# Operation Manual

**Instruction Notes for 3622566, 3622567, 3622568, 3622569**



**Figure 1**
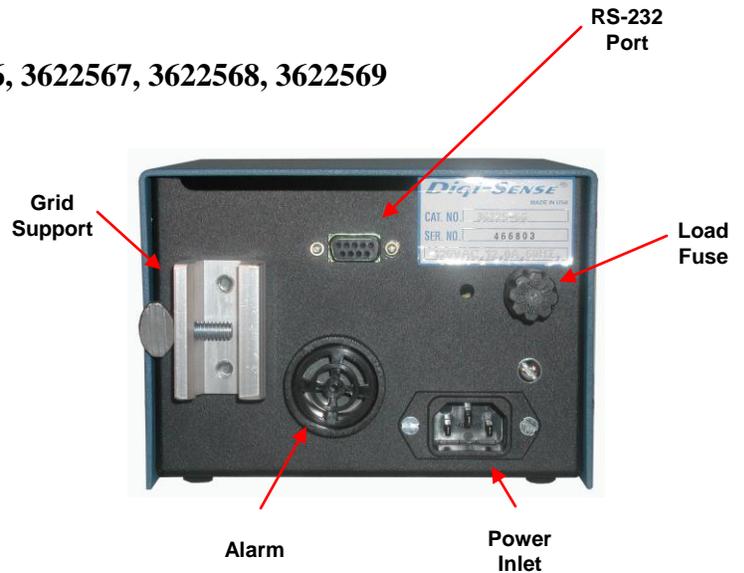


**Figure 2**

## General Description

If your heating process requires several steps, this is the control for you.  The Ramp/Soak feature of this control allows up to a 40-step profile, which can be configured from the provided software. You can profile Temperature, Time, Hold, Soak and End steps to create the ideal profile for your process. The built in adaptive control technology provides even tighter control for these demanding applications. Several input types are available. This unit comes with 6' detachable power cord, communication port, audible alarm function and grid support bracket, which is ideal for fume hood mounting to maximize bench space.

This control is a microprocessor-based, digital indicating, automatic temperature control with a single input and a single output. It features an auto-tuning function that allows automatic setting of control parameters with a minimum of user input required. This family of control accepts a type "J", "K", "T" thermocouples or RTD input depending on the model ordered.

The control automatically sets the PID parameters through a "learning" sequence in the auto-tuning mode. PID parameters include proportional band, reset/integral and rate/derivative. User-friendly features include automatic LED indicators to aid in monitoring and setup, as well as dual LED displays for process temperature and set point indication. This control automatically stores all information in a non-volatile memory.**,**

### Control Features
1. On/Off power switch.
2. On/Off alarm switch.
3. 12-amp output.
4. Control **PID with Auto-tune algorithm, solid state relay**
5. Circuit protection (fuse)
6. Low profile housing.

**Keys & Displays**
**16th DIN PID Controller**

**Upper Display:**
In the Operations Menu, displays the process value, otherwise displays the value of the parameter in the lower display.

**Temperature Units Indicator Lights:**
Indicates whether the temperature is displayed in Fahrenheit or Celsius.

**Output Activity:**
Number lights indicate activity of outputs 1 and 2.

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

EZ button – User defined

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

**Communications Activity:**
Flashes when another device is communicating with this controller.

**Infinity Key:**
Clears and Silences alarms, press to back up one level, or press and hold for two seconds to return to the Operations Menu.

**Advance Key:**
Advances through parameter prompts.

**Up and Down Keys:**
In the Operations Menu, adjusts the set point in the lower display. In other pages, changes the upper display to a higher or lower value, or changes a parameter selection.

**How to Setup and Operate**
First, connect the heater load and the sensor to the load and sensor receptacles on the front panel. Next, plug the control line cord into an appropriate 3-wire grounded power receptacle. Push the power switch to the "ON" position. Wait five seconds for the control unit to energize.

The control is shipped from the factory with the display reading in degrees C. If a display in degrees F is desirable, press the **UP/DOWN** arrow keys simultaneously for three seconds to access the Setup Page. Press the **Advance** key until the Celsius_Fahrenheit parameter [C-F] is shown in the lower display. Press the **UP** arrow key to change from C to F.

After changing the display, press the **Infinity** key to display the set point temperature and the process temperature (temperature at the sensor).

To begin the heating application, use the **Up/Down** arrow keys to enter the desired set point temperature. This is shown in the lower display. Press the **Advance** key to cycle through the Operations Page until the auto-tuning parameter [Aut] is shown in the lower display. Auto-tuning is recommended in most applications. Auto-tuning allows the control to set the parameters without those parameters being input by the user. It also minimizes the amount of temperature overshoot of the set point and decreases the time required for the process to stabilize. To use the Ramp feature, refer to the Ramp/Soak Operation section.

After setting the auto-tuning parameter [Aut] to ON, press the **Infinity** key to display the set point and process temperatures. While the control is in the auto-tuning mode, the lower display alternately flashes the set point and the "Aut" prompt. When tuning is complete, the lower display indicates only the set point.

The auto-tuning function can be aborted by setting auto-tuning [Aut] to OFF or switching off power to the control.

It is recommended that auto-tuning be used each time a process is being run. If the process is being duplicated, the parameters learned in the initial setup are stored in the memory of the control and no repeat of auto-tuning is required.

Auto-tuning feature allows quick and simple automatic control for the majority of heating applications. This control is capable of performing other control functions and has a variety of features.

**Control Sensor**

Proper placement of the sensor can eliminate many problems in the total system. The probe should be placed so that it can detect any temperature change with little thermal lag. In a process that requires fairly constant heat output, the probe should be close to the heater. In processes where heat demand is variable, the probe should be close to the work area. Some experimenting with probe location can be tried to provide optimum results.

**Specifications**

Control Mode
 - Microprocessor-based, single input, single output.
 - PID parameters

       Proportional band: 1 to 999$^{\circ}$F
       Reset: 0.00 to 99.99 repeats per minute.
       Integral: 0.00 to 99.99 minutes per repeat.
       Rate or Derivative: 0.00 to 9.99 minutes.

Operator Interface
 - **Advance, Infinity, Up and Down** keys and ON/OFF switch.
 - Dual, four digit LED displays.
 - Thermocouple receptacle or (RTD) and 3-wire load receptacle.

Input
 - Type J, K , T thermocouple or (RTD): input grounded or ungrounded.
 - Automatic cold junction compensation and break protection for sensor.
 - Degrees F or degrees C display; user selectable (preset for degrees C)

| | |
|---|---|
| **Range Type J:** | **-200°C to 1200°C** |
| **Range Type K:** | **-200°C to 1370°C** |
| **Range Type T:** | **-200°C to 400°C** |
| **Range Type RTD:** | **-200°C to 800°C** |

Primary Output (Heating or Cooling)
 - 15 Amp, 120 Volts.

Accuracy
 - Calibration accuracy:  0.1% of span.
 - Temperature stability:  0.2 $^{\circ}$F / $^{\circ}$F rise in ambient maximum.
 - Voltage stability: 0.01% of span / % of rated line voltage.

Power
 - 50/60 Hz   5%
 - Data retention upon power failure via nonvolatile memory.

Operating Environment
-    32 to 149 $^{\circ}$F / 0 to 65 $^{\circ}$C;  0 to 90% RH, non-condensing.

## Setup Menu

To enter the Setup Menu push and hold the up and down arrow keys for approximately 3 seconds. Once there, push the green advance key to scroll through to the prompt of choice and then use the up and down arrow keys to change the range. At any point within the Setup menu to return to the default display push the Infinity ∞ key.

**Setup Menu**

- [LoC] Lockout Menu
- [SEn] Sensor Type
- [Lin] Linearization
- [dEC] Decimal
- [C_F] Display Units
- [r.Lo] Range Low
- [r.hi] Range High
- [Fn1] Function One
- [o.ty] Output Type
- [Fn2] Function Two
- [hA9] Heat Algorithm
- [hSC] Heat Hysteresis
- [CA9] Cool Algorithm
- [At Y] Alarm Type
- [Ah Y] Alarm Hysteresis
- [ALA] Alarm Latching
- [AbL] Alarm Blocking
- [AS_] Alarm Silencing
- [AdSP] Alarm Display
- [rP] Ramp Action
- [rrt] Ramp Rate
- [oh_1] Power Scale High Output 1
- [oh_2] Power Scale High Output 2
- [PAr1] Upper or Left Display
- [PAr2] Lower or Right Display
- [AdS] Zone Address

**Setup Menu**
16th & 32nd DIN PID Controller

| Display | Parameter Name Description | Range (Defaults are shown bold) |
|---|---|---|
| LoC [LoC] | **Lockout Menu** Set the security clearance level. The user can access the selected level and all lower levels. Appears if: Always | 1 to 5 1 Operations Menu (read only, A/M button disabled)* 2 Operations Menu (A/M button disabled, Set point R/W)* 3 Operations Menu (A/M button enabled, Set point R/W, Control Mode R/W)* 4 Operations Menu R/W access* **5 Operations Menu and Setup Menu full R/W access** *You can change the security level at any level |
| [SEn] [ SEn] | **Sensor Type** Set the analog sensor type to match the device wired to this input. Appears if: Always | [tC] Thermocouple [uoLt] Volts dc [mA] Milliamps dc [rtH] RTD 100 Ω |
| [Lin] [ Lin] | **Linearization** Set the linearization to match the thermocouple type wired to this input. For example, select [H] for a type K thermocouple. Appears if: Sensor Type is set to Thermocouple. | [J] J [H] K [n] N [S] S [t] T |
| [dEC] [ dEC] | **Decimal** Set the precision of the displayed value. Appears if: Always | [0] Whole [0.0] Tenths [0.00] Hundredths |
| [C_F] [ C_F] | **Display Units** Select which units will be displayed. Appears if: Always | [F] °F [C] °C |
| [r.Lo] [ r.Lo] | **Range Low** Set the low range of the set point. Appears if: Always | -1,999.000 to 9,999.000 **0.0** |
| [r.hi] [ r.hi] | **Range High** Set the high range of the set point. Appears if: Always | -1,999.000 to **9,999.000** |
| [Fn1] [ fn1] | **Function of Output 1** Select which function will drive this output. Appears if: If output 1 is ordered | [oFF] Off [Cool] Cool [hEAt] Heat [ALM] Alarm |
| [o.ty] [ o.ty] | **Output Type** Select whether the process output will operate in volts or milliamps. Appears if: A process output (PM _ C _ F _-_ AAAB _ _) | [uoLt] Volts [mA] Milliamps |

To enter the Setup Menu push and hold the up and down arrow keys for approximately 3 seconds. Once there, push the green advance key to scroll through to the prompt of choice and then use the up and down arrow keys to change the range. At any point within the Setup menu to return to the default display push the Infinity ∞ key.

## Setup Menu

- [Lo̅C] Lockout Menu
- [S̅E̅n] Sensor Type
- [L̅i̅n] Linearization
- [d̅E̅C] Decimal
- [C̅_̅F] Display Units
- [r̅Lo̅] Range Low
- [r̅h̅i̅] Range High
- [F̅n̅1̅] Function One
- [o̅t̅Y] Output Type
- [F̅n̅2̅] Function Two
- [h̅.̅A̅9] Heat Algorithm
- [h̅S̅C] Heat Hysteresis
- [C̅A̅9] Cool Algorithm
- [A̅t̅Y] Alarm Type
- [A̅h̅Y] Alarm Hysteresis
- [A̅L̅A] Alarm Latching
- [A̅b̅L] Alarm Blocking
- [A̅S̅i̅] Alarm Silencing
- [A̅d̅S̅P] Alarm Display
- [r̅P] Ramp Action
- [r̅c̅t] Ramp Rate
- [o̅h̅i̅1̅] Power Scale High Output 1
- [o̅h̅i̅2̅] Power Scale High Output 2
- [P̅A̅r̅1̅] Upper or Left Display
- [P̅A̅r̅2̅] Lower or Right Display
- [A̅d̅S] Zone Address

### Setup Menu
16th & 32nd DIN PID Controller

| Display | Parameter Name Description | Range (Defaults are shown bold) |
|---|---|---|
| [F̅n̅2̅]<br>[ fn2] | **Function of Output 2**<br>Select which function will drive this output.<br>Appears if: If output 2 is ordered | [o̅F̅F] Off<br>[Co̅o̅L] Cool<br>[h̅E̅A̅t] Heat<br>[A̅L̅m̅] Alarm |
| [h̅.̅A̅9]<br>[ h.Ag] | **Heat Algorithm**<br>Set the heat control method.<br>Appears if: Output 1 or 2 set to heat | [o̅F̅F] Off<br>**[P̅i̅d] PID**<br>[o̅n̅o̅F] On-Off |
| [h̅S̅C]<br>[ hSC] | **Hysteresis (Heat & Cool)**<br>Set the control switching hysteresis for on-off control. This determines how far into the "on" region the process value needs to move before the output turns on.<br>Appears if: Heat or Cool Algorithm is set to On-Off. | 0 to 9,999.000°F or units<br>0 to 5,555.000°C<br>**Units, 3.0°F or 2.0°C** |
| [C̅A̅9]<br>[ C.Ag] | **Cool Algorithm**<br>Set the cool control method.<br>Appears if: If Output 1 or 2 is set to cool | [o̅F̅F] Off<br>[P̅i̅d] PID<br>[o̅n̅o̅F] On-Off |
| [A̅t̅Y]<br>[ A.ty] | **Alarm Type**<br>Select how the alarm will or will not track the set point.<br>Appears if: Always | [o̅F̅F] Off<br>[P̅r̅A̅L] Process Alarm<br>[d̅E̅A̅L] Deviation Alarm |
| [A̅h̅Y]<br>[ A.hy] | **Alarm Hysteresis**<br>Set the hysteresis for an alarm. This determines how far into the safe region the process value needs to move before the alarm can be cleared.<br>Appears if: When alarm type is set to process or deviation alarm | 0.001 to 9,999.000°F or units<br>0.001 to 5,555.000°C<br>**Units, 1.0°F or 1.0°C** |
| [A̅L̅A]<br>[ A.LA] | **Alarm Latching**<br>Turn alarm latching on or off. A latched alarm has to be turned off by the user.<br>Appears if: When alarm type is set to process or deviation alarm | **[n̅L̅A̅t] Non-Latching**<br>[L̅A̅t] Latching |
| [A̅b̅L]<br>[ A.bL] | **Alarm Blocking**<br>Select when an alarm will be blocked. After startup and/or after the set point changes, the alarm will be blocked until the process value enters the normal range.<br>Appears if: When alarm type is set to process or deviation alarm | [o̅F̅F] Off<br>[S̅t̅r̅] Startup<br>[S̅t̅P̅t] Set Point<br>[b̅o̅t̅h] Both |
| [A̅S̅i̅]<br>[ A.Si] | **Alarm Silencing**<br>Turn alarm silencing on to allow the user to disable the output tied (configured) to this alarm<br>Appears if: When alarm type is set to process or deviation alarm | [o̅F̅F] Off<br>[o̅n̅] On |
| [A̅d̅S̅P]<br>[A.dSP] | **Alarm Display**<br>Display an alarm message when an alarm is active.<br>Appears if: When alarm type is set to process or deviation alarm | [o̅F̅F] Off<br>[o̅n̅] **On** |

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## Setup Menu

- [LoC] Lockout Menu
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- [Ahy] Alarm Hysteresis
- [ALA] Alarm Latching
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- [AdSP] Alarm Display
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- [rrt] Ramp Rate
- [o.hi1] Power Scale High Output 1
- [o.hi2] Power Scale High Output 2
- [PAr1] Upper or Left Display
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- [AdS] Zone Address

### Setup Menu
16th & 32nd DIN PID Controller

| Display | Parameter Name Description | Range (Defaults are shown bold) |
|---|---|---|
| [ rP] | **Ramp Action**<br>Select when the controller's set point will ramp to the defined end set point.<br>Appears if: Always | [oFF] Off<br>[Str] Startup<br>[SEPt] Set Point Change<br>[both] Both |
| [ r.rt] | **Ramp Rate**<br>Set the rate for the set point ramp. Set the time units for the rate with the Ramp Scale parameter.<br>Appears if: Ramp Action is set to Startup, Set Point or Both. | 1.0°F or units<br>**1.0°C** |
| [o.hi1] | **Power Scale Output High 1**<br>Set maximum value of output 1 range.<br>Appears if: Output 1 is set to heat | 0.0 to 100%<br>**100.0** |
| [o.hi2] | **Power Scale Output High 2**<br>Set maximum value of output 2 range.<br>Appears if: Output 2 is set to heat | 0.0 to 100%<br>**100.0** |
| [PAr1] | **Upper or Left Display**<br>Select parameter to display.<br>Appears if: Always | [ACPu] Active Process Value<br>[nonE] none |
| [PAr2] | **Lower or Right Display**<br>Select parameter to display.<br>Appears if: Always | [ACSP] Active Set Point<br>[Ah_] Alarm High Set Point<br>[ALo] Alarm Low Set Point<br>[nonE] None |
| [ Ad.S] | **Zone Address - Standard Bus Communication**<br>Set zone address from 1-16.<br>Appears if: Always | 1-16<br>**1** |

## Operations Menu

Upon power up of the control, using the advance key will scroll through the various prompts found in the Operations Menu. At any point within the Operations menu to return to the default display push the Infinity ∞ key.

**Operations Menu**

- `ℝUℓ` Autotune
- `ℂℙ?` Control Mode
- `ℎℙℎ` Heat Proportional Band
- `ℂℙℎ` Cool Proportional Band
- `ℓ ℳ` Time Integral
- `ℓℳ` Time Derivative
- `oℓℎ¹` Time Base
- `oℓℎ²` Time Base
- `ℝℓo` Alarm Low Set Point
- `ℝℎℳ` Alarm High Set Point
- `ℳℂℝ` Calibration Offset
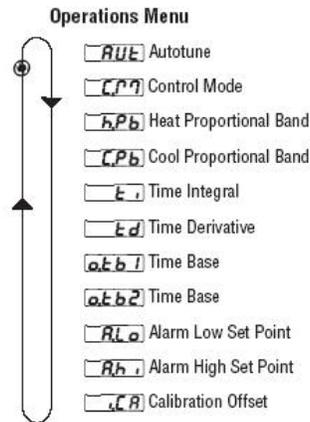
**Operations Menu**
16ᵗʰ & 32ⁿᵈ DIN PID Controller

| Display | Parameter Name Description | Range (Defaults are shown bold) |
|---|---|---|
| `ℝUℓ` [ AUt] | **Autotune** <br> Start an autotune. While active the upper or left and lower or right display will flash `ℓUℓ¹` and `ℝℓℓℎ`. <br> Appears if: Heat or cool algorithm set to PID | `no` No <br> `YES` Yes |
| `ℂℙ?` [ C.M] | **Control Mode Active** <br> View the current control mode. <br> Appears if: Always | `oℱℱ` Off <br> `ℝUℓo` Auto <br> `ℂℐℝo` Manual |
| `ℎℙℎ` [ h.Pb] | **Heat Proportional Band** <br> Set the PID proportional band for the heat outputs. <br> Appears if: Heat algorithm set to PID | 0 to 9,999.000°F or units <br> 0 to 5,555.000°C <br> **Units, 25.0°F or 14.0°C** |
| `ℂℙℎ` [ C.Pb] | **Cool Proportional Band** <br> Set the PID proportional band for the cool outputs. <br> Appears if: Cool algorithm set to PID | 0 to 9,999.000°F or units <br> 0 to 5,555.000°C <br> **Units, 25.0°F or 14.0°C** |
| `ℓ ℳ` [ ti] | **Time Integral** <br> Set the PID integral for the outputs. <br> Appears if: Heat or cool algorithm set to PID | 0 to 9,999 seconds per repeat <br> **180.0** |
| `ℓℳ` [ td] | **Time Derivative** <br> Set the PID derivative time for the outputs. <br> Appears if: Heat or cool algorithm set to PID | 0 to 9,999 seconds <br> **0.0 seconds** |
| `oℓℎ¹` [o.tb1] | **Time Base Output 1** <br> Set the time base for fixed-time-base control. <br> Appears if: Output 1 set to heat or cool with control algorithm set to PID. | 0.1 to 60.0 seconds (solid-state relay or switched dc) <br> 5.0 to 60.0 seconds (mechanical relay & NO-ARC power control) <br> **1 sec. [SSR & sw dc], 20.0 sec. [mech. relay & NO-ARC]** |
| `oℓℎ²` [o.tb2] | **Time Base Output 2** <br> Set the time base for fixed-time-base control. <br> Appears if: Output 2 set to heat or cool with control algorithm set to PID. | 0.1 to 60.0 seconds (solid-state relay or switched dc) <br> 5.0 to 60.0 seconds (mechanical relay & NO-ARC power control) <br> **1 sec. [SSR & sw dc], 20.0 sec. [mech. relay & NO-ARC]** |
| `ℝℓo` [ A.Lo] | **Alarm Low Set Point** <br> Process - set the process value that will trigger a low alarm. <br> Deviation - set the span of units from the closed loop set point that will trigger a low alarm. <br> Appears if: If Alarm Type (A.ty) is set to Process or Deviation Alarm | -1,999.000 to 9,999.000°F or units <br> -1,128.000 to 5,537.000°C <br> **Units, 32.0°F or 0.0°C** |
| `ℝℎℳ` [ A.hi] | **Alarm High Set Point** <br> Process - set the process value that will trigger a high alarm. <br> Deviation - set the span of units from the closed loop set point that will trigger a high alarm. <br> Appears if: If Alarm Type (A.ty) is set to Process or Deviation Alarm | -1,999.000 to 9,999.000°F or units <br> -1,128.000 to 5,537.000°C <br> **Units, 300.0°F or 150.0°C** |
| `ℳℂℝ` [ i.CA] | **Calibration Offset** <br> Set an offset value for a process output. <br> Appears if: Always | -1,999.000 to 9,999.000°F or units <br> -1,110.555 to 5,555.000°C <br> **0.0** |

## How to Tune and Operate

Manual operation provides direct (time proportioned % time) control from -100% to 100%. A negative value is allowed only when Ot 1=Cool. Automatic operation provides sensory feedback ON/OFF or PID control. When the operation transfers from automatic to manual operation, the power level from automatic operation is retained and restored to the previous set point.

The % LED indicates manual operation. The LED is on when in Manual operation and off when in AUTO operation. When the LED is flashing, press the **Infinity** key again within 5 seconds to complete the change in operation. It the sensor is open and LOC=0, 1 or 2, the control switches to Manual operation if the output was stable before the break occurred.

**Tuning-Automatic**

Auto-tuning: This control can automatically tune the PID parameters to fit the characteristics of your particular thermal system.

Auto-tune can only be used when Output 1 is hEAt.  Once the auto-tune sequence has begun, the lower display flashes between AUt and the set point.  The displayed set point remains unchanged.

Once the control finished "learning" the system, it returns to standard PID control with the values automatically set. Auto-tuning is complete within 80 minutes.  Any change of the set point, while in auto-tune, re-initiates the auto-tune procedure.

In order for the control to successfully complete auto-tune, the process must cross set point four times within 80 minutes after auto-tune has started. If this does not happen within the 80 minute time limit, Pb1 remains at 0 and the control functions in an ON/OFF mode.
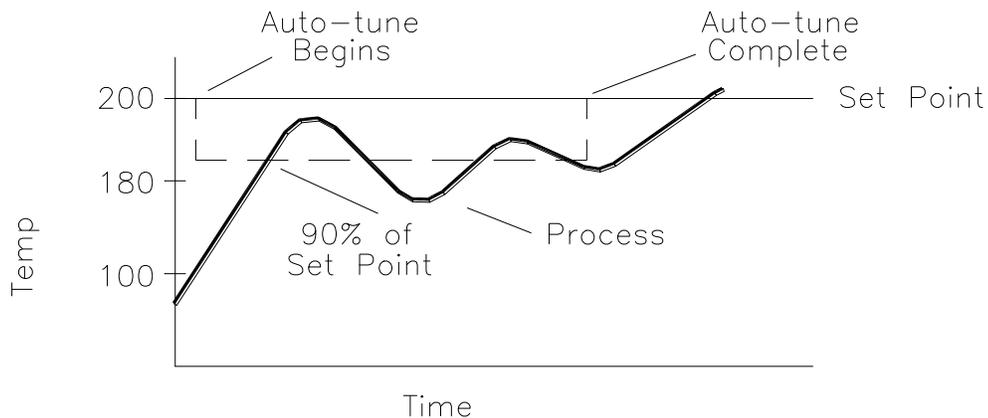


To start auto-tuning:
1.      Press the **Advance** key until the Aut prompt appears in the lower display.
2.      Change the parameter to On.
3.      Press the **Infinity** key to display the set point and sensor temperatures. While the control is in the tuning mode, the lower display alternately displays set point and the "Aut" prompt.
4.      When tuning is complete, the lower display indicates setpoint only and Aut reverts to OFF. The control installs appropriate PID tuning parameters and saves them in the non-volatile memory.

*To abort auto-tuning, the operator must reset Aut to OFF. Auto-tuning may also be aborted by cycling power off and on. In all cases, aborting auto-tuning restores all original values.

**Error Code Definitions and Actions:**

Er.In - An open or reversed polarity sensor is the most likely cause. Check the sensor; if the connection is good and functions properly, call the factory.  Make sure the input parameter [SEn] is set to the correct type thermocouple.

Er.Ab – Ambient temperature may be too hot or too cold. Make sure that the temperature surrounding the control is –18 to 65C.

Er.CS – Checksum Error. Settings may have changed unexpectedly. Press the **Infinity** key to clear the error. Verify settings. If error message persists, contact the factory.

To clear a corrected error, cycle power to the control.

**Ramp/Soak Operation**

The control is furnished with a CD for installation of a USB 2.0 to RS-485 driver.  Before communicating with the control through a pc this driver must be installed. Insert the CD into you pc and follow the instructions.

Once this is accomplished it is recommended to go to the Watlow web site, www.watlow.com and under the download center tab, click on Software Download and install the EZ-Zone configuration software.  This software will allow  you to easily set any parameter in the control and allow simple profile setup.

Once the software has been installed you can now attach the control to a pc and open the EZ-Zone configuration software.
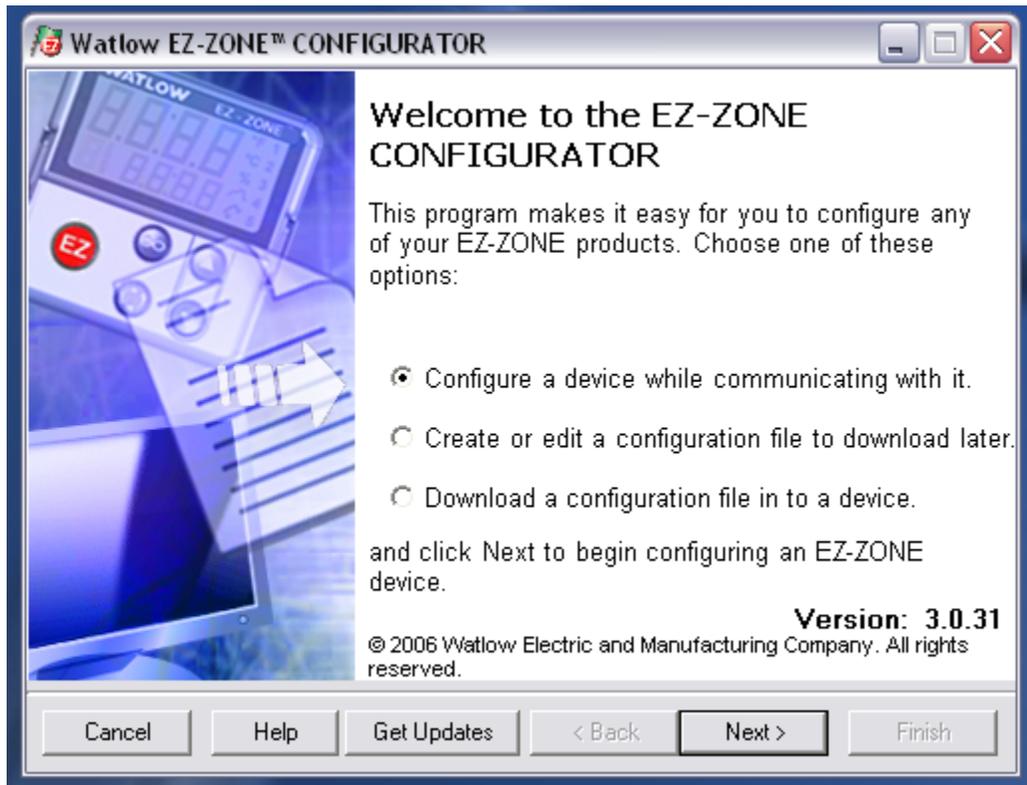


**First Screen**
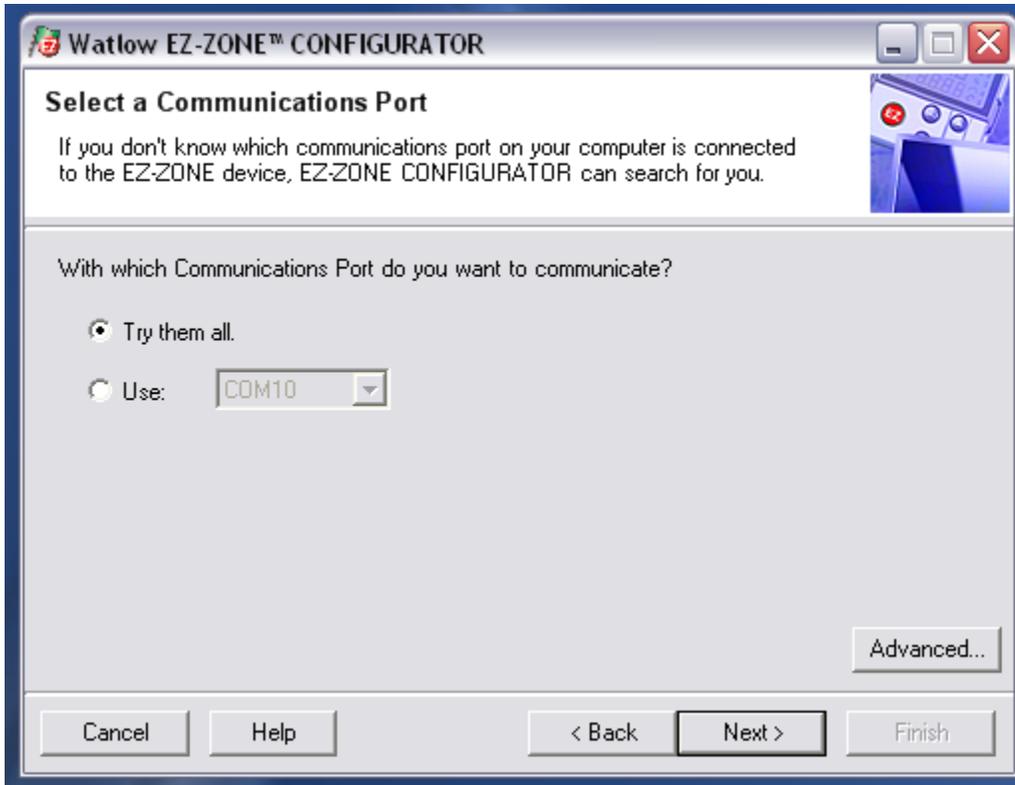
**Second Screen**
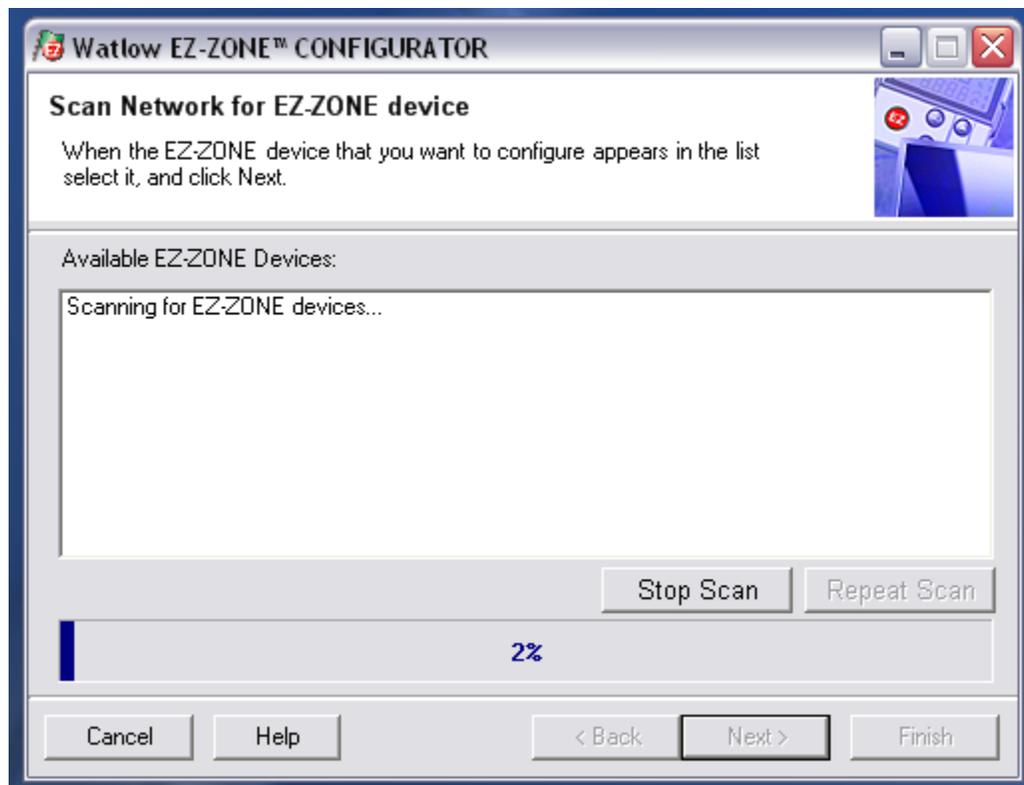


**Third Screen**
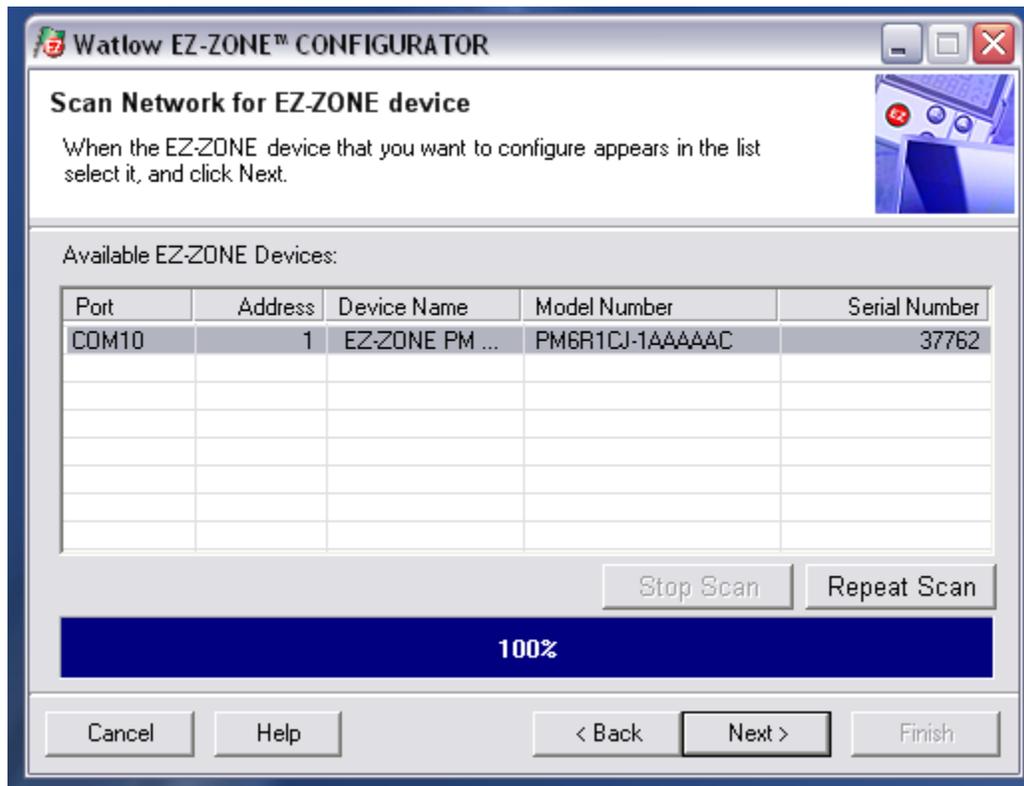
**Forth Screen**

**EZ-Zone Configurator software will now open and the following will appear on the screen:**
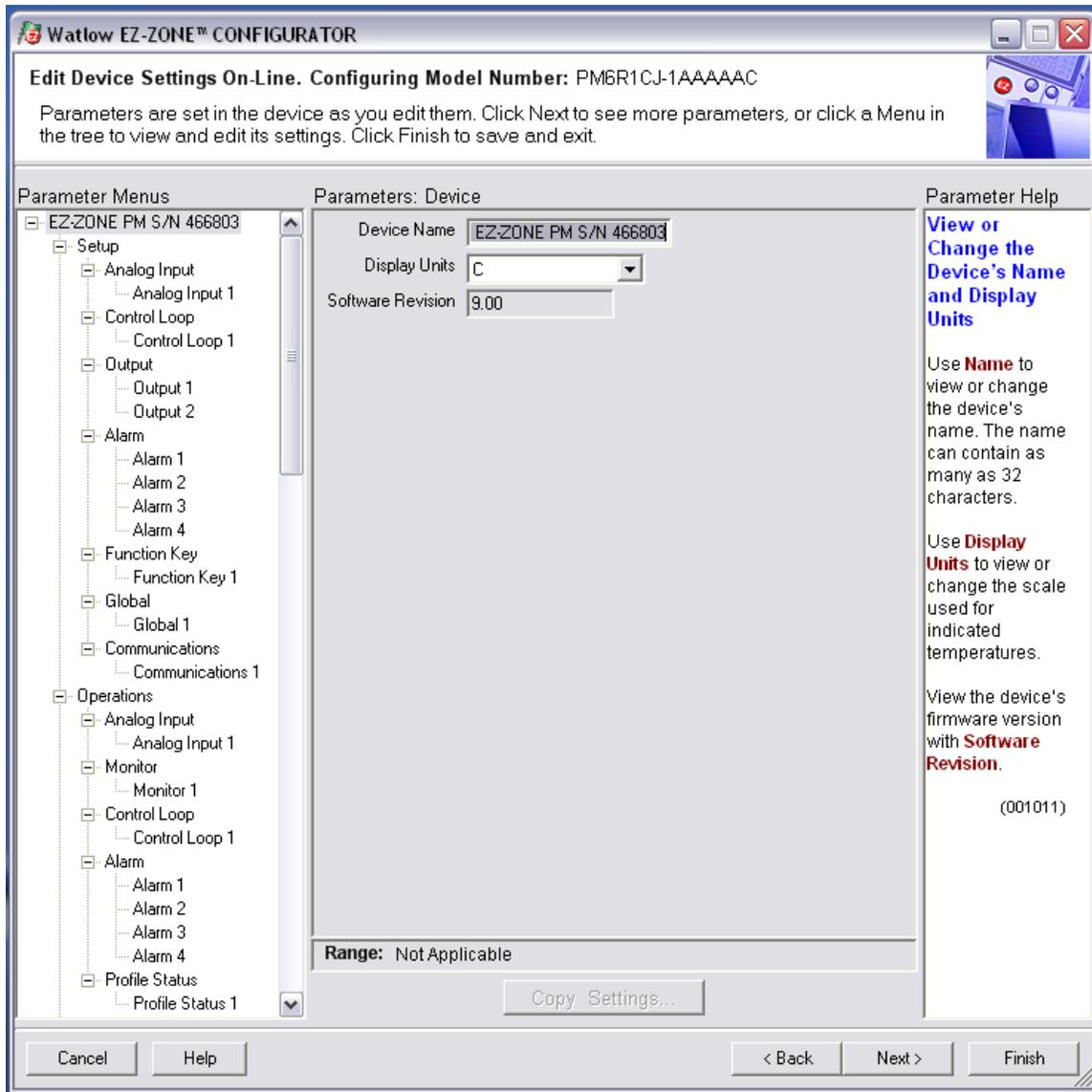
**Continued:**
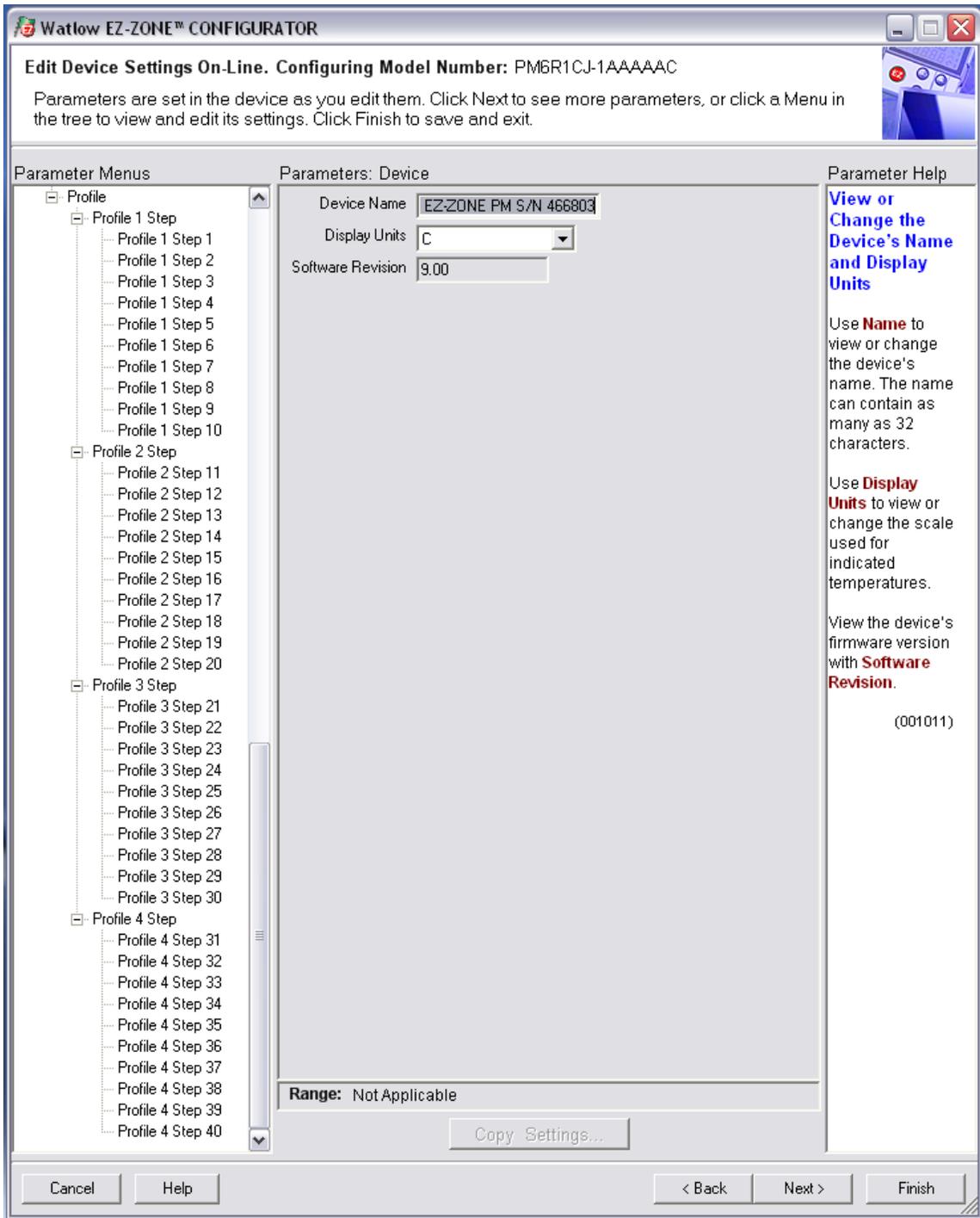
**To activate the Ramp action, follow the below setup:**

**Ramp Action Continued:**

Edit Device Settings On-Line. Configuring Model PM6R1CJ-1AAAAAC

Parameters are set in the device as you edit them. Click Next to see more parameters, or click a Menu in the tree to view and edit its settings. Click Finish to save and exit.

| Parameter Menus | Parameters: Setup: Control Loop 1 | Parameter Help |
|---|---|---|

Parameter Menus tree:
- EZ-ZONE PM
  - Setup
    - Analog Input
    - Control Loop
      - Control Loop 1
    - Output
      - Output 1
      - Output 2
    - Alarm
      - Alarm 1
      - Alarm 2
      - Alarm 3
      - Alarm 4
    - Function Key
      - Function Key 1
    - Global
      - Global 1
    - Communications
      - Communications 1
  - Operations
    - Analog Input
      - Analog Input 1
    - Monitor
      - Monitor 1
    - Control Loop
      - Control Loop 1
    - Alarm
    - Profile Status
      - Profile Status 1
  - Factory
    - Custom Setup
    - Lock
    - Diagnostics
    - Calibration
  - Profile

Parameters: Setup: Control Loop 1

| Parameter | Value | Unit |
|---|---|---|
| Heat Algorithm | PID | |
| Cool Algorithm | Off | |
| Cool Output Curve | Off | |
| TRU-TUNE+ Enable | No | |
| TRU-TUNE+ Band | 0 | °C |
| TRU-TUNE+ Gain | 3 | |
| Autotune Aggressiveness | Critical | |
| Peltier Delay | 0.0 | |
| User Failure Action | User | |
| Input Error Failure | User | |
| Fixed Power | 0.0 | % |
| Open Loop Detect Enable | No | |
| Open Loop Detect Time | 240 | |
| Open Loop Detect Deviation | 6 | °C |
| Ramp Action | Off | |
| Ramp Scale | Minutes | |
| Ramp Rate | 1 | °C |
| Low Set Point | -1128 | °C |
| High Set Point | 5537 | °C |
| Set Point Open Limit Low | -100.0 | % |
| Set Point Open Limit High | 100.0 | % |

Parameter Help:

**Set Up a Ramp**

Use **Ramp Action** to determine if and when the controller will ramp.
- **Off** will disable ramping.
- **Startup** will enable ramping when the controller powers up and disable it when the process value reaches the set point.
- **Set Point** will enable ramping when the set point is changed.
- **Both** will enable ramping on start up or when the set point is changed.

Use **Ramp Scale** to change the time scale of the **Ramp Rate**.

Use **Ramp Rate** to set the maximum speed of the ramp.

(007014)

**Range:** Not Applicable

Copy Settings...

Cancel | Help | ‹ Back | Next › | Finish

# Navigating the Profiling Page

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

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

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

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

**Note:**
Changes made to profile parameters in the Profiling Pages will be saved and will also have an immediate impact on the running profile. Some parameters in the Profile Status Menu can be changed for the currently running profile, but should only be changed by knowledgeable personnel and with caution. Changing parameters via the Profile Status Menu will not change the stored profile but will have an immediate impact on the profile that is running.

## How to Start a Profile

After defining the profile follow the steps below to run the profile:

1. From the Home Page push the Advance Key ◉ repeatedly until Profile Start `PSt1` appears in the lower display.
2. Use the Up ○ or Down ○ key to choose the file or step number within a profile where you want the profile to begin running.
3. Press the Advance Key ◉. This takes you to Profile Action `PAC1`, where you can select the appropriate action.
   - `nonE` No action
   - `ProF` Begin execution from first step of the specified profile number, whether it exists or not.
   - `PAUS` Pause the currently running profile.
   - `rESU` Resume running the profile from the previously paused step.
   - `End` End the profile.
   - `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. (To disable EEPROM writes, go to the Setup Page and then the `CoM` menu. Proceed to the `nUS` prompt and set it to no for `CoM` 1, 2 or both.)

## Profiling Parameters

`P1` to `P4`
`ProF`
   `1` to `10`
   `P1`
    `StYP` Step Type
    `tSP1` Target Set Point Loop 1
    `hoUr` Hours
    `Min` Minutes
    `SEC` Seconds
    `rAtE` Rate
    `WP1` Wait For Process 1
    `WE1` Wait For Event 1
    `WE2` Wait for Event 2
    `doW` Day of Week
    `JS` Jump Step
    `JC` Jump Count
    `End` End Type
    `Ent1` Event 1
    `Ent2` Event 2

## Select What Type this Step Will Be

Use **Step Type** to select what this step will do. The parameter list updates in a few seconds after the **Step Type** setting is changed.

• An **Unused Step** is, in effect, an empty step that can be used to erase a step in the profile.

• A **Time** step ramps to a **Target Set Point** over a specified time and maintains up to two **Event** states for the designated time.

• A **Rate** step ramps the process value to the **Target Set Point** without exceeding the **Rate**, while maintaining up to two **Event** outputs.

• A **Soak** step maintains the last **Target Set Point** and up to two **Event** states for the designated time.

• A **Wait for Event** step will wait for up to two **Wait Events** to be satisfied while maintaining up to two **Event** outputs.

• A **Wait for Process** step will wait for the process value to match the **Wait for Process** value, while maintaining up to two **Event** outputs.

• A **Wait for Both** step will wait for the process value to match the **Wait for Process** value and up to two **Wait Events** to be satisfied while maintaining up to two **Event** outputs.

• A **Jump Loop** step will jump to the **Jump Step** the number of times designated in **Jump Count**, while maintaining up to two **Event** outputs.

• An **End** step will set up to two **Event** outputs and end the profile. If a profile doesn't include an **End** step, control will move to the next step. If no **End** step in encountered, after step 40 control will default to the set point in effect before the profile started.

**Profiling Page:**

**Profiling Page**

| Dis-play | Parameter name Description | Range | Default | Parameter Appears in Menu When | Modbus Relative Address | CIP Class Instance Attribute hex (dec) | Data Type & Read/ Write |
|---|---|---|---|---|---|---|---|
| `P1` `ProF` **Profiling Menu** | | | | | | | |
| `P1` [ P1] to `P4` [ P4] | **Step** Select a step to edit or view. | 1 to 10 [profile 1] 11 to 20 [profile 2] 21 to 30 [profile 3] 31 to 40 [profile 4] | | Always | | | |
| `StYP` [S.typ] | **Step Type** Select a step type. | `USEP` Unused Step (50) `End` End (27) `JL` Jump Loop (116) `CLoC` Wait For Time (1543) `WJbo` Wait For Both (210) `WJPr` Wait For Process (209) `WJE` Wait For Event (144) `SoAH` Soak (87) `t` Time (143) | Unused | Always | *Instance 1* *Map 1    Map 2* 2570      4500  Offset to next instance (*Map 1 equals +80, Map 2 equals +100*) | 0x79 (121) 1 to 40 1 | uint RWE |
| `tSP1` [t.SP1] | *Step Type Parameters* **Target Set Point** (loop 1) Select the set point for this step. | -1,999.000 to 9,999.000°F or units -1,128 to 5,537.000°C | 0.0°F or units -18°C | Step Type is set to Time, Rate, Wait for Process or Wait for Both. | *Instance 1* *Map 1    Map 2* 2572      4502  Offset to next instance (*Map 1 equals +50, Map 2 equals +100*) | 0x79 (121) 1 to 40 2 | float RWE |
| `hoUr` [hoUr] | *Step Type Parameters* **Hours** Select the hours (plus Minutes and Seconds) for a timed step. | 0 to 99 | 0 | Step Type is set to Time or Soak. | *Instance 1* *Map 1    Map 2* 2574      4504  Offset to next instance (*Map 1 equals +50, Map 2 equals +100*) | 0x79 (121) 1 to 40 3 | uint RWE |
| `Min` [Min] | *Step Type Parameters* **Minutes** Select the minutes (plus Hours and Seconds) for a timed step. | 0 to 59 | 0 | Step Type is set to Time or Soak. | *Instance 1* *Map 1    Map 2* 2576      4506  Offset to next instance (*Map 1 equals +50, Map 2 equals +100*) | 0x79 (121) 1 to 40 4 | uint RWE |
| `SEC` [ SEC] | *Step Type Parameters* **Seconds** Select the seconds (plus Hours and Minutes) for a timed step. | 0 to 59 | 0 | Step Type is set to Time or Soak. | *Instance 1* *Map 1    Map 2* 2578      4508  Offset to next instance (*Map 1 equals +50, Map 2 equals +100*) | 0x79 (121) 1 to 40 5 | uint RWE |
| **Note:** Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces. | | | | | | | **R: Read W: Write E: EEPROM S: User Set** |

**Profiling Page Continued:**

<p align="center">Profiling Page</p>

| Display | Parameter name Description | Range | Default | Parameter Appears in Menu When | Modbus Relative Address | CIP Class Instance Attribute hex (dec) | Data Type & Read/Write |
|---|---|---|---|---|---|---|---|
| LIP1 [W.P1] | *Step Type Parameters* **Wait For Process Value** Select which analog input Wait For Process will use. | -1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C | 0.0°F or units -18.0°C | Step Type is set to Wait For Process. | *Instance 1* Map 1 Map 2 2590 4520 Offset to next instance (*Map 1 equals +50, Map 2 equals +100*) | 0x79 (121) 1 to 40 0xB (11) | float RWE |
| WE.1 [WE.1] | *Step Type Parameters* **Wait Event (1)** Select the event state that must be satisfied during this step. Digital input 5 provides the state of Event 1, and digital input 6 provides the state of Event 2. | [oFF] Off (62) [on] On (63) [nonE] None (61) | Off | Step Type is set to Wait Event or Wait for Both. | *Instance 1* Map 1 Map 2 2586 4516 Offset to next instance (*Map 1 equals +50, Map 2 equals +100*) | 0x79 (121) 1 to 40 9 | uint RWE |
| WE.2 [WE.2] | *Step Type Parameters* **Wait Event (2)** Select the event state that must be satisfied during this step. Digital input 5 provides the state of Event 1, and digital input 6 provides the state of Event 2. | [oFF] Off (62) [on] On (63) [nonE] None (61) | Off | Step Type is set to Wait Event or Wait for Both. | *Instance 1* Map 1 Map 2 2588 4518 Offset to next instance (*Map 1 equals +50, Map 2 equals +100*) | 0x79 (121) 1 to 40 0xA (10) | uint RWE |
| dow [dow] | *Step Type Parameters* **Day of Week** | [Ed] Every Day (1567) [wd] Week days (1566) [Sun] Sunday (1565) [Mon] Monday (1559) [tuE] Tuesday (1560) [WEd] Wednesday (1561) [thur] Thursday (1562) [Fri] Friday (1563) [SAt] Saturday (1564) | Sunday | If real time clock is present and StepType is set to Wait for Time. | *Instance 1* Map 1 Map 2 - - - - 4580 Offset to next instance Map 2 equals +100) | 0x79 (121) 1 to 40 0x29 (41) | uint RWE |
| JS [ JS] | *Step Type Parameters* **Jump Step** Select a step to jump to. | 1 to 40 | 0 | Step Type is set to Jump Loop. | *Instance 1* Map 1 Map 2 2592 4522 Offset to next instance (*Map 1 equals +50, Map 2 equals +100*) | 0x79 (121) 1 to 40 0xC (12) | uint RWE |
| JC [ JC] | *Step Type Parameters* **Jump Count** Set the number of jumps. A value of 0 creates an infinite loop. Loops can be nested four deep. | 0 to 9,999 | 0 | Step Type is set to Jump Loop. | *Instance 1* Map 1 Map 2 2594 4524 Offset to next instance (*Map 1 equals +50, Map 2 equals +100*) | 0x79 (121) 1 to 40 0xD (13) | uint RWE |
| **Note:** Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces. | | | | | | | R: Read W: Write E: EEPROM S: User Set |

**Profiling Page Continued:**

<div align="center">

**Profiling Page**

</div>

| Dis-play | Parameter name Description | Range | Default | Parameter Appears in Menu When | Modbus Relative Ad-dress | CIP Class Instance Attribute hex (dec) | Data Type & Read/ Write |
|---|---|---|---|---|---|---|---|
| [End] [ End] | *Step Type Parameters* **End Type** Select what the controller will do when this profile ends. | [oFF] Control Mode set to Off (62) [Hold] Hold last closed-loop set point in the profile (47) [USEr] User, reverts to pre-vious set point (100) | Off | Step Type is set to End. | *Instance 1* *Map 1*   *Map 2* 2596      4526 Offset to next instance (*Map 1 equals +50, Map 2 equals +100*) | 0x79 (121) 1 to 40 0xE (14) | uint RWE |
| [Ent1] [Ent1] | *Step Type Parameters* **Event Output (1)** Select whether Event Out-put 1 or 2 is on or off during this step. | [oFF] Off (62) [on] On (63) | Off | Step Type is set to Time, Rate, Soak, Wait Event, Wait for Pro-cess, Wait for Both or Jump Loop. | *Instance 1* *Map 1*   *Map 2* 2582      4512 Offset to next instance (*Map 1 equals +50, Map 2 equals +100*) | 0x79 (121) 1 to 40 7 | uint RWE |
| [Ent2] [Ent2] | *Step Type Parameters* **Event Output (2)** Select whether Event Out-put 1 or 2 is on or off during this step. | [oFF] Off (62) [on] On (63) | Off | Step Type is set to Time, Rate, Soak, Wait Event, Wait for Pro-cess, Wait for Both or Jump Loop. | *Instance 1* *Map 1*   *Map 2* 2584      4514 Offset to next instance (*Map 1 equals +50, Map 2 equals +100*) | 0x79 (121) 1 to 40 8 | uint RWE |
| **Note:** Some values will be rounded off to fit in the four-character display. Full values can be read with other interfaces. | | | | | | | **R: Read W: Write E: EEPROM S: User Set** |

## GLOSSARY

**Automatic prompts:** Data entry points where a microprocessor-based control "prompts" or asks the operator for information input.

**Auto-tune:** Automatically tunes the parameters to fit the characteristics of your particular thermal system.

**Cold junction compensation:** Electronic means to compensate for the effect temperature at the cold junction.

**Cycle time:** The time necessary to complete a full On-through-Off period in a time proportioning control system.

**Derivative/Rate:** Anticipatory action that senses the rate of change of the process, and compensates to minimize overshoot and undershoot.

**Default parameters:** The parameters (programmed instructions) permanently stored in microprocessor software to provide the data base.

**Droop:** Difference in temperature between set point and stabilized process temperature.

**Hysteresis:** In On/Off control, the temperature change necessary to change the output from On to full Off.

**Input (sensor):** Process variable information being supplied to the instrument.

**Integral/Reset:** Control action that automatically eliminates offset, or "droop", between set point and actual process temperature.

**Offset:** Adjustment to actual input temperature and to the temperature valves the control uses for display and control.

**ON/OFF control:** Control of temperature about a set point by turning the output full On below set point and full Off above set point.

**Output:** Action in response to difference between set point and process variable.

**Overshoot:** Condition where temperature exceeds steeping due to initial power up or process changes.

**Parameter:** a physical property whose value determines the response of a electronic control to given inputs.

**PID:** Proportioning control with auto-reset and rate.

**Process variable:** Thermal system element to be regulated, such as time, temperature, relative humidity, etc.

**Proportional band:** Span of temperature about the set point where time proportional control action takes place.

**Set point:** Intended value of the process variable.

**Thermal system:** A regulated environment consisting of a heat source, heat transfer medium, sensing device and a process variable control.

**Thermocouple:** Temperature sensing device that is constructed of two dissimilar metals wherein a measurable, predicative voltage is generated corresponding to temperature.

Thermocouple break protection: Fail-safe operation that assures output shutdown upon an open thermocouple condition.

Time Proportioning Control: Action which varies the amount of ON and OFF time when "close" to the set point (within the proportional band). This variance is proportional to the difference between the set point and the actual process temperature.

**Maintenance**
Simple preventative maintenance steps include keeping the controller clean. Protect it from overload, excessive dirt, oil and corrosion.

**Warranty**

Digi-Sense, for itself does hereby offer a warranty for products from the date of receipt by the user, under normal and proper usage, against defects in workmanship and materials for 12 months, and will repair or replace any defective part(s) without charge when same is shipped Prepaid to Digi-Sense from which the product was originally purchased.

Should the nature of any defect require that the product, or any constituent portion thereof, be returned to Digi-Sense, Vernon Hill, Illinois, prepaid for service, a condition precedent to any return shall be the procurement of authorization from Digi-Sense assigning a **Return Goods Number** to the product or part requiring service.

Parts and accessories manufactured by others are warranted only to the extent of the regular warranty of the manufacturer or supplier of such materials and only insofar as Digi-Sense is able to transfer the benefits of warranty coverage, if any, to the user.  Any  adequately warranted defective part or accessory manufactured or supplied by others may be exchanged through Digi-Sense for a replacement part is shipped prepaid and received at Digi-Sense within 30 days from the date any replacement part is obtained by the user.

This warranty supersedes and is given in lieu of all implied warranties, and is void if the user causes damages from improper usage of product under normal operating conditions.

12 MONTHS LIMITED WARRANTY ON ALL PARTS AND LABOR IS GIVEN BY DIGI-SENSE.

CATALOG NUMBER  3622566, 3622567, 3622568, 3622569

SERIAL NUMBER _____

DATE OF PURCHASE _____

**Digi-Sense**
**625 East Bunker Court, MS 18**
**Vernon Hills, Illinois 60061-1844, U.S.A**
**Phone: 847-549-7600  Fax: 847-549-7676**
**( 800) 323-4340**