Wireless Pneumatic Thermostat- WPT-800 Series

1 Overview

The Cypress Envirosystems Wireless Pneumatic Thermostat (WPT) retrofits an existing pneumatic thermostat to provide Direct Digital Control (DDC) like zone control functionality at a fraction of the time and cost without disturbing occupants.

The WPT enables remote monitoring of zone temperature, branch pressure, remote control of setpoints, and programmable setback or setup of the pneumatic HVAC systems. It also enables integration with utility Demand Response programs.

The WPT can function either as a standalone system or can be integrated with an existing Building Management System via BACnet/IP. As a result, the WPT helps a building owner and tenants save energy, improve comfort, and reduce the maintenance cost of the legacy pneumatic HVAC systems.

1.1 Components

The WPT- 800 Series kit includes the following components:

- WPT
- Universal wall bracket
- Mounting screws, #6 x 1” self-tapping (x2)
- CR123 batteries (x2)

1.2 Prerequisites for Installation

The WPT relies on a wireless network for communication unless operating in a standalone mode. When using the WPT in a standalone mode, these prerequisites may be skipped. Before installing the WPT, the wireless network must be set up. The following tasks must be completed before proceeding to WPT installation:

- Installation of WPT Green Box and USB Hub (HUSB)
- Installation of WPT Repeaters (RWAL)
- Assignment of a network ID to the Green Box
- Assignment of a unique node ID to each WPT in the network

Manuals for the WPT Green Box, HUSB, and repeaters can be found at http://www.cypressenvirosystems.com/wpt-downloads.php.

1.3 Tools Required for Installation

- Philips-head screwdriver
- 1/16” hex Allen wrench
- 2mm hex Allen wrench

2 WPT Installation

The overall WPT installation procedure includes:

- Mounting the WPT on the wall
- Configuring the WPT
- Calibrating the WPT

2.1 Mounting the WPT

2.1.1 Remove the Existing Thermostat

1. Remove the external cover of the existing thermostat, if any.
2. Locate and remove the fixing screws and carefully withdraw the unit from the wall along with the attached pneumatic tubes.
3. Detach the old thermostat unit from the air tubes carefully. The air tubes may not have a lot of slack – be careful that the tubes do not retract into the wall. In a 2-pipe system, note the positions of branch and main tubes.

ESD Handling Precautions

Warning!

- The WPT contains ESD sensitive circuit cards and components.
- Great care must be exercised while handling the WPT with the cover open.
- Do not touch any of the circuit boards with fingers or any part of the body.
- Touching the circuit boards may cause the unit to fail due to electrostatic discharge.
- Hold and handle the unit as shown in Figure 1, using the external bottom plastic cover as the support.

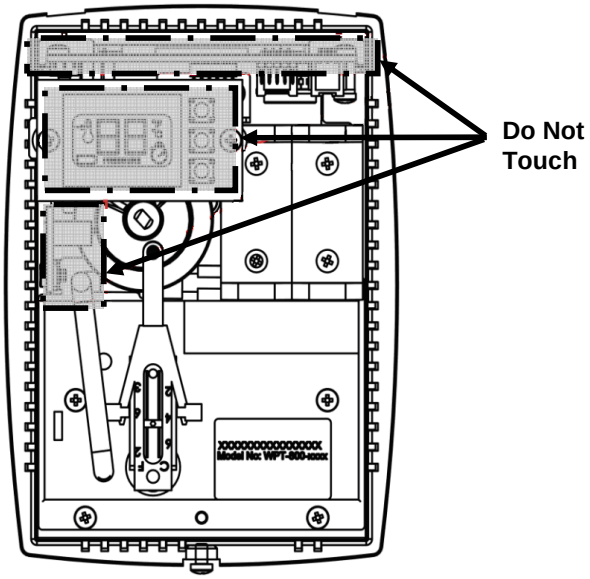


Figure 1. Handling the WPT

Thermostat Lever Handling Precautions

Warning!

- Great care must be exercised while calibrating the WPT.
- Handle the thermostat lever as little as possible.
- Use extreme caution not to allow the lever to rotate sideways while adjusting the setscrew.
- Damage to the bi-metallic spring can result if the end of the lever is allowed to move left or right by more than 1/16".

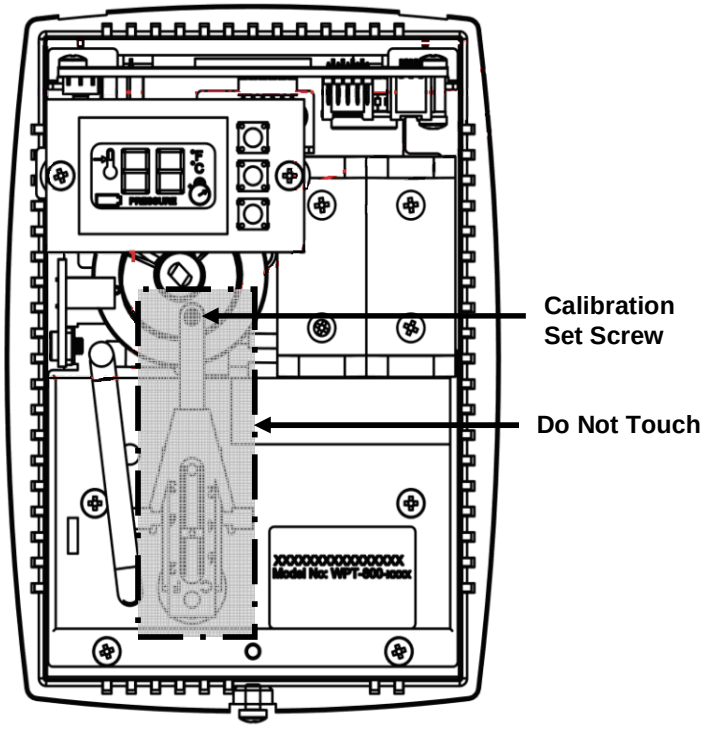


Figure 2. WPT Lever

2.1.2 Installing the WPT

The WPT is installed in the existing thermostat location using the universal wall bracket provided with the WPT kit. To install the WPT:

1. If the universal wall mounting bracket is attached to WPT, remove it by unscrewing the two captive screws on the bottom of the WPT, as shown in Figure 3.

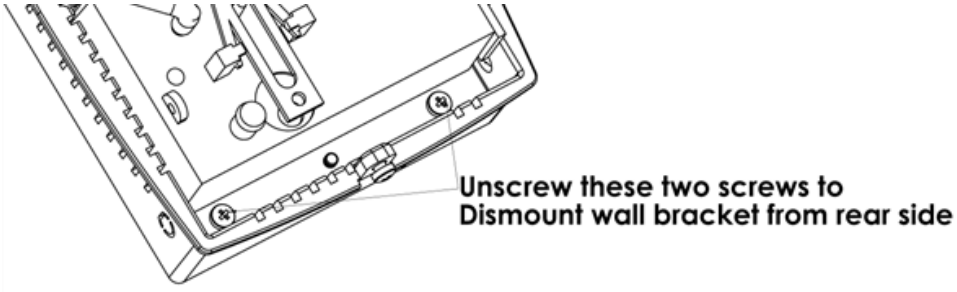


Figure 3. Removing the Universal Wall Bracket

2. Adjust the universal wall bracket against the old thermostat position, such that any two slots on the wall bracket match the existing two holes on the wall. The universal wall bracket is shown in Figure 4.

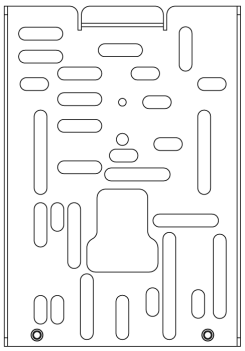


Figure 4. Universal Wall Bracket

3. Pull the air tubes through the central opening of the universal wall bracket.
4. Affix the universal wall bracket to the wall with two screws, as shown in Figure 5.

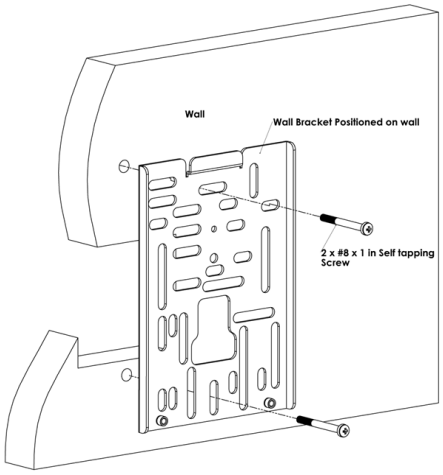


Figure 5. Mounting the Universal Wall Bracket

5. Connect the branch and main tubes to the air tubes marked B and M on the rear of the WPT, as shown in Figure 6. Connect the pneumatic tube to the M port in case of single pipe WPT.

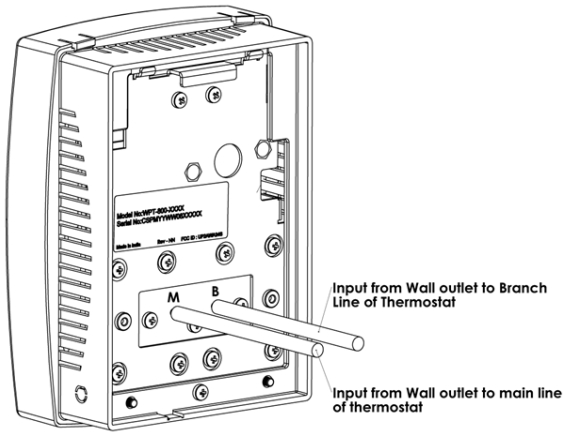


Figure 6. Connecting Main and Branch Tubes to M and B Ports

6. Fit the WPT to the universal wall bracket using the captive screws.
7. Fit the batteries and close the top cover. The battery polarities are as shown in Figure 7.

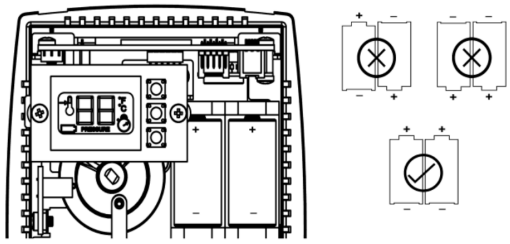


Figure 7. WPT Batteries

2.1.3 Installing/Replacing Batteries

Warning!

Replace battery with CR123 type or equivalent from Panasonic, Sanyo, Energizer or Duracell only. Use of any other battery may present a risk of fire or explosion. See Figure 7 for correct polarity.

- Do not charge.
- Do not heat, disassemble nor dispose of in fire.
- Do not insert batteries with the ⊕ and ⊙ polarities reversed.

- Do not short-circuit.
- Be sure to wrap each battery when disposing or storing to avoid short circuit.

Caution!

- If leaked liquid gets in the eyes, wash them with clean water and consult a physician immediately.
- Do not use new and used batteries together. Do not use different types of batteries together.
- Do not apply strong pressure to the batteries nor handle roughly.
- Do not use or leave the batteries in direct sunlight or in high-temperature areas.

2.2 Configuring the WPT

NOTE: When installing the WPT in a standalone mode, please skip to Section 2.2.3.

The WPT can be configured using the LCD display and the 3 front buttons. The menu structure is displayed below. Please refer to this diagram while calibrating and configuring the WPT.

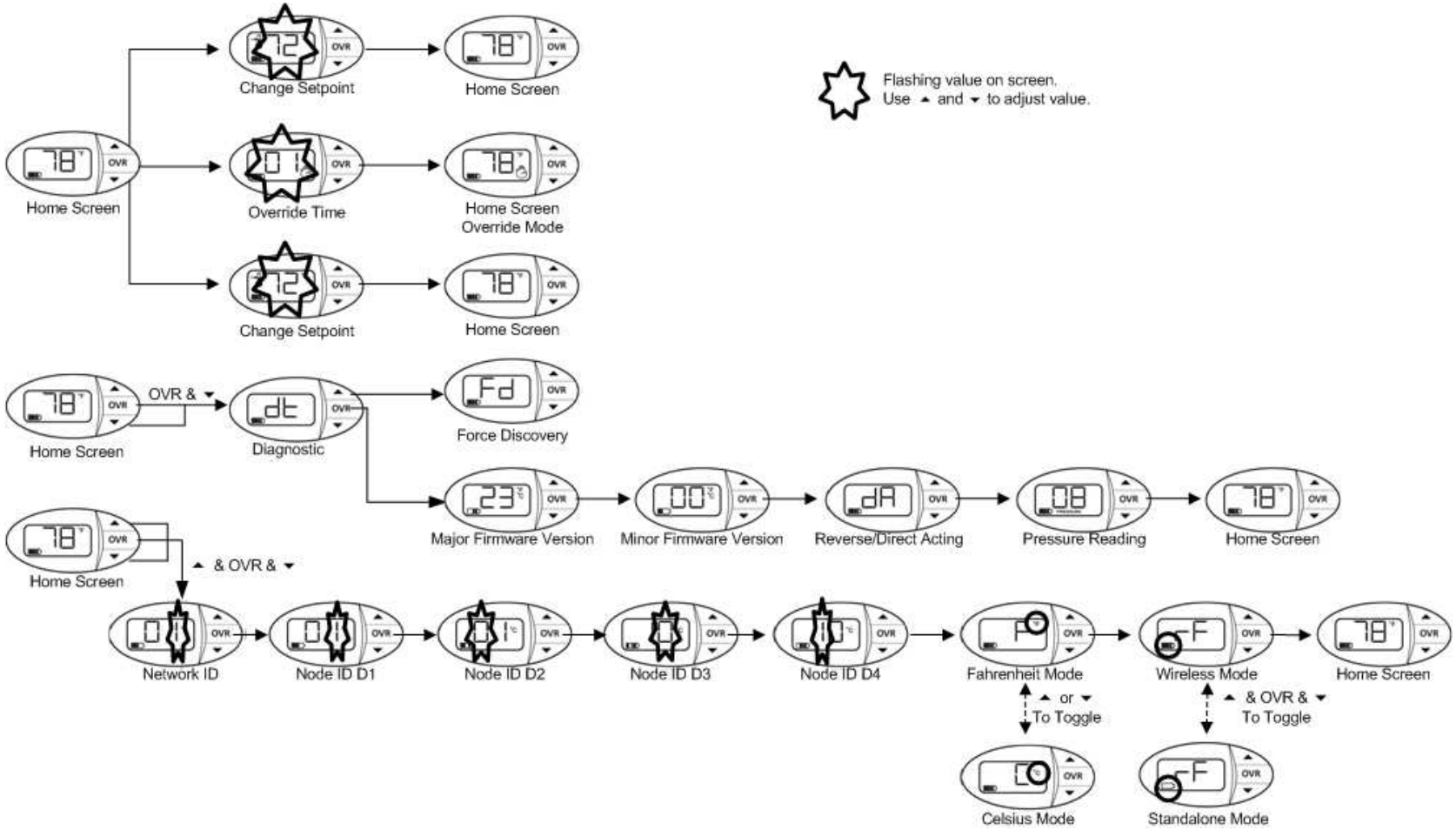


Figure 8. WPT Menu Structure

2.2.1 Configuring the Network ID and Node ID

The WPT must be configured with a valid network ID and node ID for the unit to be operational. The network ID is a single digit number. The node ID is a four digit number. The four digit node ID is displayed in groups of two (D2, D1 together and D4, D3 together).

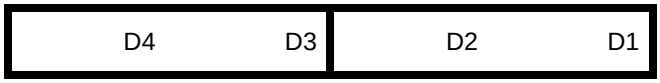


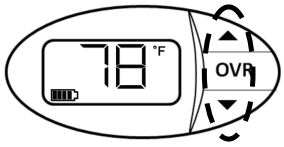
Figure 9. WPT Node ID Digits

Before configuring the WPT, insert the batteries in the holder and press any key. The system will switch on and initialize. During initialization and whenever the WPT starts a discovery process, "dy" is displayed on the LCD. During this period the WPT is attempting to discover its nearest RWALs and HUSB. This process should not be disturbed. Wait for the "dy" to disappear from the LCD before commencing any operation. After initialization, the LCD displays either E0 or the current temperature. See Section 4 for a description of display codes. The WPT is now ready for the configuration of the network ID and the node ID.

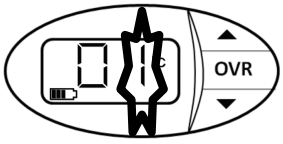
To configure the network ID and the node IDs, perform the following:

1. Press all three keys simultaneously, hold for two seconds, then release. The WPT enters "Programming Mode" and shows the current or default network ID.

   NOTE: ℉ icon is displayed, indicating that the network ID is being programmed.



Press and release all three keys simultaneously to enter Programming Mode



Digit will flash when configuring the Network ID

Figure 10. Configuring Network ID

2. Press the ▲ or ▼ key to change the network ID to the required value.

   NOTE: The network ID cannot have a "0" value.

3. Press OVR to confirm the network ID. This completes the programming of the network ID and the LCD displays the first digit, D1, of the node ID.

   NOTE: ℃ icon is displayed, indicating that the node ID is being programmed.

4. Press the ▲ or ▼ key to change D1 to the required value.

   NOTE: D1 cannot have an "F" value.

5. Press OVR to confirm D1.

6. Repeat steps 4 and 5 to configure D2, D3, and D4 of the node ID.

NOTE: While the node ID is being configured, the corresponding bar of the battery indicator flashes.

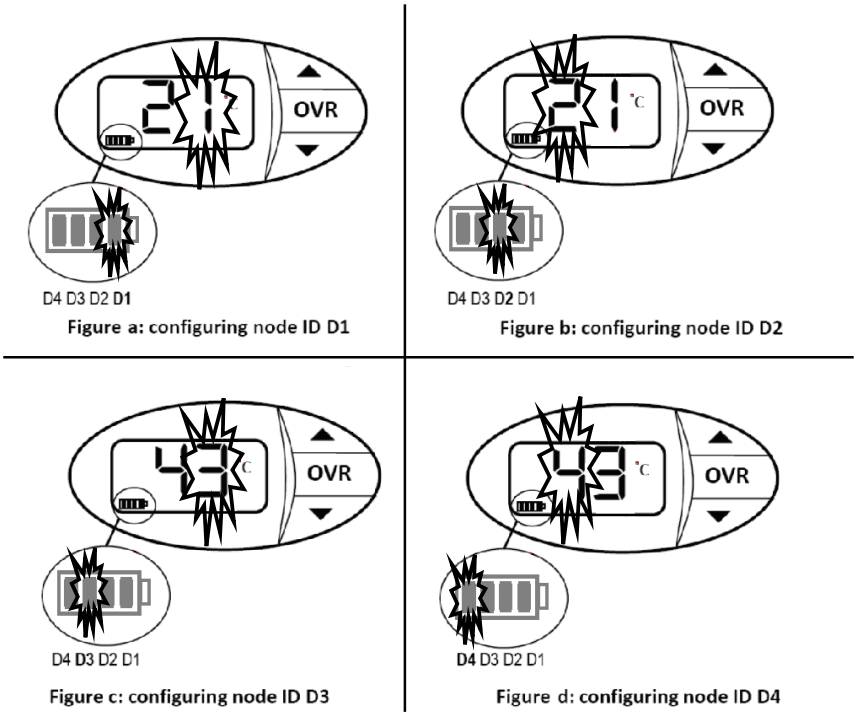


Figure 11. Configuring Node ID 4321

7. After D4 is configured and confirmed, press the OVR button 3 times to exit from Programming Mode.

   NOTE: The WPT will automatically exit the programming mode if no key is pressed for one minute.

The network and node IDs can be changed any time by completing steps 1 through 7.

2.2.2 Selecting between Celsius and Fahrenheit display

NOTE: This feature is available for WPT Rev. 22 and above.

The WPT can display temperatures in Celsius or Fahrenheit. The default setting is for Fahrenheit. To toggle the setting:

1. From the home screen, press all three keys simultaneously to enter "Programming Mode".
2. Press the OVR button 5 times to navigate past the Network and Node ID programming screen and into the Celsius/Fahrenheit screen.
3. Press ▲ or ▼ to toggle between Celsius and Fahrenheit.
4. Press OVR to accept the C/F change.
5. Press OVR to exit Programming Mode.
6. Verify that the ambient temperature is displayed in the selected units (C or F).

2.2.3 Standalone (RF Mode) On/Off

NOTE: This feature is available for WPT Rev. 22 and above.

The WPT can also be used as a standalone pneumatic thermostat. In this setup, the wireless radio is turned off to preserve battery life. If the radio remains on without a wireless network, the WPT will continually search for a network, which reduces the overall battery life. To turn off the radio, perform the following:

1. From the home screen, press all three keys simultaneously to enter "Programming Mode".
2. Press the OVR button 6 times to navigate past the Network, Node ID, and the C/F screen into the Standalone On/Off screen.
3. Press all three keys simultaneously to toggle between Standalone (RF Mode) On and Off. When the battery icon is empty, RF is off and the device is in standalone mode. When the battery icon is full, RF is on and the device requires a Wireless Network.
4. Press OVR to accept the Standalone changes and exit Programming Mode.

2.3 Calibrating the WPT

1. Remove the front cover of the WPT and make sure that the WPT is acclimatized to the ambient temperature.

NOTE: This can take 5 to 10 minutes after attachment to the wall. The bi-metallic spring is very sensitive to body heat. Keep hands and breathe away from WPT to minimize calibration error.

NOTE: The black throttling range adjuster has been factory set to the location marked on the lever as shown in Figure 12. The factory setting provides a Throttling Range (TR) of about 4F. The TR adjuster is very sensitive and should not be moved more than ±0.100" from the factory setting. The bi-metallic strip can be damaged if enough care is not taken while moving the throttling range adjuster. Use a gentle nudging motion on the throttling range adjuster, without exerting force on the bi-metal strip, as this type of force will likely damage the bi-metallic strip.

2. Configure the setpoint manually using the ▲ or ▼ key to match the ambient temperature value displayed on the LCD.
3. Set the WPT for the branch line pressure measurement mode following the instructions in Section 3.3.
4. Use a 1/16" hex Allen wrench and very carefully turn the calibration set screw on the thermostat lever, shown in Figure 12, until the desired branch pressure is achieved. Use extreme caution not to allow the lever to rotate sideways while adjusting the setscrew. Damage to the bi-metallic spring can result if the end of the lever is allowed to move left or right by more than 1/16".

NOTE: Single pipe WPTs might take a longer time to respond during calibration. Please allow sufficient time to calibrate the WPT accurately.

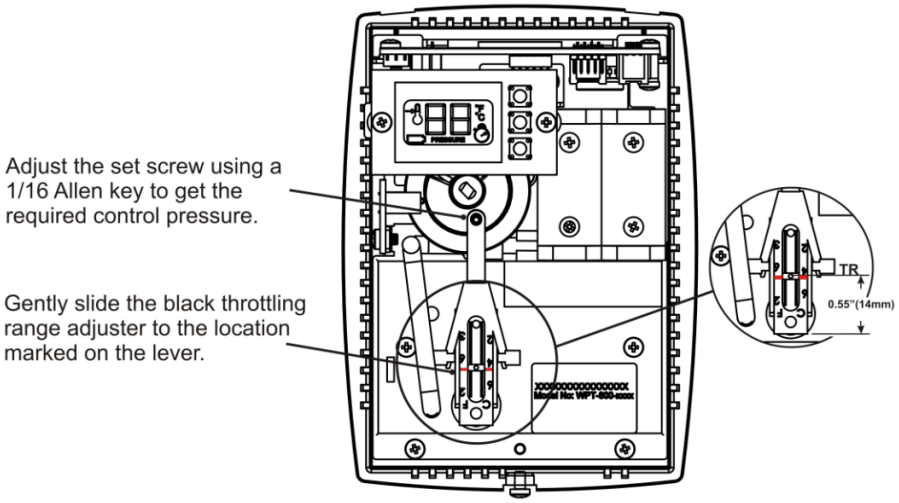


Figure 12. WPT Calibration

5. Press the OVR key to exit pressure measurement mode.
6. Verify that the pressure changes as per the control action (Direct/Reverse) by increasing and decreasing the setpoint using the ▲ or ▼ key.
7. Configure the setpoint to the desired value using the ▲ or ▼ key.
8. Replace the WPT front cover.

3 Operation

The various indicators and characters that are displayed on the LCD display are shown in the Figure 13.

Figure 13. LCD Display

The front panel of the LCD display is used to perform the following functions:

- Changing the setpoint temperature
- Turning on/off the occupancy override
- Measuring the branch line pressure

3.1 Changing the Setpoint Temperature

NOTE: Before changing the setpoint, note the current setpoint. This procedure can not be cancelled once begun.

The setpoint temperature can be changed using the ▲ or ▼ keys. To change the setpoint temperature:

- Press the ▲ or ▼ key once to view the current setpoint along with the setpoint indicator.
- Press the ▲ or ▼ key to change the setpoint value.
- Once the desired value is reached, press the OVR key to accept the change. Leaving the display on the desired value for 5 seconds will also result in a setpoint change.

The LCD display will revert to the current temperature.

3.2 Turning ON/OFF the Occupancy Override

To change the occupancy override:

- Press the OVR key to activate the occupancy override. The LCD display flashes the override duration in hours.
- Press the ▲ or ▼ key to change the override duration to desired value.
- Once the desired value is reached, press the OVR key to accept the change. Leaving the display on the desired value for 5 seconds will also result in a duration change.

During the override duration, the LCD displays the OVR indicator.

3.3 Measuring the Branch Line Pressure

To measure the branch line pressure:

- Press the ▼ key and OVR key together for two seconds.
  NOTE: The display shows ‘dt’.
- Press OVR four times. The LCD displays the branch pressure in PSI along with PRESSURE indicator. **NOTE:** The display shows “--" if the motor is in motion when trying to access branch pressure.
- Press OVR to exit.

3.4 Locking and Unlocking WPT Controls

The WPT can be locked to prevent occupants from overriding setpoints. To lock or unlock the WPT, press the ▲ and ▼ keys simultaneously. The display will show “LC” if the unit is locked, “UL” if the unit is unlocked. Press the ▲ and ▼ keys simultaneously to reach the desired condition.

4 Troubleshooting

The WPT is designed with diagnostic functions to detect and diagnose faults.

Code	Cause	Possible Solution
dy	Indicates that the WPT is performing a discovery operation and it should not be disturbed.	This indication disappears automatically after a few seconds.
dt	Indicates that the WPT is performing a diagnostic operation.	This indication disappears automatically after a few seconds.
Fd	Indicates that the WPT is performing a forced discovery operation.	This indication disappears automatically after a few seconds.
UL	Indicates that the keypad is unlocked by the user.	This indication disappears automatically after a few seconds.
LC	Indicates that the keypad is locked.	This indication disappears automatically after a few seconds.
E0	Discovery error – Not able to connect to nearest repeater or HUSB	Retry discovery by pressing any key. Check if repeater or HUSB is working. Try resetting the repeater. Try with a different position of the repeater/ HUSB if feasible.
E1	Time synchronization error – Not able to synchronize the WPT time with the wireless network	If this error occurs after successful commissioning of the system, the WPT will recover from this error within a couple of refresh cycles.
E2	Radio error – Not able to send/receive data	Restart the unit with removing and inserting the battery. If the error continues the device requires replacement. Contact the distributor.
E4	Connect error – Not able to connect to the nearest HUSB or repeater	If this error occurs after successful installation, the WPT will auto recover after couple of refresh cycles. If the error persists consider adding a repeater in the zone.

5 Repair

Except for the batteries, the WPT does not have any field replaceable or repairable parts. Contact the original distributor of the unit for repair or warranty service.

NOTE: Care should be taken to keep the unit dust-free during installation.

The WPT is designed to work reliably with a clean, dry-compressed air supply at the required pressure.

6 Technical Specification

Action	Direct / Reverse Acting
Number of pipes	Single / Dual pipe
Setpoint Temperature Range	55ºF to 85ºF (13℃ to 29 ℃)
Air connections	Barb fittings, 3/32 in (2.5 mm) ID tube
Maximum Operating Pipe Pressure	25 psi (170 kPa)
Airflow Usage	0.011 scfm (5.2 mL/s)
Sensitivity	Factory Adjusted to 2.0 – 2.5 PSI/F
Operating Frequency Band	2.4 GHz ISM Band
Battery Life	More than 2 years (with four setpoint changes per day)
Operating Conditions	32 to 122ºF (0 to 50ºC) 95%RH Max, Noncondensing
Storage Conditions	-40 to 122ºF (-40 to 50ºC) 95%RH Max, Noncondensing
Dimensions	Length: 5.6 in (141 mm) Width: 4.1 in (103.5 mm) Depth: 2.1 in (53.3 mm)

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