>
</tr>
<tr>
<td></td>
<td>Diagnostics Menu 62</td>
</tr>
<tr>
<td></td>
<td>Factory Page</td>
</tr>
<tr>
<td></td>
<td>Security Setting Menu 60</td>
</tr>
</tbody>
</table>

### Appendix

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Data Map 53</td>
</tr>
<tr>
<td></td>
<td>Date of Manufacture 62, 63</td>
</tr>
<tr>
<td></td>
<td>dead band 70</td>
</tr>
<tr>
<td></td>
<td>Dead Band 34, 70</td>
</tr>
<tr>
<td></td>
<td>Decimal 42</td>
</tr>
<tr>
<td></td>
<td>deviation alarms 72</td>
</tr>
<tr>
<td></td>
<td>Diagnostics Menu 62</td>
</tr>
<tr>
<td></td>
<td>digital input 4</td>
</tr>
<tr>
<td></td>
<td>Digital Input Function 51</td>
</tr>
<tr>
<td></td>
<td>Digital Input/Output Menu 32, 42</td>
</tr>
<tr>
<td></td>
<td>Direction 42</td>
</tr>
<tr>
<td></td>
<td>Display 50</td>
</tr>
<tr>
<td></td>
<td>Display Pairs 52</td>
</tr>
<tr>
<td></td>
<td>Display Units 52, 53</td>
</tr>
<tr>
<td>E</td>
<td>Electrical Gain 67</td>
</tr>
<tr>
<td></td>
<td>Electrical Input Offset 63, 67</td>
</tr>
<tr>
<td></td>
<td>Electrical Input Slope 63, 67</td>
</tr>
<tr>
<td></td>
<td>Electrical Measurement 63, 67</td>
</tr>
<tr>
<td></td>
<td>Electrical Output Offset 63</td>
</tr>
<tr>
<td></td>
<td>Electrical Output Slope 63</td>
</tr>
<tr>
<td></td>
<td>End 58</td>
</tr>
<tr>
<td></td>
<td>End Set Point Value 56</td>
</tr>
<tr>
<td></td>
<td>Event Output (1 and 2) 57, 58</td>
</tr>
<tr>
<td></td>
<td>EZ-ZONE™ ST</td>
</tr>
<tr>
<td></td>
<td>without contactor 6, 8</td>
</tr>
<tr>
<td></td>
<td>with contactor 7</td>
</tr>
<tr>
<td></td>
<td>EZ-ZONE™ ST</td>
</tr>
<tr>
<td></td>
<td>without contactor 7</td>
</tr>
</tbody>
</table>

---

Watlow EZ-ZONE® ST
EZ Key 4

Factory Page

Control Module 59
features and benefits 3
Filter Time 41, 67
filter time constant 67
Function 66
Function Instance 42, 44
functions 4

G

Global Menu 52
Guaranteed Soak Deviation 52
Guaranteed Soak Enable 52

H

Heat Algorithm 44, 69
Heater Error 36
Heat Hysteresis 34, 69
Heat Power 33, 65
Heat Proportional Band 34, 65, 70
High Power Scale 43, 48
high range 68
high scale 68
High Set Point
Alarm 35, 36, 72
Current 36
Limit 32
Loop 46, 68

M

Manual Control Indicator Light 69
manual (open loop) control 68
manual tuning 65
Minutes 55
Modbus Default Assembly Structure
40-79 82
Modbus Default Assembly Structure
80-119 83
Modbus - Programmable Memory
Blocks 82
Modbus Register Mapping 39
Modbus RTU & Modbus TCP Protocols 28
Modbus - Using Programmable
Memory Blocks 75
Modbus Word Order 53
model numbers 86
Monitor Menu 32
mounting and unmounting from a
DIN rail 14

N

National Electric (NEC) 9–10
network wiring 25
Non-volatile Save 39, 53
Non-Volatile Save 26

O

on-off control 69
Open Loop Detect Deviation 46
Open Loop Detect Enable 46
Open Loop Detect Time 46
Open Loop Set Point 34
Operations Page
Control Module 30
ordering information
replacement base 88
replacement heat sink 88
replacement solid state relays
(SSRs) 88
output configuration 68
output features 68
Output Menu 47
outputs 4
Output State 32

P

Parameter 1 to 20 60
Parity 26, 53
Password 59, 62, 74
Password Security Enable 73
Peltier Delay 39
Phase Angle 71
process alarms 72
Process Error Enable 41
Process Error Low 41
Process Value 31
Process Value Active 33
Profibus DP 29
Profile Status Menu 37
Profile Type 52
Profiling Page 54
profiling parameters 54
programming the Home Page 65
proportional control 69
plus integral (PI) control 70
plus integral plus derivative (PID)
control 70
Public Key 59, 62

Q

R

Ramp Action 46
Ramp Rate 46, 71
Ramp Scale 46, 71
Range High 41, 68
Range Low 41, 42, 68
Rate 55, 57
Read 36
Read Lockout Security 73
Remote User Interface. See RUI
replacing the solid-state relay 15–16
restoring user settings 65
Rolling Password 61, 74
RTD Leads 40

S

saving user settings 65
Scale High 41, 68
Scale Low 41, 68
Seconds 55
secure settings 73, 74
Security Setting 60, 62
sensor selection 67
Sensor Type 40, 66, 68
Serial Number 62
Set Lockout Security 73
set point high limit 68
Set Point High Limit Open Loop 47
set point low limit 68
Set Point Low Limit Open Loop 47

labels. See sub-assembly labels
Latching 49, 72
Limit Menu 32, 44
Linearization 40
Setup Page
Control Module 39
Sides
Alarm 49
Limit 44
Silencing 49, 73
single set point ramping 71
Soft Start 71
Soft Start Time 71
Software Build 62
Software Configuration 76
Software ID 62
Software Release 62
Source 48
specifications 85
status indicator light 9
Step Type 55
sub-assembly labels 13
System Security 74

T
thermal system control 3
Time 57
Time Base 43, 48
Time Derivative 34, 65, 70
Time Integral 34, 65, 70
troubleshooting 79
TRU-TUNE+™ Band 45, 66
TRU-TUNE+™ Enable 45, 66
TRU-TUNE+™ Gain 45, 66
tuning the PID parameters 65
Type 48

U
Unlock 74
Unlock Code 74
Unused Step 58
User Failure Action 45
User Password 61, 74
User Programmable Memory Blocks 28
User Restore Set 52, 65
User Save Set 52, 65
User Tune Aggressiveness 65
Using EZ-ZONE® Configurator Software 76
using the software 73

V
variable time base 71

W
Wait Event (1 and 2) 56
Wait For Event 57
Wait For Process 57
wiring
output 4 mechanical relay, form A 22
wiring 7–14
input 1 process 18
input 1 RTD 18
input 1 thermocouple 18
input 2 process 19
input 2 RTD 19
input 2 thermocouple 19
Modbus RTU or standard bus EIA-485 communications 24
output 1 solid-state relay without a
contactor 21
output 1 solid-state relay with a
contactor 20
output 2 mechanical relay, form A 22
output 2 solid-state relay, form A 22
output 3 mechanical relay, form C 22
output 4 mechanical relay, form A 22
power 18
standard bus EIA-485 communications 24
without a contactor 10
with a contactor 9
wiring a network 25

X

Y

Z


### Declaration of Conformity

Series EZ-ZONE® ST Tower

WATLOW
1241 Bundy Blvd.
Winona, MN 55987 USA

 Declares that the following product:

**Designation:** Series EZ-ZONE® ST Tower

**Model Numbers:** ST, followed by K, B, P, E, H, D, J or C, followed by A, L or B, followed by A, B or F, followed by L, H, 1, 2 or 3, followed by any letter or number, followed by A – H, J – N, P, R, S or T, followed by A, B, C, D, E or F followed by any three numbers or letters.

**Classification:** Temperature control, Installation Category II, Pollution degree 2, IP20

**Rated Voltage and Frequency:**
- Control 100 to 240 V~ ac or 24 to 28 V dc (ac = 50/60 Hz)
- Load 24 to 240 V~ ac or 48 to 600 V~ ac zero cross, or
- Load 100 to 240 V~ ac or 260 to 600 V~ ac phase angle^3^.

**Rated Power Consumption:** Control 12 VA, Control with Contactor 50 VA, Control with external contactor 140 VA. Load Current 25, 40 or 75A depending upon SSR and heatsink used. (see derating curve)

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


<table>
<thead>
<tr>
<th>Directive</th>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN 61326-1</td>
<td>2006</td>
<td>Electrical equipment for measurement, control and laboratory use – EMC requirements (Industrial Immunity, Class A Emissions^1^). Not for use in a Class B environment without additional filtering.</td>
</tr>
<tr>
<td>EN 61000-4-2</td>
<td>1996 +A1,A2:2001</td>
<td>Electrostatic Discharge Immunity</td>
</tr>
<tr>
<td>EN 61000-4-3</td>
<td>2006</td>
<td>Radiated Field Immunity</td>
</tr>
<tr>
<td>EN 61000-4-4</td>
<td>2004</td>
<td>Electrical Fast-Transient / Burst Immunity</td>
</tr>
<tr>
<td>EN 61000-4-5</td>
<td>2006</td>
<td>Surge Immunity</td>
</tr>
<tr>
<td>EN 61000-4-6</td>
<td>1996</td>
<td>Conducted Immunity</td>
</tr>
<tr>
<td>EN 61000-4-8</td>
<td>1994 +A1, A2, A3:2005</td>
<td>Magnetic Field Immunity</td>
</tr>
<tr>
<td>EN 61000-4-11</td>
<td>2004</td>
<td>Voltage Dips, Short Interruptions and Voltage Variations Immunity</td>
</tr>
<tr>
<td>EN 61000-3-2^4^</td>
<td>2006</td>
<td>Harmonic Current Emissions</td>
</tr>
<tr>
<td>EN 61000-3-3^5^</td>
<td>2005</td>
<td>Voltage Fluctuations and Flicker</td>
</tr>
<tr>
<td>SEMI F47</td>
<td>2000</td>
<td>Specification for Semiconductor Sag Immunity Figure R1-1</td>
</tr>
</tbody>
</table>

^1^NOTE 1: Use of an external filter is required to comply with conducted emissions limits for load terminals. For 230 Vac or less, use Watlow P/N 14-0019 or Crydom P/N 1F25 filters. For voltages up to 440 Vac use Watlow P/N 14-0020 or Crydom P/N 3F20 filters. A Line Impedance Stabilization Network (LISN) was used for conducted emissions measurements.

^2^NOTE 2: To comply with flicker requirements cycle time may need to be greater than 175 seconds if Load Power is ≤ 16A to comply with standard, or the maximum source impedance needs to be determined. Source impedance shall meet EN 61000-3-11 requirements for load currents > 16A. Control module power complies with 61000-3-3 requirements.
Declaration of Conformity (cont.)

3. **NOTE 3:** For Phase Angle control models, filtering in addition to that recommended in NOTE 1 will be needed to comply with conducted emissions requirements, consult factory for details.

4. **NOTE 4:** Phase angle models will need power factor correction to pass harmonic current standard.

---

**2006/95/EC Low-Voltage Directive**

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

**Compliant with 2002/95/EC RoHS Directive**

**Per 2002/96/EC WEEE Directive  Please Recycle Properly**

---

**Amperage/Temperature Derating Curve**

EZ-ZONE ST

<table>
<thead>
<tr>
<th>Deg C (Heatsink Inlet Temperature)</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amps (P.U. 120V)</td>
<td>80</td>
<td>70</td>
<td>60</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- 75 amps at 50 C
- 45.0
- 40 amps at 50 C
- 35.0
- 30.0
- 25 amps at 50 C
- 21.5
- 10.0

---

Raymond D. Feller III  Winona, Minnesota, USA
Name of Authorized Representative  Place of Issue
General Manager  January 2010
Title of Authorized Representative  Date of Issue

Signature of Authorized Representative
How to Reach Us

Corporate Headquarters
Watlow Electric Manufacturing Company
12001 Lackland Road
St. Louis, MO 63146
Sales: 1-800-WATLOW2
Manufacturing Support: 1-800-4-WATLOW
Email: info@watlow.com
Website: www.watlow.com
From outside the USA and Canada:
Tel: +1 (314) 878-4600
Fax: +1 (314) 878-6814

Latin America
Watlow de México S.A. de C.V.
Av. Fundición No. 5
Col. Parques Industriales
Querétaro, Qro. CP-76130
Mexico
Tel: +52 442 217-6235
Fax: +52 442 217-6403

Asia and Pacific
Watlow Singapore Pte Ltd.
16 Ayer Rajah Crescent,
#06-03/04,
Singapore 139965
Tel: +65 6773 9488 Fax: +65 6778 0323
Email: info@watlow.com.sg Website: www.watlow.com.sg

Watlow Korea Co., Ltd.
#1406, E&C Dream Tower, 46, Yeongdeungpo-gu, Seoul 150-103
Republic of Korea
Tel: +82 (2) 2628-5770 Fax: +82 (2) 2628-5771
Website: www.watlow.co.kr

Watlow Malaysia Sdn Bhd
No. 14-3 Jalan 2/114
Kuchai Business Centre
Jalan Kuchai Lama
58200 Kuala Lumpur
Malaysia
Tel: +60 3 7980 7741 Fax: +60 3 7980 7739

Watlow Electric Taiwan Corporation
10F-1 No.189 Chi-Shen 2nd Road Kaohsiung 80143
Taiwan
Tel: +886-7-2885168 Fax: +886-7-2885668

Watlow Electric Manufacturing (Shanghai) Company
1118 Fangyuan Road, Anting Industrial Park, Jiading, Shanghai, PRC 201203
People's Republic of China
Tel: +86 21 39509510 Fax: +86 21 5080-0906
Email: info@watlow.cn Website: www.watlow.cn

Your Authorized Watlow Distributor

TOTAL
3 Year Warranty

Watlow Ibérica, S.L.U.
C/Marte 12, Posterior, Local 9 E-28850 Torrejón de Ardoz Madrid - Spain
T. +34 91 675 12 92
F. +34 91 648 73 80
Email: info@watlow.es
Website: www.watlow.es

Watlow UK Ltd.
Linby Industrial Estate
Linby, Nottingham, NG15 8AA
United Kingdom
Telephone: (0) 115 964 0777
Fax: (0) 115 964 0071
Email: info@watlow.co.uk
Website: www.watlow.co.uk
From outside The United Kingdom:
Tel: +44 115 964 0777
Fax: +44 115 964 0071

Watlow Japan Ltd.
1-14-4 Uchikanda, Chiyoda-Ku
Tokyo 101-0047
Japan
Tel: +81-3-3518-6630 Fax: +81-3-3518-6632
Email: infoj@watlow.com Website: www.watlow.co.jp

Watlow Electric Manufacturing Co., Ltd.
10F-1 No.189 Chi-Shen 2nd Road Kaohsiung 80143
Taiwan
Tel: +886-7-2885168 Fax: +886-7-2885668