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 Wireless Range Test Kit (RKIT) is used in conducting a wireless survey of the installation site to determine the locations for repeaters (RWALs) in order to provide maximum wireless coverage for the WPT network. For more details on factors affecting wireless performance in a building refer to the WPT Network Planning Guide.

1.1. Components

The WPT Wireless Range Test Kit includes the following components:

- **Wireless Range Test Receiver** (WPT-800-RX)

  This is a battery powered device that is used to emulate a USB Hub (HUSB) or Wall Powered Repeater (RWAL) during a site survey

- **Wireless Range Test Transmitter** (WPT-800-TX)

  This is a battery powered device that is used to emulate a WPT node during a site survey. It can also be used to emulate a repeater, when evaluating RWAL to RWAL paths. Note that a real RWAL will have a slightly longer RF transmission range than this Transmitter, due to its external antenna. Keep this in mind when surveying RWAL to RWAL hops.

- **Batteries** (CR123)

  Two CR123 type batteries are required for each RKIT device

1.2. Prerequisites for Site Survey

Before starting the site survey using the Range Test Kit, the following are required:

- A copy of the floor plan with the locations of the existing pneumatic thermostats marked along with the locations of the columns, walls, elevator shafts, stairwells, partitions, file cabinets, and other large metal items

- Approximate distance between each pneumatic thermostat

- Information about the materials used for the walls and their thickness

Manuals for the WPT, RWAL, WPT Green Box, HUSB and other manuals related to the WPT system can be found at http://www.cypressenvirosystems.com/wpt-downloads.php.

1.3. Tools Required for Installation

- 1/16" hex Allen wrench (required for battery replacement only)

2.   Handling Precautions

2.1.   ESD Handling Precautions

ATTENTION
OBSERVE PRECAUTIONS
ELECTROSTATIC
SENSITIVE DEVICES

- The receiver and transmitter contain ESD sensitive circuit cards and components.

- The cover should remain in place at all times, except during battery replacement.

- Great care must be exercised while handling the receiver and transmitter 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 units using the bottom plastic cover.

2.2.   Battery Handling Precautions

⚠ Warning!

Replace the batteries 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 2 for correct polarity.

- Do not attempt to charge batteries.

- Do not heat, disassemble nor dispose of batteries 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!
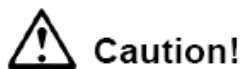
- If leaked liquid gets in the eyes, wash them with clean water and consult a physician immediately.

- Do not use new and used batteries together.

- Do not use different types of batteries together.

- Do not apply strong pressure to the batteries or handle them roughly.

- Do not use or leave the batteries in direct sunlight or in high-temperature areas.

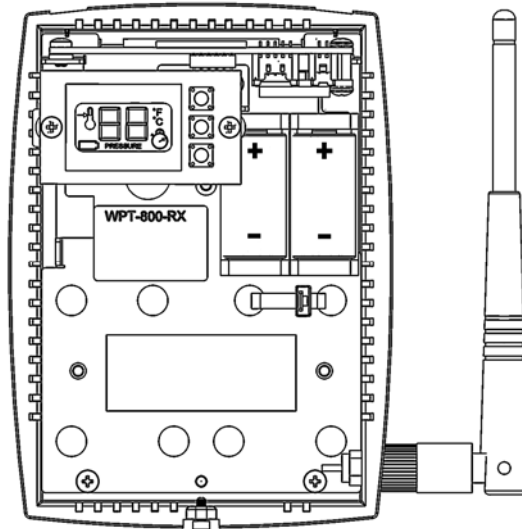## 3.   Batteries and Power

3.1.   Installing Batteries

1. Open the covers by unscrewing the bottom cover screw as shown in Figure 1. The cover screw can be opened using a 1/16" hex Allen key.
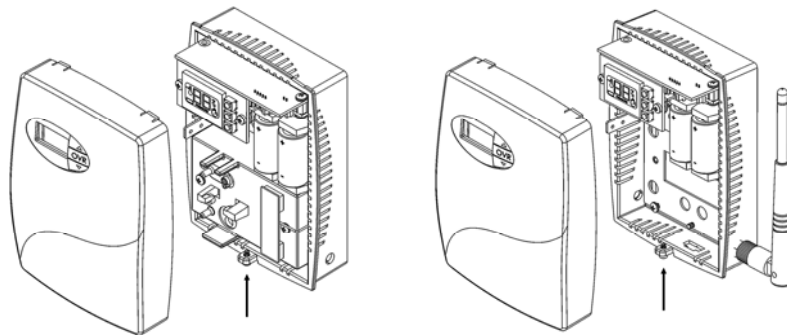
Figure 1. RKIT Transmitter (left) and Receiver (right)

2. Insert the batteries with polarities as shown in Figure 2 (positive end pointing up for both batteries), and close the top cover.

Figure 2. Inserting Batteries

3. Replace the cover and tighten the bottom screw in place.

3.2. Powering Up RKIT for the First Time

When new batteries are installed in either device, press any button to switch the device on into low-power idle mode. The battery level indicator as shown in Figure 3 will appear on the LCD indicating the device is in low-power idle mode and is ready for use.

3.3. Battery Life

The batteries can remain installed in both devices at all times (during transport between site surveys, etc), since the low-power idle mode consumes very little power. Without active use, the batteries will last several years with the devices in low-power idle mode.

The batteries provide enough power to perform at least 1000 individual range tests (testing the location of 1000 WPTs). Please keep spare batteries readily available during the site survey.

4. RKIT Basics

4.1. Buttons and Display

On both Receiver and Transmitter, there are three buttons adjacent to the LCD: ▲, **OVR**, and ▼.

The LCD Display, as shown in Figure 3, displays various indicators and characters.

Figure 3. LCD Display

Battery Level Indicator	Indicates if the system is in low–power idle mode and the battery level
Occupancy Override Indicator	Indicates if a data packet is received (Receiver) or is transmitted (Transmitter)
Dual Digit	Display RSSI (signal strength) reading, RKIT ID, etc.

4.2. RKIT ID

RKIT supports selection of one of three different RKIT IDs - A, B and C, so that up to three sets of RKITs can be used to perform a site-survey in the same building without conflicting or cross-talking between kits. In order for a set of RKITs to communicate, the Receiver and Transmitter must have the same RKIT ID.

Select RKIT ID on Both Devices:

1. While the device is in low–power idle mode, hold down and release all three buttons.
2. When the RKIT ID is flashing on the display, press the ▲ or ▼ button to change the ID and the change will appear on the display.
3. Press the **OVR** button to store the new ID, and the device will go back to low–power idle mode.

Check RKIT ID on Both Devices:

1. While the device is in low-power idle mode, press the **OVR** button.
2. When "rt" is displayed, press the **OVR** button again (or wait 2 seconds) to display the RKIT ID.

4.3. RSSI Scale

Radio Signal Strength Indicator (RSSI) is displayed in a scale of 1 to 5 on the Transmitter to indicate the wireless signal strength of a range. Section 5 will explain how to interpret the RSSI scale.

RSSI	5	4	3	2	1
Indoor	100 ft	140 ft	160 ft	180 ft	200 ft
Outdoor	400 ft	600 ft	800 ft	1000 ft	1200 ft

Table 1. Typical indoor and outdoor RKIT ranges

4.4. Start Range Test

On Receiver, press the ▲ button so that it starts listening for data packets from the Transmitter. The RKIT ID will be displayed while the receiver is active, and the override indicator will flash every time a valid data packet is received.

On the Transmitter, press the ▲ button so that it starts initiating communication with the Receiver. The RSSI scale will be displayed and the override indicator will flash every time a data packet is sent (once per second).

4.5. Stop Range Test / Turn off Devices

When the device is turned off, goes back to the low–power idle mode. The batteries can remain installed in both devices at all times, since the low-power idle mode consumes very little power. Without active use, the batteries will last several years with the devices in low-power idle mode.

During range test:

- The Receiver or Transmitter test can be interrupted by pressing the ▲ button, which will return the device to low-power idle mode

- The Transmitter test will stop automatically after 30 seconds.

- The Receiver test will stop automatically 10 minutes after the last data packet is received from the Transmitter.

5. Performing a Wireless Site Survey

The purpose of the Wireless Site Survey is to determine the appropriate locations for the HUSB and repeaters (RWALs) in order to build a WPT wireless network. The survey is completed by checking the wireless signal at each thermostat location (where a WPT will be installed). If the wireless signal strength is below an acceptable level, RWALs will be required in order to increase the signal strength.

Site survey procedures:

1. Use the floor plan to determine the potential target location for the HUSB.
2. Configure both the Receiver and Transmitter with the same RKIT ID. Make sure there are no RKITs with same RKIT ID operating nearby.
3. Place the Receiver at the target location for the HUSB and press the ▲ button. Make sure the RKIT ID is displayed and override indicator is not flashing.
4. Take the Transmitter to the thermostat location.

5. Start the range test by pressing the ▲ button on the Transmitter. The override indicator will flash once to indicate a data packet is sent. RSSI scale will be displayed (in a scale of 1 to 5) and updated every second.

6. Observe the RSSI:

   - Scale of 5-3 indicates acceptable wireless coverage

   - Scale of 2-1 indicates weak wireless coverage

   - "--" indicates no wireless coverage

7. If the RSSI at the thermostat (or WPT) is 2-1, consider placing a RWAL between the HUSB and the thermostat, especially, if there are additional thermostats located further from the HUSB. For example, in the sample layout in Figure 4, note that there are several thermostats (or WPTs) outside the coverage area of the HUSB. RWALs are needed to relay the signal from these locations as shown in Figure 5.

8. If an RWAL is needed, make sure that there is either a wall power outlet or access to run a 24VAC cable within reach of each of the desired RWAL locations to power the RWAL or RWAL-24V.
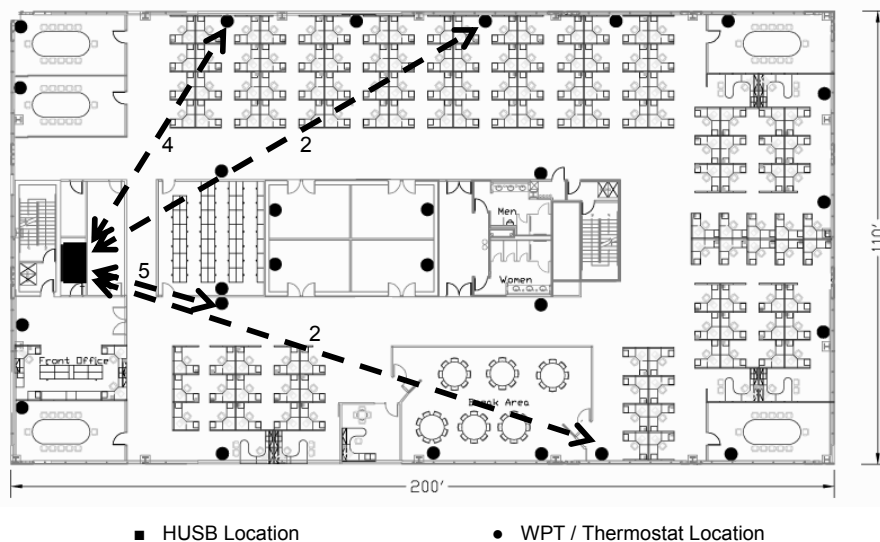
■ HUSB Location   ● WPT / Thermostat Location

Figure 4. Sample Layout of Thermostat Locations

| ■ HUSB Location | ▲ RWAL Location | ● WPT / Thermostat Location |
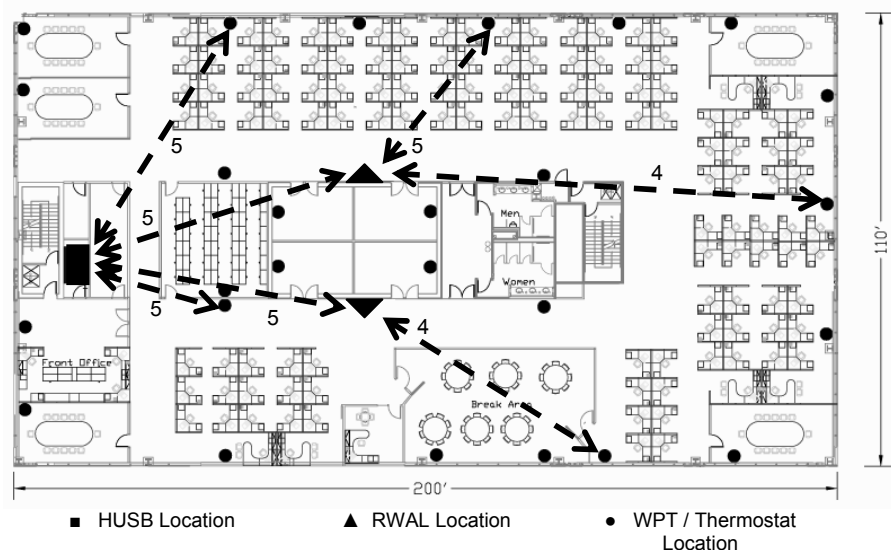
Figure 5. RWAL Installations

9. If a target RWAL location is identified, move the Receiver to this location and repeat step 5 and 6 to make sure RSSI is within the acceptable range.
10. To stop the test, press ▲ button on both Receiver and Transmitter.

Repeat the above steps for other WPTs to build a WPT wireless network.

Note: The typical battery life of the Receiver and Transmitter are sufficient for testing approximately 1000 WPT locations. Please keep spare batteries readily available during the site survey.

6. Repair

Other than the batteries, the receiver and transmitter do not have any replaceable or repairable parts. Contact the original distributor of the unit for repair or warranty service.

7. Troubleshooting

Problems	Cause	Possible Solution
Either Receiver or Transmitter does not display battery icon after pressing any buttons.	No batteries inserted, batteries inserted incorrectly, or batteries are low	Check the batteries.
Both Receiver and Transmitter are in range, but they have no communication after range test is started, i.e.	RKIT ID mismatch.	Make sure the RKIT ID on both devices are the same

Transmitter always displays "– –" and Receiver is not flashing its override indicator.		
Receiver is flashing its override indicator even though the Transmitter is turned off.	Another Transmitter with the same RKIT ID is in operation nearby.	Make sure there is no other Transmitter with the same RKIT ID in operation nearby.
Transmitter shows a valid RSSI reading even though the Receiver is turned off.	Another Receiver with the same RKIT ID is in operation nearby.	Make sure there is no other Receiver with the same RKIT ID in operation nearby.

8. Technical Specification

DC Power	Receiver: 2 x CR123, 3V, 1500 mAH batteries Transmitter: 2 x CR123, 3V, 1500 mAH batteries
Antenna	Receiver: External Rubber Dipole, 4dBi gain, omni-directional, 2.4 to 2.5 GHz Transmitter: Internal PCB Antenna, 2dBi gain, omni-directional, 2.4 to 2.5 GHz
Operating Frequency Band	2.4 GHz ISM Band
Operating Condition	32 to 122ºF (0 to 50ºC) 95%RH Max, Noncondensing
Storage Condition	-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)