# SERVICE & SETUP MANUAL


# WATER HEATER
# ELECTRONIC CONTROLLER

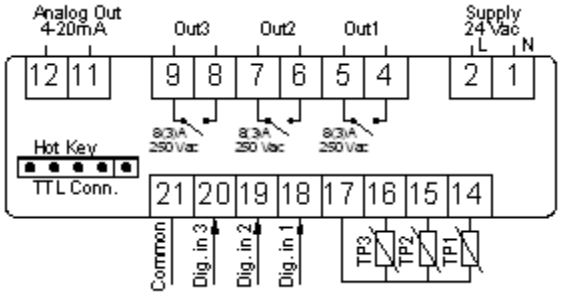
A WATTS Brand PVI INDUSTRIES - Fort Worth, Texas - Web www.pvi.com - Phone 1-800-433-5654

## INDEX

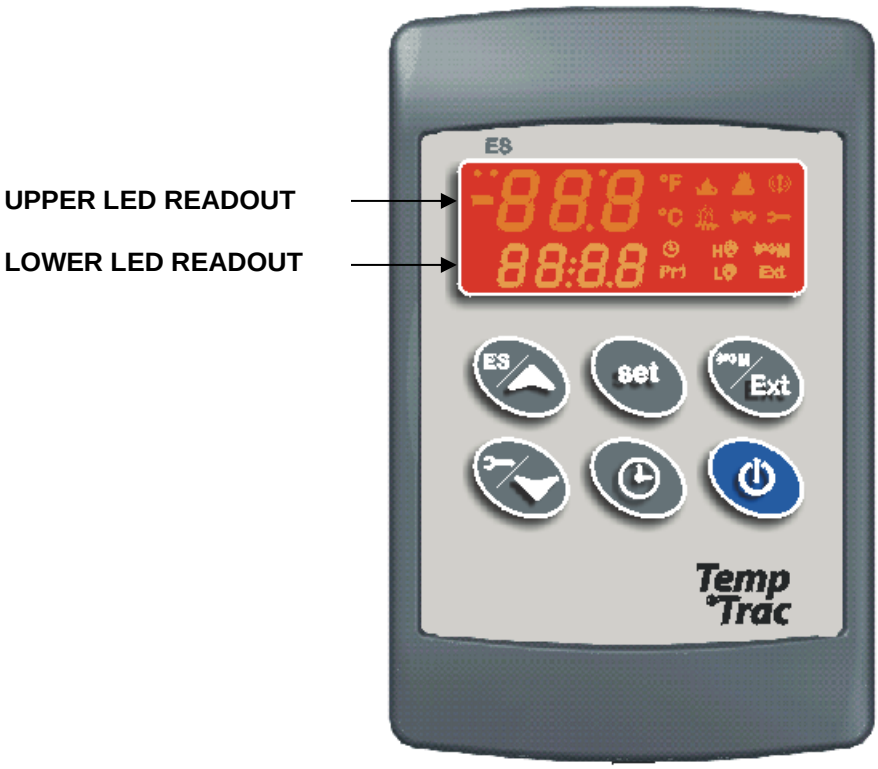
# 1. TECHNICAL DATA

**Housing:** Self-extinguishing ABS.
**Case:** Facia 100x64 mm; depth 76mm
**Mounting:** Panel mounting in a 56x72 mm panel cut-out with two screws. ⌀ 3x2mm. Distance between the holes 40mm
**Protection:** IP20.
**Frontal protection:** IP65 with optional frontal gasket mod. RGW-V
**Connections:** Spade on connectors 6.3 mm for supply and relays and 4÷20mA-
Screw terminals block for probes, digital input
**Power supply:** 24Vac Class 2
**Power absorption:** 7VA max.
**Display:** Dual display
**Relay outputs:** 3 SPST relay contacts, 3A, 8A resistive load.
**Other output:** Audible alarm
4÷20mA modulation output
**Inputs:** 3 NTC probes
**Digital inputs:** 3 Dry Contact
**Hot key facility** for fast programming
**Serial output:** TTL standard
**Communication protocol:** Modbus - RTU
**Data storing:** On non-volatile memory (EEPROM).
**Internal clock back-up:** 24 hours
**Kind of action:** 1B.
**Pollution grade:** Normal
**Software class:** A.
**Operating temperature:** 32÷140°F **(**0÷60 °C)
**Storage temperature:** -13÷140°F **(**-25÷60 °C)
**Relative humidity:** 20÷85% (no condensing)
**Measuring and regulation range: NTC probe:** -58÷230°F **(**-40÷110°C)
**Resolution:** 1°F or 1 °C (selectable).
**Accuracy (ambient temp. 77°F)**: ±1 °F ±1 digit

# 2. WIRING DIAGRAMS



# 3. DISPLAY AND INTERFACE




## 3.1 KEYBOARD

**SET**
- Displays and modifies the temperature set points.
- In programming mode it selects a parameter or confirms an operation.

**UP**
- Displays and modifies the energy saving (Night Time Setback) settings.
- In programming mode it browses the parameter codes or increases the displayed value.

**DOWN**
- Displays the working hours of the load relays.
- In programming mode it browses the parameter codes or decreases the displayed value.

**CLOCK**
- Changes lower display from inlet temperature to current time and day.
- To set the current time and day.

**EXT**
- Changes upper display between outlet temperature, inlet temperature, outdoor reset temperature, modulation % or the temperature difference between the inlet and outlet temperatures.
- In programming mode it sets the modulation output (4-20mA). (Password is required (321).

**ON/OFF**
- Switches the control ON or OFF.

**KEY COMBINATIONS**


To lock and unlock the keyboard.


To enter the programming mode.


To exit the programming mode.

## 3.2 LED ICON LEGEND

| LED | MODE | Function |
|---|---|---|
| °F | ON | Temperatures are displayed in degrees Fahrenheit. |
| °C | ON | Temperatures are displayed in degrees Celsius. |
| | Flashing | Output 1 time delay. Output 1 will not energize until ***AC1*** time delay expires OR ***i3F=Edi*** and the remote enable/disable is in standby (disabled). |
| | ON | Output 1 relay is on. Spade contacts 4 & 5 are closed.<br>Usually this is the primary CALL FOR HEAT. |
| | Flashing | Output 2 time delay. Output 2 will not energize until ***AC2*** time delay expires. *(On 2-stage units only.)*<br>*Or* **oS2** is set to **AL.** (Output 2 is an alarm indicator and it is off.) |
| | ON | Output 2 relay is on or the ***AL2*** alarm output is enabled. Spade contacts 6 & 7 are closed. |
| | Flashing | Output 3 time delay. Output 3 will not energize until ***AC3*** time delay expires. |
| | ON | Output 3 relay is on. Spade contacts 8 & 9 are closed. |
| M | ON | Modulation output signal is in manual control mode. Parameter ***PS4*** should be set to nu for automatic operation.<br>Or If **dS1** or **dS2** is set to display the modulation output value **ANI.** |
| M | Flashing | Modulation is forced to value in ***i1S*** by digital input 1. |
| | ON | Modulation output signal is automatically controlled by temperature probe 1. |
| | Flashing | Modulation output time delay is activated. Modulation output will remain at 4mA until the ***AC4*** time delay expires.<br>Or Modulation will remain in low fire until probe 2 is below **TH4** by the amount of **HY4.** |
| Ext | ON | The outside temperature is displayed (top or bottom display). See **dS1** & **dS2.** |
| L | FLASHING | Digital input 2 (alarm) is activated. |
| H | FLASHING | Digital input 3 (alarm) is activated. |
| L<br>H | FLASHING | When both L and H are flashing other safety interlocks such as low water cut-off or high temperature limit may be in failure. |
| | ON | Lower LED display is displaying time clock. |
| Pr1 | ON | While in the **Pr2** menu, signals that current the parameter is accessible in the **Pr1** menu. |
| | FLASHING | ALARM signal (any alarm condition LA, HA, P1, P2, P3, AL2, AL3, Nn1, Nn2, Nn3). |
| | FLASHING | Programmed working hours limit is exceeded. See **oP1**, **oP2**, **oP3** & **ou1**, **ou2**, **ou3.** |
| | ON | Working hours are displayed in the lower LED display. |
| ES | ON | The Energy saving function is running. This is a LED dot under the ES label top left. |
| PoF | Pops Up | Displayed when trying to make a change, the Keypad is locked. See section 4.5. |

## 3.3 UPPER LED READOUT (RED)

The default display of this readout is the temperature sensed at Probe 2. Probe 2 may display the tank stored water temperature, outlet water temperature, flue gas temperature, ambient temperature, remote tank or blended water temperature, etc., depending on the product and application. Refer to your specific water heaters Installation and Maintenance Manual and the supplied wiring drawing. The upper LED readout can also be switched to display Probe 1 or 3 (if used) or the modulation % or the temperature difference between Probe 1 and 2. If Probe 2 is not utilized, the display will show "**nu**".

By pressing and releasing the 

button once, the Upper LED will display the actual temperature sensed at Probe 3. Probe 3 (if used) may display the flue gas temperature or outside ambient temperature, etc., depending on the product and application.

By pressing and releasing the 

button again, the Upper LED will display the modulation %. If the product is a non-modulating product, the displayed valve should not be considered.

By pressing and releasing the 

button a third time, the Upper LED will display the difference between the temperature sensed at Probe 2 (if used) and the temperature sensed at Probe 1.

To return to the default in the Upper LED readout, press the 

button to cycle back to the Probe 2 temperature.

All of the display information described above is available for monitoring through the optional MODBUS RTU interface.

## 3.4 LOWER LED READOUT (YELLOW)

The default display of this readout is the temperature sensed at Probe 1. Probe 1 will be inserted into the appropriate area of the storage tank to provide effective temperature response for the heat source (this may not be at the top of the tank). The lower LED readout can also be switched to display Probe 2 or 3 (if used) or the modulation % or the Time of Day.

By pressing and releasing the 
button once, the Lower LED display will show the Time of Day. Press again to return to default display.

## 3.5 TO SET THE CURRENT TIME AND DAY (24 HOUR CLOCK)

1. Push and hold the 
button for more than 3 seconds. The 
LED ICON starts flashing and the "Hur" (hour) parameter name is displayed in the Upper LED readout**,** its value is displayed in the Lower LED readout**.**
2. Pushing the 

or 
button alternates the LED readouts between the following:
   - "Hur" (hour) in the Upper readout and its value in the lower readout.
   - "Min" (minute) in the Upper readout**,** its value in the Lower readout.
   - "dAY" (day) in the Upper readout**,** its value in the Lower readout.
3. To adjust a value, press the 

button and the value in the Lower LED will start flashing. Change the value by pressing the 

or 
buttons. When correct, press 

**.**
4. To exit push 

**+** 

or wait 15 seconds without pressing any buttons.

**NOTE**: This device recognizes Sunday as the first day of the week and Saturday as the last.

## 3.6 TO SET THE ENERGY SAVINGS TIME

1. Push the 

button for more than 3 seconds and the first parameter of the energy saving will be displayed.
2. Use 

and 
keys to browse them.
3. To change a value push 

key followed by 

or  .
4. To exit, press 

and 

or wait 30s without pressing any key.

## 3.7 TO SET THE MODULATION OUTPUT MANUALLY

1. Push and hold the 

key for more than 3 seconds M LED switches ON and the **PS4** parameter is displayed in the upper display, while the **PAS** label is shown in the lower display. The passkey will be required to view and manually change the modulation % value. Passkey is “321”.
2. Release the key, and insert the password as described in the par. 4.3. The value of **PS4** will be displayed in the lower display. **(nu)** stands for not used. Return to this condition for automatic operation.
3. To adjust modulation manually, push the 

key, the value starts flashing. Then use 

or 
keys to modified it.
4. To exit, press 

and 

or wait 30s without pressing any key.

**NOTE: After a modification, it will be possible to enter the Modulation output setting without entering the password for 10min. After this time you will be asked for the password again.**

## 3.8 HOW TO SEE THE WORKING HOURS OF RELAY OUTPUTS

1. Push the 
key for more than 3 seconds, LED switches ON, the display 2 will show **ou1** and the display 1 will show the working hours of the relay 1.
2. By pushing 

or 
keys, the working hours of other outputs are displayed.
3. To exit, press 

and 

or wait 30s without pressing any key.

## 3.9 HOW TO RESET THE WORKING HOURS OF RELAY OUTPUTS

1. To reset the working hours of a load enter Pr2 menu. See section 4.3.
2. Select the parameter: **ou1** for the output 1 or **ou2** for output 2 or **ou3** for output 3.
3. Push the 

key, and the value will start flashing, use the 
key to decrease the value.

# 4. PROGRAMMING

## 4.1 SET POINTS PROGRAMMING

1. Push the set key, the upper display will show the "**St1**", while the lower display will show its value.
2. Use the ES and key to see the set point to be modified.
3. Push the set key to modify the displayed value. It starts flashing.
4. To change it push the ES or keys.
5. Push the set key to confirm the value and pass to the setting of next set point.
6. Repeat the operations for additional set points.

**To exit:** press set and ES or wait 30s without pressing any key.
**NOTE:** Each point has a time out of 30 seconds. If no key is pressed within 30s the controller exits the set points programming procedure.

**NOTE**: The set value is stored even when the procedure exits due to the 15 second expiration.

## 4.2 HOW TO CHANGE PARAMETERS IN THE "Pr1" LIST (NOT PASSWORD PROTECTED)

1. Enter the Programming mode by pressing the set and key for 3s.
2. Select the required parameter. The name of the parameter is on the upper display and its value is on the lower display.
3. Press the set key: the value of the parameter will start blinking.
4. Use ES or to change the value.
5. Press set to store the new value and move to the following parameter.

**To exit**: Press set and ES and or wait 30s without pressing a key.

**NOTE**: The set value is stored even when the procedure exits due to the 15 second expiration.

## 4.3 HOW TO ENTER PARAMETERS IN THE "Pr2" LIST (PASSWORD PROTECTED)

1. Enter the "Pr1" level.
2. Press the DOWN key.
3. Select "**Pr2**" – "**PAS**" parameter and press the set key.
4. The value ""0 - -" with a flashing zero is displayed.
   Use ES or keys to input the security code in the flashing digit; confirm the figure by pressing set.
5. The security code is "321".

**NOTE: each parameter in "Pr2" can be removed or put into "Pr1" (user level) by pressing set + .**
**When a parameter is present also in "Pr1" the "Pr1" icon is on.**

## 4.4 HOW TO CHANGE THE PARAMETER VALUES IN “Pr2”

1. Enter the Programming mode.
2. Select the required parameter with 

or  keys.
3. Press the 

key and the value will start blinking.
4. Use 

or  keys to change its value.
5. Press 

to store the new value and move to the next parameter.

**To exit**: Press 

and 

or wait 30s without pressing a key.

**NOTE**: the new programming is stored even if the procedure exits by time-out.

## 4.5 HOW TO LOCK THE KEYBOARD

1. Keep the 

and  keys pressed together for more than 3 s.
2. The “PoF” message will be displayed and the keyboard is locked. At this point it is only possible to view the set point. Any attempt to change a set point will display the “PoF” message.
3. Repeat step 1 to unlock the keyboard.
4. The “Pon” message will be displayed and the keyboard will be unlocked.

# 5. PARAMETERS

**All the parameters can be set in:**
- **Pr1: immediately accessible menu.**
- **Pr2: password protected menu.**

**Label: The displayed label when using the Keypad.**
**Range: Indicates the possible values and units that can be set.**
**Firm Version: Firmware of the TempTrac control can be viewed in the rEL parameter.**

| Label | Firm Version | Description | Range X÷Y From X to Y | Rev 0.3 Level | Rev 0.5 Level | Hex Modbus Address Base 0 | Modbus Command Address 40000+ |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| **St1** | **0.3 & 0.5** | Set point1 | LS1÷US1 | Pr1 | Pr1 | 0x300 | 769 |
| **St2** | **0.3 & 0.5** | Set point2 | LS2÷US2 | Pr1 | Pr1 | 0x301 | 770 |
| **St3** | **0.3 & 0.5** | Set point3 | LS3÷US3 | Pr1 | Pr1 | 0x302 | 771 |
| **St5** | **0.3 & 0.5** | Set point5 Set point 3 alternate | -20÷70°F | Pr1 | Pr1 | 0x303 | 772 |
| **HY1** | **0.3 & 0.5** | Differential for St1 | -22÷22°F | Pr2 | Pr2 | 0x304 | 773 |
| **LS1** | **0.3 & 0.5** | Minimum set point1 | -40°F÷SET | Pr2 | Pr2 | 0x305 | 774 |
| **US1** | **0.3 & 0.5** | Maximum set point1 | SET ÷ 230°F | Pr2 | Pr2 | 0x306 | 775 |
| **AC1** | **0.3 & 0.5** | Anti-short cycle delay for output 1 | 0÷30 min. | Pr2 | Pr2 | 0x307 | 776 |
| **S2c** | **0.3 & 0.5** | Configuration of St2: dependent on St1 or independent | diP; ind | Pr3 | Pr2 | 0x308 | 777 |
| **HY2** | **0.3 & 0.5** | Differential for St2 | -22÷22°F | Pr2 | Pr2 | 0x309 | 778 |
| **LS2** | **0.3 & 0.5** | Minimum set point2 | -40°F÷St2 | Pr2 | Pr2 | 0x30A | 779 |
| **uS2** | **0.3 & 0.5** | Maximum set point2 | St2 ÷ 230°F | Pr2 | Pr2 | 0x30B | 780 |
| **AC2** | **0.3 & 0.5** | Anti-short cycle delay for output 2 | 0÷30 min. | Pr2 | Pr2 | 0x30C | 781 |
| **S3c** | **0.3 & 0.5** | Configuration of St3: dependent on St1 or independent | diP; ind | Pr2 | Pr2 | 0x30D | 782 |
| **HY3** | **0.3 & 0.5** | Differential for set point 3 St3 | -22÷22°F | Pr2 | Pr2 | 0x30E | 783 |
| **LS3** | **0.3 & 0.5** | Minimum set point 3 St3 | -40°F÷St3 | Pr2 | Pr2 | 0x30F | 784 |
| **uS3** | **0.3 & 0.5** | Maximum set point 3 St3 | St3 ÷ 230°F | Pr2 | Pr2 | 0x310 | 785 |
| **AC3** | **0.3 & 0.5** | Anti-short cycle delay for output 3 | 0÷30 min. | Pr2 | Pr2 | 0x311 | 786 |
| **o3P** | **0.3 & 0.5** | Probe selection for output 3 | Pb1 / Pb2 | Pr2 | Pr2 | 0x312 | 787 |
| **SSE** | **0.3 & 0.5** | Set point shift for output 3 enable disable | No; Yes | Pr2 | Pr2 | 0x313 | 788 |
| **HY5** | **0.3 & 0.5** | Differential for set point 5 | -22÷22°F | Pr2 | Pr2 | 0x314 | 789 |
| **Ac5** | **0.3 & 0.5** | Anti-short cycle delay for output 3 alternate set point | 0÷30 min. | Pr2 | Pr2 | 0x315 | 790 |
| **AcA** | **0.3 & 0.5** | Time delay between the St3 to St5 set point shift | 0÷15 min. | Pr2 | Pr2 | 0x316 | 791 |
| | | **ANALOGUE OUTPUT 4÷20mA (output 4)** | | | | | |
| **S4c** | **0.3 & 0.5** | Configuration of St4: dependent on St1 or independent | diP; ind | Pr3 | Pr2 | 0x317 | 792 |
| **St4** | **0.3 & 0.5** | Analogue output set point | -100÷100°F | Pr2 | Pr2 | 0x318 | 793 |
| **SR** | **0.3 & 0.5** | Analogue output band width | -100÷100°F | Pr2 | Pr2 | 0x319 | 794 |
| **Th4** | **0.3 & 0.5** | Outlet temperature threshold for forcing to 4ma the analog output | -40°F ÷ 230°F | Pr2 | Pr2 | 0x31A | 795 |
| **HY4** | **0.3 & 0.5** | Differential for restart working of analog output | -45 ÷ -1 °F | Pr2 | Pr2 | 0x31B | 796 |
| **Ac4** | **0.3 & 0.5** | Anti-short cycle delay for output 4 | 0÷30 min. | Pr2 | Pr2 | 0x31C | 797 |
| **PS4** | **0.3 & 0.5** | Analog output percentage (nu=101) | 0÷100, nu | Pr2 | Pr2 | 0x31D | 798 |
| **PP4** | **0.3 & 0.5** | Analog output percentage with fault probe 1 (nu=101) | 0÷100, nu | Pr3 | Pr2 | 0x31E | 799 |
| | | **DYNAMIC RESET** | | | | | |
| **tt** | **0.3 & 0.5** | Outdoor temperature threshold for dynamic reset of St1 | -40÷230°F | Pr2 | Pr2 | 0x31F | 800 |
| **rr2** | **0.3 & 0.5** | Outdoor temperature band width | -100÷100°F | Pr2 | Pr2 | 0x320 | 801 |
| **rr1** | **0.3 & 0.5** | Maximum shift of St1 | -100÷100°F | Pr2 | Pr2 | 0x321 | 802 |
| **tt2** | **0.3 & 0.5** | Outdoor temperature threshold to open all the loads | -40÷230°F | Pr2 | Pr2 | 0x322 | 803 |
| **Ht2** | **0.3 & 0.5** | Differential for restart working of controller | -45 ÷ -1 °F | Pr2 | Pr2 | 0x323 | 804 |

| Label | Firm Version | Description | Range X÷Y From X to Y | Rev 0.3 Level | Rev 0.5 Level | Hex Modbus Address Base 0 | Modbus Command Address 40000+ |
|---|---|---|---|---|---|---|---|
| | 0.3 & 0.5 | **DIGITAL INPUTS** | | | | | |
| i1P | 0.3 & 0.5 | Digital input 1 polarity | CL÷OP | Pr3 | Pr2 | 0x324 | 805 |
| i2P | 0.3 & 0.5 | Digital input 2 polarity | CL÷OP | Pr2 | Pr2 | 0x325 | 806 |
| i2d | 0.3 & 0.5 | Digital input 2 alarm delay | 0÷255 min. | Pr3 | Pr2 | 0x326 | 807 |
| i3P | 0.3 & 0.5 | Digital input 3 polarity | CL÷OP | Pr2 | Pr2 | 0x327 | 808 |
| i3d | 0.3 & 0.5 | Digital input 3 alarm delay | 0÷255 min. | Pr3 | Pr2 | 0x328 | 809 |
| | 0.3 & 0.5 | **DISPLAY** | | | | | |
| cF | 0.3 & 0.5 | Temperature measurement unit | °C ÷ °F | Pr3 | Pr2 | 0x329 | 810 |
| rES | 0.3 & 0.5 | Resolution (integer/decimal point) only for °C | in ÷ de | Pr3 | Pr2 | 0x32A | 811 |
| dS2 | 0.3 | Default showing for display #2 Top (red) | Pb2, Pb3 | Pr2 | | 0x32B | 812 |
| dS2 | 0.5 | Default showing for display #2 Top (red) Pb3 will display yellow EXT, Ani will display yellow Valve/M | Pb1,Pb2,Pb3,AnI | | Pr2 | 0x32B | 812 |
| dS1 | 0.3 | Default showing for display #1 Bottom (Yellow) | Pb1; tiM | Pr2 | | 0x32C | 813 |
| dS1 | 0.5 | Default showing for display #1 Bottom (Yellow) Pb3 will display yellow EXT, Ani will display yellow Valve/M | Pb1,Pb2,Pb3,AnI, TiM | | Pr2 | 0x32C | 813 |
| | | **ALARMS** | | | | | |
| Alc | 0.3 & 0.5 | Temperature alarms configuration: dependent on St1 or independent | rE÷Ab | Pr3 | Pr2 | 0x32D | 814 |
| ALL | 0.3 & 0.5 | minimum temperature alarm, referred to TP1 | -40÷230°F | Pr2 | Pr2 | 0x32E | 815 |
| Alu | 0.3 & 0.5 | MAXIMUM temperature alarm, referred to TP1 | -40÷230°F | Pr3 | Pr2 | 0x32F | 816 |
| AFH | 0.3 & 0.5 | Differential for temperature alarm recovery | 1÷45°F | Pr2 | Pr2 | 0x330 | 817 |
| ALd | 0.3 & 0.5 | Temperature alarm delay | 0÷255 min. | Pr2 | Pr2 | 0x331 | 818 |
| dAo | 0.3 & 0.5 | Delay of temperature alarm at start up 1 = 10 min disp 0.1 | 0 ÷ 23h 50 min. | Pr2 | Pr2 | 0x332 | 819 |
| | | **ANALOGUE INPUTS** | | | | | |
| oF1 | 0.3 & 0.5 | First probe calibration | -21÷21°F | Pr3 | Pr2 | 0x333 | 820 |
| P2P | 0.3 & 0.5 | Second probe presence | No; Yes | Pr2 | Pr2 | 0x334 | 821 |
| oF2 | 0.3 & 0.5 | Second probe calibration | -21÷21°F | Pr3 | Pr2 | 0x335 | 822 |
| P3P | 0.3 & 0.5 | Third probe presence | No; Yes | Pr2 | Pr2 | 0x336 | 823 |
| oF3 | 0.3 & 0.5 | Third probe calibration | -21÷21°F | Pr3 | Pr2 | 0x337 | 824 |
| | | **TIME AND DATE** | | | | | |
| Hur | 0.3 & 0.5 | Current hour | 0 ÷ 23 | Pr2 | Pr2 | 0x338 | 825 |
| Min | 0.3 & 0.5 | Current minute | 0 ÷ 59 | Pr2 | Pr2 | 0x339 | 826 |
| dAY | 0.3 & 0.5 | Current day | Sun ÷ SAt | Pr2 | Pr2 | 0x33A | 827 |
| | | **ENERGY SAVING TIMES** | | | | | |
| E1 | 0.3 & 0.5 | Energy saving start on Sunday | 0 ÷ 23h 50 min. - nu | Pr2 | Pr2 | 0x33B | 828 |
| S1 | 0.3 & 0.5 | Energy saving stop on Sunday | 0 ÷ 23h 50 min. - nu | Pr2 | Pr2 | 0x33C | 829 |
| Sb1 | 0.3 & 0.5 | Set back temperature on Sunday | -40÷40°F | Pr2 | Pr2 | 0x33D | 830 |
| E2 | 0.3 & 0.5 | Energy saving start on Monday | 0 ÷ 23h 50 min. - nu | Pr2 | Pr2 | 0x33E | 831 |
| S2 | 0.3 & 0.5 | Energy saving stop on Monday | 0 ÷ 23h 50 min. - nu | Pr2 | Pr2 | 0x33F | 832 |
| Sb2 | 0.3 & 0.5 | Set back temperature on Monday | -40÷40°F | Pr2 | Pr2 | 0x340 | 833 |
| E3 | 0.3 & 0.5 | Energy saving start on Tuesday | 0 ÷ 23h 50 min. - nu | Pr2 | Pr2 | 0x341 | 834 |
| S3 | 0.3 & 0.5 | Energy saving stop on Tuesday | 0 ÷ 23h 50 min. - nu | Pr2 | Pr2 | 0x342 | 835 |
| Sb3 | 0.3 & 0.5 | Set back temperature on Tuesday | -40÷40°F | Pr2 | Pr2 | 0x343 | 836 |
| E4 | 0.3 & 0.5 | Energy saving start on Wednesday | 0 ÷ 23h 50 min. - nu | Pr2 | Pr2 | 0x344 | 837 |
| S4 | 0.3 & 0.5 | Energy saving stop on Wednesday | 0 ÷ 23h 50 min. - nu | Pr2 | Pr2 | 0x345 | 838 |
| Sb4 | 0.3 & 0.5 | Set back temperature on Wednesday | -40÷40°F | Pr2 | Pr2 | 0x346 | 839 |
| E5 | 0.3 & 0.5 | Energy saving start on Thursday | 0 ÷ 23h 50 min. - nu | Pr2 | Pr2 | 0x347 | 840 |
| S5 | 0.3 & 0.5 | Energy saving stop on Thursday | 0 ÷ 23h 50 min. - nu | Pr2 | Pr2 | 0x348 | 841 |

| Label | Firm Version | Description | Range X÷Y From X to Y | Rev 0.3 Level | Rev 0.5 Level | Hex Modbus Address Base 0 | Modbus Command Address 40000+ |
|---|---|---|---|---|---|---|---|
| **Sb5** | **0.3 & 0.5** | Set back temperature on Thursday | -40÷40°F | Pr2 | Pr2 | 0x349 | 842 |
| **E6** | **0.3 & 0.5** | Energy saving start on Friday | 0 ÷ 23h 50 min. - nu | Pr2 | Pr2 | 0x34A | 843 |
| **S6** | **0.3 & 0.5** | Energy saving stop on Friday | 0 ÷ 23h 50 min. - nu | Pr2 | Pr2 | 0x34B | 844 |
| **Sb6** | **0.3 & 0.5** | Set back temperature on Friday | -40÷40°F | Pr2 | Pr2 | 0x34C | 845 |
| **E7** | **0.3 & 0.5** | Energy saving start on Saturday | 0 ÷ 23h 50 min. - nu | Pr2 | Pr2 | 0x34D | 846 |
| **S7** | **0.3 & 0.5** | Energy saving stop on Saturday | 0 ÷ 23h 50 min. - nu | Pr2 | Pr2 | 0x34E | 847 |
| **Sb7** | **0.3 & 0.5** | Set back temperature on Saturday | -40÷40°F | Pr2 | Pr2 | 0x34F | 848 |
| | | **WORKING HOURS** | | | | | |
| **ou1** | **0.3 & 0.5** | working hours actual of relay 1 | 0÷9999h | Pr1 | Pr2 | 0x350 | 849 |
| **ou2** | **0.3 & 0.5** | working hours actual of relay 2 | 0÷9999h | Pr1 | Pr2 | 0x351 | 850 |
| **ou3** | **0.3 & 0.5** | working hours actual of relay 3 | 0÷9999h | Pr2 | Pr2 | 0x352 | 851 |
| **oP1** | **0.3 & 0.5** | working hours limit of relay 1 | 0÷9999h; with 0 the function is disabled | Pr2 | Pr2 | 0x353 | 852 |
| **oP2** | **0.3 & 0.5** | working hours limit of relay 2 | 0÷9999h; with 0 the function is disabled | Pr2 | Pr2 | 0x354 | 853 |
| **oP3** | **0.3 & 0.5** | working hours limit of relay 3 | 0÷9999h; with 0 the function is disabled | Pr2 | Pr2 | 0x355 | 854 |
| | | **OUTPUTS SETTING** | | | | | |
| **1on** | **0.3 & 0.5** | The output 1 is always on or depending on temperature | rEG=1,1;YES=0,1; no=0,0 | Pr2 | Pr2 | 0x356 | 855 |
| **2on** | **0.3 & 0.5** | The output 2 is always on or depending on temperature | rEG=1,1;YES=0,1; no=0,0 | Pr2 | Pr2 | 0x357 | 856 |
| **3on** | **0.3 & 0.5** | The output 3 is always on or depending on temperature | rEG=1,1;YES=0,1; no=0,0 | Pr2 | Pr2 | 0x358 | 857 |
| | | **OTHER** | | | | | |
| **Adr** | **0.3 & 0.5** | Serial address | 0÷247 | Pr2 | Pr2 | 0x359 | 858 |
| **Ptb** | **0.3 & 0.5** | Parameter map code always = 1 | readable only | Pr2 | Pr2 | 0x35A | 859 |
| **rEL** | **0.3 & 0.5** | Software release 5 = 0.5, 3 = 0.3 | readable only | Pr2 | Pr2 | 0x35B | 860 |
| **i1S** | **0.5** | Analog output when Digital Input 1 is activated | 4-20mA | | Pr2 | 0x35C | 861 |
| **i1t** | **0.5** | Analog output at i1S extra time if Digital Input 1 is not activated | 0÷30 sec. | | Pr2 | 0x35D | 862 |
| **i1d** | **0.5** | Digital Input 1 Alarm Delay | 0÷255 min. | | Pr2 | 0x35E | 863 |
| **i1F** | **0.5** | If Yes, Digital Input 1 will function as Alarm. Operating only when trying to call for output 1 and Input 1 is active, subject to i1d timer | No; Yes | | Pr2 | 0x35F | 864 |
| **i2F** | **0.5** | Digital Input 2 will function only when Output 1 is energized | No; Yes | | Pr2 | 0x360 | 865 |
| **i3F** | **0.5** | Digital Input 3 will function only when Output 1 is energized, When Edi is selected, Output 1 will open when digital input 3 is activated | No; Yes; Edi | | Pr2 | 0x361 | 866 |
| **oS2** | **0.5** | Output 2 function: either temp relay or alarm relay | Std; AL | | Pr2 | 0x362 | 867 |
| | | | | | | | |
| | **0.3 & 0.5** | Probe 1 temperature | Degrees F/C | | Pr2 | 0x100 | 257 |
| | **0.3** | Probe 1 Information/Status Normal=512 or 0x0200, Fault=515 or 0x0203. Fault will, drop call for heat, buz, Flash Yellow P1, light yellow valve/M | bit (0,1 on) probe failure | | Pr2 | 0x101 | 258 |
| | **0.3 & 0.5** | Probe 2 temperature | Degrees F/C | | Pr2 | 0x102 | 259 |
| | **0.3** | Probe 2 Information/Status Normal=512 or 0x0200, Fault=515 or 0x0203. Fault will buz, Flash Red P2 | bit (0,1 on) probe failure | | Pr2 | 0x103 | 260 |
| | **0.3 & 0.5** | Probe 3 temperature | Degrees F/C | | Pr2 | 0x104 | 261 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **0.3** | Probe 3 Information/Status Normal=512 or 0x0200, Fault=515 or 0x0203. Fault will buz, Flash Red P3 | bit (0,1 on) probe failure | | Pr2 | 0x105 | 262 |
| | **0.5** | Modulation rate output (4 to 20mA) | 0÷100% | | Pr2 | 0x106 | 263 |
| | **0.3 & 0.5** | Status of Relay 1,2&3 | bit 0,1,2 | | Pr2 | 0x801 | 2050 |
| | **0.3** | Input 3 Alarm, buz, ALMMB, Flashes HP= 4096 or 0x0800 | bit # 12 or 13th bit | | Pr2 | 0xD00 | 3329 |
| | **0.3** | Input 2 Alarm, buz, Flashes LP= 4096 or 0x0800 | bit # 12 or 13th bit | | Pr2 | 0xD00 | 3329 |
| | **0.3** | Input 2 & 3, buz, Flashed HP & LP= 4096 or 0X0800 | bit # 12 or 13th bit | | Pr2 | 0xD00 | 3329 |
| | **0.5** | Low Temperature Alarm, beep, Flash Yellow LA= 1 or 0x0001 | bit # 0 or 1st bit | | Pr2 | 0xD00 | 3329 |
| | **0.5** | High Temperature Alarm, beep, Flash yellow HA= 2 or 0x0002 | bit # 1 or 2nd bit | | Pr2 | 0xD00 | 3329 |
| | **0.5** | Probe 1 error, open or shorted, Drops call for heat, yel valve/M on, Flash Yellow P1=4 or 0x0004 | bit # 2 or 3rd bit | | Pr2 | 0xD00 | 3329 |
| | **0.5** | Probe 2 error, open or shorted, Flashing red P2=256 or 0x0100 | bit # 8 or 9th bit | | Pr2 | 0xD00 | 3329 |
| | **0.5** | Probe 3 error, open or shorted, Flashing red P3=512 or 0x0200 | bit # 9 or 10th bit | | Pr2 | 0xD00 | 3329 |
| | **0.5** | ALARM 1 (stops heating) Input 1, beep, Flash AL1 = 1024 or 0x0400. Will recover is Input 1 goes away, or need for call for heat goes away. | bit # 10 or 11th bit | | Pr2 | 0xD00 | 3329 |
| | **0.5** | ALARM 2 (Lockout, stops heating) Input 2, Flash AL2 & Lguage & valve= 2048 or 0x1000 | bit # 11 or 12th bit | | Pr2 | 0xD00 | 3329 |
| | **0.5** | ALARM 3 (Lockout, stops heating) Input 3/ALMMB/ALOAF, beep, Flash AL3 & Hguage & valve (This is ALARM ON ANY FAILURE)= 4096 or 0x0800 | bit # 12 or 13th bit | | Pr2 | 0xD00 | 3329 |
| | **0.5** | Maintenance Relay1, beep, Flash Nn1 & wrench=8192 or 0x2000 You must reset hours ou1 or set oP1=0 | bit # 13 or 14th bit | | Pr2 | 0xD00 | 3329 |
| | **0.5** | Maintenance Relay2, beep, Flash Nn2 & wrench=16384 or 0x4000 You must reset hours ou2 or set oP2=0 | bit # 14 or 15th bit | | Pr2 | 0xD00 | 3329 |
| | **0.5** | Maintenance Relay3, beep, Flash Nn3 & wrench=32768 or 0x8000 You must reset hours ou3 or set oP3=0 | bit # 15 or 16th bit | | Pr2 | 0xD00 | 3329 |
| | **0.3** | On/Off On=257 or 0x0101, Off=1 or 0x0001 Can be used to reset ALMMB alarm by cycling OFF, wait 30 sec , ON | Low byte is mask, Hi byte is command. Bit # 0 & #8 | | Pr2 | 0x500 | 1281 |
| | **0.3** | Keyboard Lock Lock=2056 or 0x0808, Unlock=8 or 0x0008. If locked PoF is displayed when keypad edit is attempted | Low byte is mask, Hi byte is command. Bit # 3 & #11 | | Pr2 | 0x500 | 1281 |
| | **0.3** | Reset audible alarm when condition is corrected, 4112 or 0x1010 does not reset alarm, just stops the beeping | Low byte is mask, Hi byte is command. Bit # 3 & #12 | | Pr2 | 0x500 | 1281 |
| | | Energy Savings Registers are enumerated 0 to 145 w/145=n/u | | | | | |

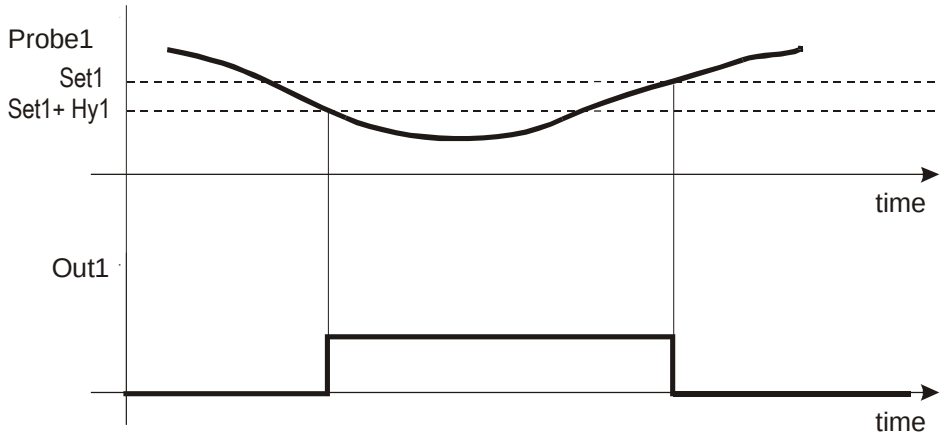
# 6. RELAY OUTPUTS

## 6.1 OUTPUT SETUP AND SPECS

1. 3 relay outputs. SPST relay contacts going to spade terminals #4-9.
2. The outputs are rated at 3A, or 8A resistive load.
3. Each output (1-3) can be controlled via Modbus RTU Communication by setting **on** or **oFF** to the **1on**, **2on**, **3on** parameters.
4. Each output can be configured to operate as a control output, typically for temperature control. This is done when **1on**, **2on**, **3on** respectively are set to **rEG**. This is the default setting.
   a. **1on**=**rEG** Output 1 is configured for Temperature Control (Same for **2on**, **3on**).
   b. **1on**=**oFF** Output 1 is off.
   c. **1on**=**on** Output 1 is on any time the TempTrac is enabled (Alarms will not disable). On power loss, this contact will be open, and when the TempTrac displays OFF, this will contact will be open. This is no longer a control output, and is not subject to alarms.
5. Output 1, Spade terminals 4 & 5.
6. Output 2, Spade terminals 6 & 7.
7. Output 3, Spade terminals 8 & 9.

## 6.2 OUTPUT 1 CALL FOR HEAT (1on=rEG)

**Kind of action**: Heating
**Reference probe**: TP1
**Terminals:** SPADE 4 & 5
**Related Parameters:** St1, Hy1, LS1, US1, AC1, i3F, 1on

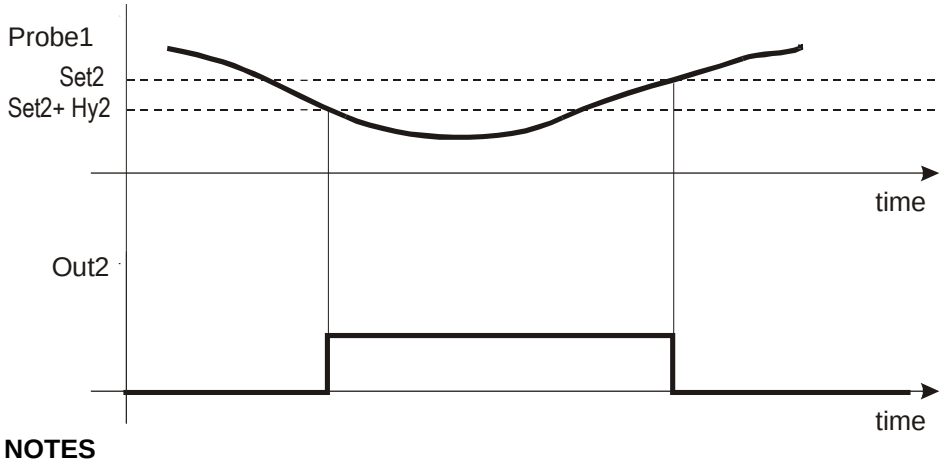



**NOTES**

1. When probe 1 **TP1** falls below **St1**, a call for heat output will occur.
2. **Hy1** is the differential to prevent short cycling.
3. When **Hy1** is negative, this will prevent the call for heat from starting until **TP1** falls below **St1** + **Hy1**. The call for heat will continue until **TP1** reaches or goes above **St1**. See chart above.
4. If **Hy1** is positive, then the call for heat will start when **TP1** falls below **St1**, and will stay active until **TP1** rises above **St1** + **Hy1**. Not shown on chart.

## 6.3 OUTPUT 2 2ND STAGE (oS2=Std 2on=rEG)

**Kind of action**: Heating
**Reference probe**: TP1
**Terminals:** SPADE 6 & 7
**Related Parameters:** S2c, St2, Hy2, LS2, US2, AC2, oS2, 2on




**NOTES**

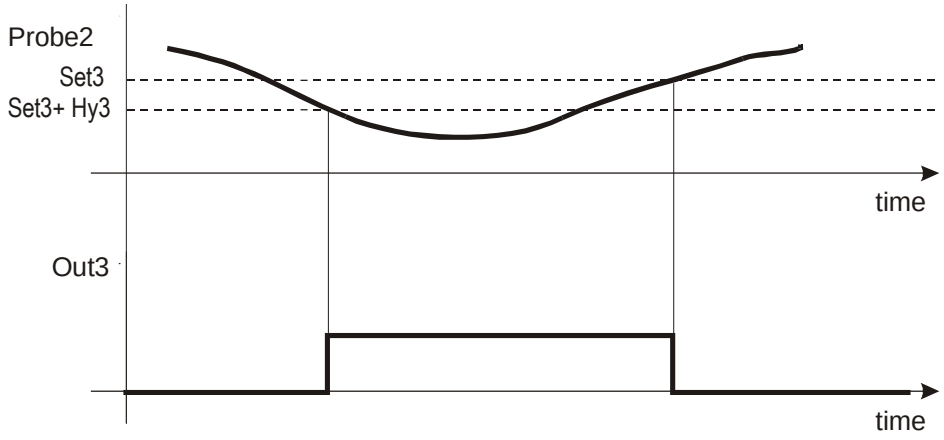
1. Output 2 will function as an output temperature control when **oS2**=**Std**, otherwise output 2 is an alarm output contact.
2. **S2c** determines if **St2** is relative to **St1** or independent. (**S2c**=**dep** or **ind.**)
3. **Hy2** functionality same as **Hy1**. See OUTPUT 1 CALL FOR HEAT.

## 6.4 OUTPUT 2 AS ALARM RELAY (oS2=AL, 2ON=REG)

1. Output 2 will function as an alarm contact when oS2=AL.
2. When an alarm condition occurs, Output 2 will be energized (relay closes) as an indication of an alarm condition.
3. **Terminals:** SPADE 6 & 7.

## 6.5 OUTPUT 3 TEMPERATURE PROTECTION (3on=rEG)

**Kind of action**: Heating
**Reference probe**: TP1 or TP2
**Terminals:** SPADE 8 & 9
**Related Parameters:** S3c, St3, Hy3, LS3, uS3, AC3, 3on, o3P




**NOTES**

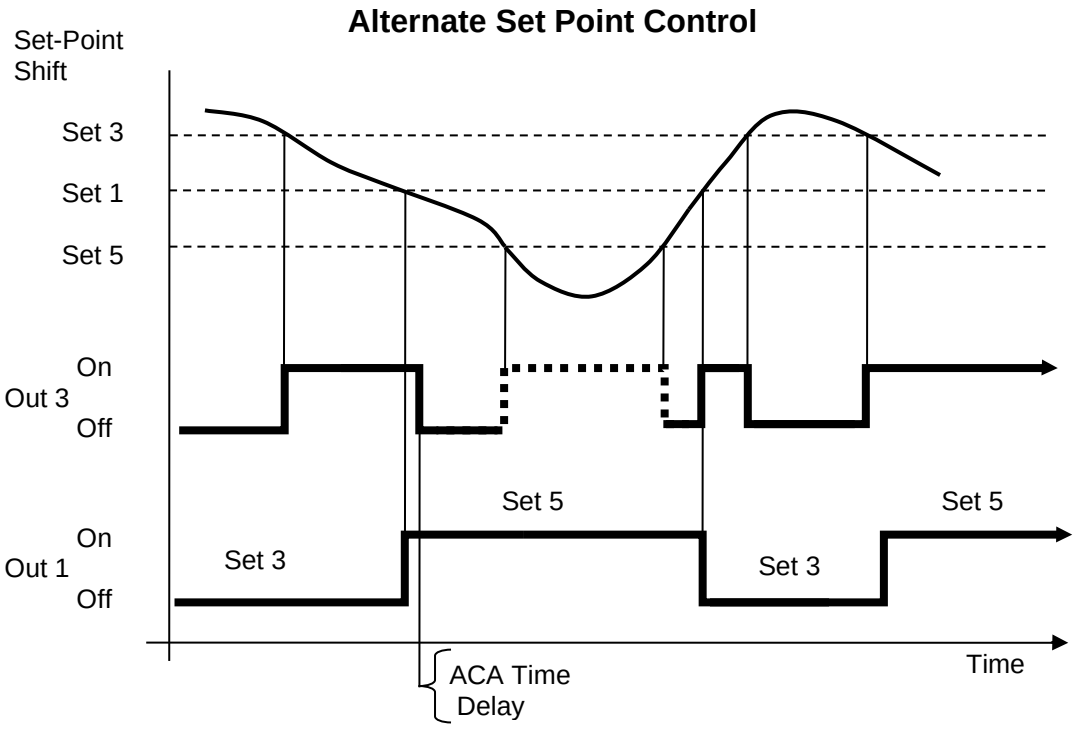
1. Output 3 can be used to enable pumps when temperature falls below a St3.
2. **o3P** will select the probe for Output 3. Pb1 or Pb2.

## 6.6 OUTPUT 3 ALTERNATE SET POINT

**Kind of action**: Heating
**Reference probe**: TP1 or TP2
**Related Parameters:** St3, Hy3, LS3, US3, AC3, St5, Hy5, 3on, o3P, SSE, AC5, ACA

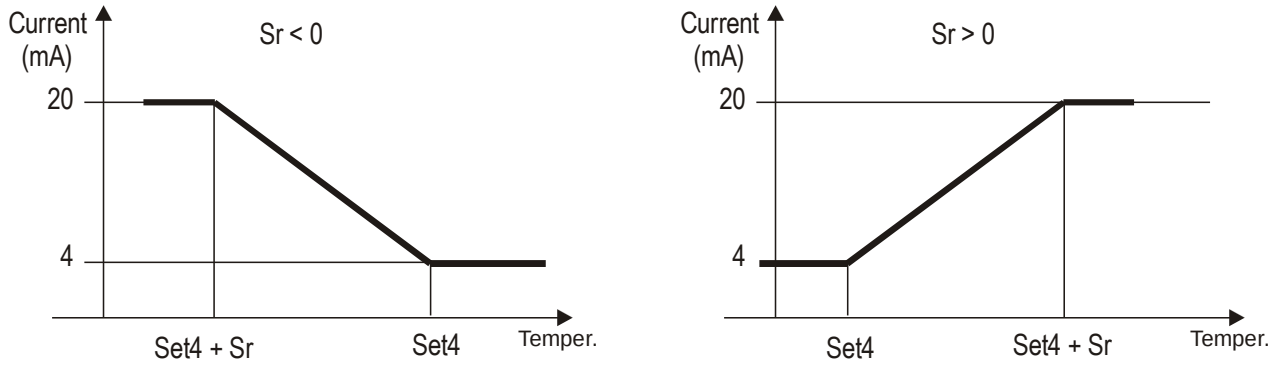
**NOTES**

1. When **SSE** is enabled and Output 1 is in a de-energized state (off) Output 3 will function according to **St3**. When Output 1 is in an energized state Output 3 will function according to **St5**.
2. **ACA** delays the change from **St3** to **St5**.
3. **o3P** selects temperature probe to be referenced by Output 3.
4. **Hy1**, **Hy3** and **Hy5** are active but not shown in this illustration.



# 7. MODULATION OUTPUT

**Kind of action**: if Sr< 0 Heating; if Sr>0 Cooling. See diagrams.

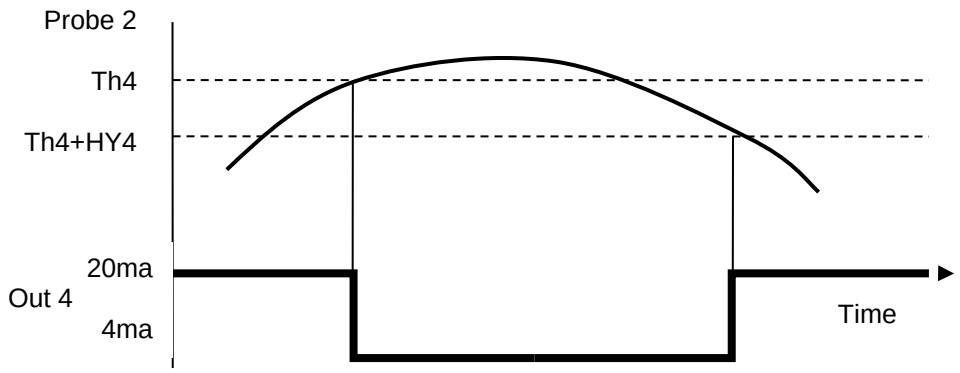



**Reference probe**: TP1
**Related Parameters:** S4c, St4, Sr, PS4, PP4, Ac4, i1S, i1t, i1F, i1d

**NOTES**

1. The kind of action of the modulation output depends on the sign of the **Sr** parameter.
2. If the parameter **PS4** is different from **nu**, the percentage of the modulation output depends on the value set in **PS4**, independently from the value of the probe. (0-100% represents 4mA to 20mA.)
3. If **i1F=No** and digital input 1 is ACTIVE, the analog modulation output is forced to the mA set in **i1S** parameter independently from the value of the probe and the value of the **PS4** parameters. After digital input 1 is no longer ACTIVE, the analog output will stay at the actual mA value set in **i1S** for the time period set by at the **i1t** parameter.
4. If the probe **TP1** is broken**, PS4=nu** and the digital input 1 is off, the value of the modulation output depends on the **PP4** parameter.
5. The value of the **PS4** parameter can be set directly by the keyboard. See par. 3.6.
6. Anti-short cycle delay for the analog output: when the analog output reaches the 4mA, it is held at 4mA for this time. During this time the icon is flashing. When this delay has expired, normal functioning of modulation output restarts. This delay will be reinitiated again after output 1 switches off.
7. Ranges: **i1S** (4-20 range) is actual mA, **i1t** (0-30 range) is seconds. **PS4** & **PP4** (0-100 & nu range) is percentage of output 0%=4mA 100%=20mA nu=AUTO.

## 8. MODULATION BUFFER




**Kind of action**: Heating
**Reference probe**: TP2
**Related Parameters:** Th4, HY4

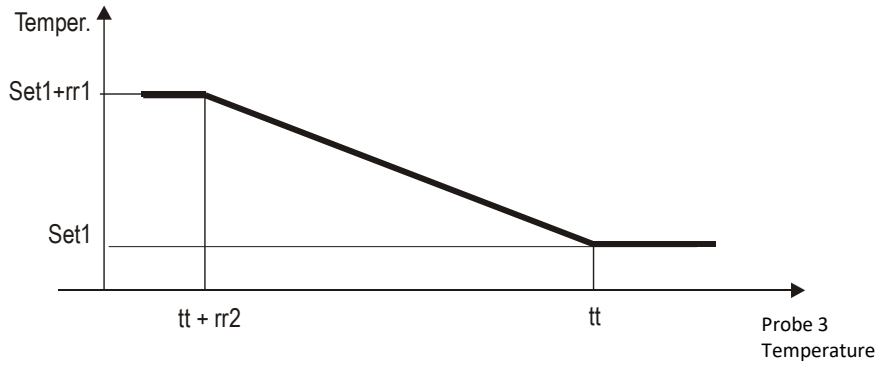
**NOTES**

1. This function references probe **TP2** and will trigger output 4 to reduce the signal to 4mA when the temperature of **Th4** is reached by **TP2** and hold it until **TP2** drops below **TH4+HY4**. Output 4 then returns to normal operation referencing **TP1.**

## 9. DYNAMIC RESET OF St1

**Kind of action**: Inverse
**Reference probe**: TP3
**Related Parameters:** tt, rr2, St1, rr1

If the outdoor temperature is lower than **tt** the dynamic reset of the **St1** action starts as described in the following diagrams.




**NOTES**

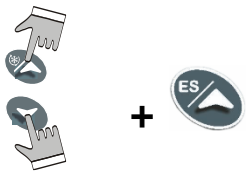
1. With **rr1**=**0** the dynamic reset of the set point 1 is disabled.
2. If the **TP3** is not present (**P3P**=**no**) or broken, the dynamic reset of the set point 1 is disabled.

## 10. WARM WEATHER SHUT DOWN

The **tt2** parameter, referring to the outdoor probe TP3, establishes the upper threshold which all the relay outputs are open. Normal regulation restarts when **TP3**< **tt2**+**Ht2**.
To disable this function set **tt2** to high a value. If the third probe is not present **P3P**=**no**, this function is disabled.

# 11. HOT KEY PROGRAMMING

To upload program from control to HOT KEY:



Insert HOT KEY into the TTL/HOT KEY connection on the back of the control. Press and keys together momentarily then press the key. The **uPL** message will appear while uploading is occurring and the **End** message will appear when finished. Push any key to return to normal operation.

To download program from HOT KEY to control:

**ON/OFF**

Press the **ON/OFF** key to turn off the control. Insert the HOT KEY into the TTL connection on the back of the control. Press the **ON/OFF** key again and downloading will begin. The **DoL** message will appear while downloading is occurring and the **End** message will appear when finished. Push any key to return to normal operation.

If **err** message is displayed during upload or download the programming failed. The cause of a failed program may be user error, faulty control or Hot Key.

# 12. ASSIGNING TEMPTRAC® ADDRESS FOR MODBUS RTU

The first step to interfacing a BAS (Building Automation Control) with a water heater or group of water heaters will be the assignment of the address number for each heater.


1. Enter the Programming mode by pressing the Set 

and DOWN  key for 3s. (lead with the SET key.)

2. Press the DOWN key.

3. Select "**Pr2**" – "**PAS**" parameter and press the "SET" key.

4. The value "0 - -" with a flashing zero is displayed.

5. Use UP or DOWN keys to input the Passkey in the flashing digit; confirm the figure by pressing "SET". The Passkey is "321".

6. Once you have entered the Pr2 menu press the DOWN key until the parameter **Adr** appears on the screen as shown to the right:


7. Now press the SET key once and the number will begin to blink. Use the arrow key to set the address. Each TempTrac on a RS-485 network must have a different address, to enable proper communication.

**NOTE:** The default for each TempTrac is Address #1. You can assign them to any number in the range of 1-247, this is the limitations of the MODBUS-RTU standard.

# 13. ALARMS

Alarm messages are displayed in the lower display of the TempTrac and are alternated with the default message. These alarm messages are displayed together with the icon devoted to signalling the alarm conditions.

| Message | Cause | Outputs and information |
|---|---|---|
| "P1" | TP1 probe failure. Open or shorted | Audible alarm sounds. Output 1 and 2, if depending on the probe, open; modulation output, if depending on the probe, according to the PP4 parameter. Inspect probe 1; Screw terminals 14 & 17. |
| "P2" | TP2 probe failure. Open or shorted | Audible alarm sounds. Output 3 open. Inspect probe 2; Screw terminals 15 & 17. |
| "P3" | TP3 probe failure. Open or shorted | Audible alarm sounds. Dynamic reset of St1 disabled. Warm weather shut down disabled. Flue Gas Temperature Protection disabled. Inspect probe 3; Screw terminals 16 & 17. |
| "HA" | High-temperature limit set point exceeded | Audible alarm sounds, operation continues. see **ALu.** |
| "LA" | Low-temperature alarm | Audible alarm sounds, operation continues. see **ALL.** |
| "AL1" | Digital Input 1 ACTIVE and configured as Alarm | Opens Output 1. Subject to "need" for Output 1, and **i1d**. Automatic recover if the need for Output 1 is gone. With the loss of Input 1 signal, alarm is still active until a button is pressed. See **i1F**, **i1P**, **i1d.** |
| "AL2" | Digital Input 2 is ACTIVE for one or more of the conditions listed in section Audible Alarm | Audible alarm sounds. There is a time delay before this alarm is ACTIVE. Opens all temperature controlled outputs. Lockout condition. See **oS2**, **i2d**, **i2P**, **i2F.** |
| "AL3" | Digital Input 3 is ACTIVE for one or more of the conditions listed in section Audible Alarm | Audible alarm sounds. There is a time delay before this alarm is ACTIVE. Opens all temperature controlled outputs. Lockout condition. This is also the alarm for the ALMMB or ALOAF option code sometimes referred to as Alarm On Failure. See **i3d**, **i3F**, **i3P.** |
| "Nn1" | Maintenance alert for call-for-heat | Audible alarm sounds, operation continues. Maintenance Required; hours on **ou1** exceed setting in **oP1**. Clear **ou1** ( Flashing). |
| "Nn2" | Maintenance alert for second stage | Audible alarm sounds, operation continues. Maintenance Required; hours on **ou2** exceed setting in **oP2**. Clear **ou1** ( Flashing). |
| "Nn3" | Maintenance alert for freeze protection | Audible alarm sounds, operation continues. Maintenance Required; hours on **ou3** exceed setting in **oP3**. Clear **ou1** ( Flashing). |
| "rtc" | The real time clock has lost its setting | Energy saving functions disabled. (Can occur after powered down for extended time.) |
| "rtF" | Real time clock failure | Energy saving functions disabled. (TempTrac® requires replacement.) |

## 13.1 DIGITAL INPUT ALARMS

**Digital Inputs**
Polarity of the inputs is determined by the i1p, i2p, i3p parameters. If they are set to “CL” (closed) then a signal is present when the input terminal has a connection to the common (COM) terminal #21. When the parameter is set to “OP” (open) then a signal is present when the input terminal does not have a connection to the common (COM) terminal.

**Digital Input 1** (Screw terminal #18, COM #21)

1. When a signal is continuously present for number of minutes in parameter **i1d,** the input is then ACTIVE.
2. When **i1F=Yes**, Digital input 1 is assigned to the alarm function and considered only when there is a need for Output 1.
3. When digital input 1 is ACTIVE, “**AL1”** will flash, and Output 1 will be disabled. Output 2 and 3 will continue to function.
4. This alarm will reset automatically if the need for Output 1 is removed (Probe 1 temperature rises above setpoint).
5. If **i1F=No** Digital Input 1 is not used as an alarm, but used as way method of forcing a specified modulation rate. See details about the **i1S** modulation function; refer to the MODULATION Output section of the manual.

**Digital Input 2** (Screw terminal #19, COM #21)

1. When a signal is continuously present for number of minutes in parameter **i2d,** the input is then ACTIVE.
2. When **i2F=Yes**, Digital input 2 ACTIVE is considered only if Output 1 is energized.
3. When digital input 2 is ACTIVE, “**AL2”** will flash.

**Digital Input 3** (Screw terminal #20, COM #21)

1. When a signal is continuously present for number of minutes in parameter **i3d,** the input is then ACTIVE.
2. When **i3F=No**, Digital input 3 ACTIVE functions as an alarm independent of output 1. “**AL3**” will flash for this condition.
3. When **i3F**=**Yes**, Digital input 3 ACTIVE functions as an alarm and is considered only if Output 1 is energized. “**AL3**” will flash for this condition.
4. When **i3F=Edi**, Digital input 3 ACTIVE de-energizes Output 1, and alarm conditions will not be registered in memory or indicated in any way until Digital input 3 deactivates. Note: no existing alarm indication will be shown until Digital input 3 state changes (neither an alarm icon, the **AL#** indication on the display nor the audible alarm activation). (This feature is still subject to the **i3d** timer.)

The Instrument will revert to normal operation when these digital inputs are disabled + any button is pressed.

## 13.2 AUDIBLE ALARM

The TempTrac audible alarm is activated each time a connected alarm condition occurs. The following are representative alarm conditions that may be connected to and activate the TempTrac audible alarm (some alarms may be connected to and operate separately from the TempTrac on some products).

- High/low water temperature alarm
- Probe failures
- External thermostat limit failure
- Flame Failure
- High and low gas pressure
- Low water

The audible alarm is silenced by pressing any key (alarm condition still present).

## 13.3 ALARM RECOVERY

1. Probe alarms: "**P1**", "**P2**", and "**P3**"; automatically stop a few seconds after the probe returns to normal operation. Check connections before replacing the probe.
2. Temperature alarms "**HA**" and "**LA**" automatically stop as soon as probe 1 temperature returns to **AFH** degrees below or above the alarm value respectively.
3. The digital input 1 alarm recovers automatically when the need for output 1 stops. Manual recovery is required when the condition of Input 1 is removed, but the need for output 1 is still present. Pressing any button will reset this condition.
4. The digital input 2 & 3 alarms recover when condition(s) listed above are normalized and any button is pressed.
5. RTC alarm stops after programming the real time clock.
6. RTF alarm requires the replacement of the TempTrac® device.

**For additional information, contact the PVI Industries Customer Service department at 800-784-8326.**