Wireless Pneumatic Thermostat (WPT)

Level 1 Certification Training

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Doc No: 900-00010-01 Rev 01

Purpose

Walk through the steps for a successful installation

- Site survey
- Staging
- Installation
- Commissioning
- Post install

Technical Training

Introduction

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Key Components of WPT System

Green Box
(GBC-800-001)

Contains configuration tools, remote monitoring & control application, BACnet interface, DR Interface, and web services.

Hub
(WPT-800-HUSB)

Connects the WPT wireless network to the Green Box.

Wall powered repeater
(WPT-800-RWAL)
(WPT-800-RWAL 24V)

Extends the WPT wireless range.

WPT Node
(WPT-800-TXXX)
(WPT-800-TXXX-DB)

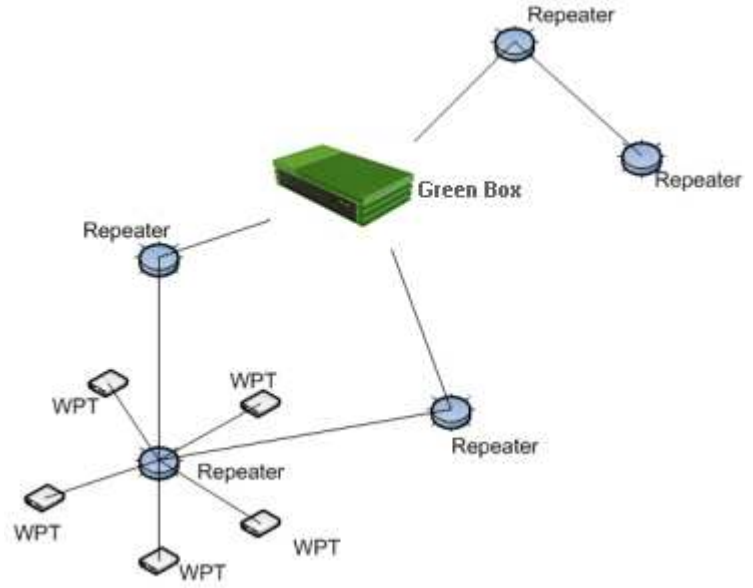
Replaces the existing pneumatic thermostat. Available in single/dual pipe with direct/reverse action.

Terminology used in this training

Green Box or GBC	Hub or HUSB	Repeater or RWAL	WPT or WPT-DB

Cypress Wireless Communications

- Uses Cypress Semiconductor wireless technology – first deployed over six years ago, with over 25 million nodes in use today.
- Hybrid mesh networking that is fast, easy to use, highly reliable and self-healing
- Allocate (1) Repeater for up to every (15) WPTs
- Up to 225 WPTs with 14 Repeaters and 1 Hub are supported per GBC.
  - (14 Repeaters + 1 Hub) X 15 WPTs = 225 Total WPTs
- The WPT network allows a total of (6) data hops back to the Hub
  - Think of a data hop as a repeater. If 3 repeaters are required for a WPT then you have 3 hops.



2.4 GHz DSSS radios, +20dBm (100mW) peak output

NOTE: Do not use where cell phones or WiFi are prohibited (i.e. hospital operating rooms), or in environments requiring temperature validation.

Network Formation / Reformation

- The WPT network automatically form once the components are powered. The components should be powered up as follows:
  - Hub / server
  - Repeaters
  - WPTs

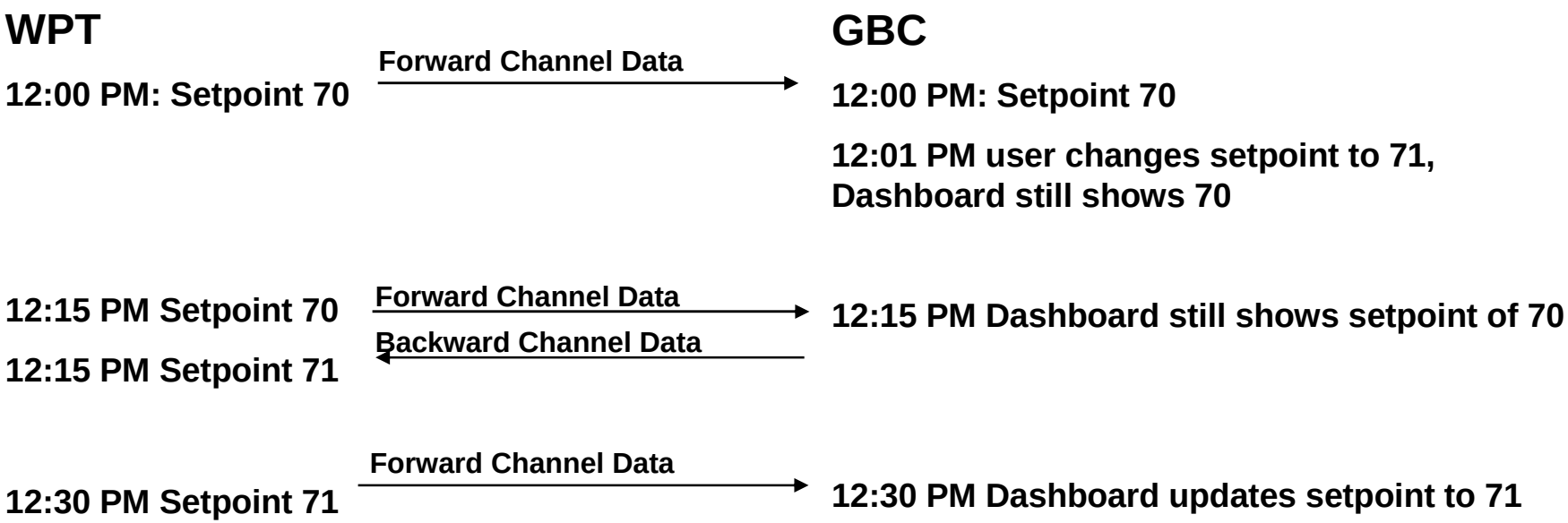
- As they are powered, Hub, Repeaters, and WPTs begin communicating with each other and determining best communication routes.

- Network formation only takes a few seconds in most cases, but it can take a few minutes for all devices to be “negotiated” into the network.
  - For example, if a Repeater drops off the network it can take some time for the network to “re-negotiate” a new path (self healing).

- Remember, WPTs only associate themselves with one device (directly with the Hub, or with a Repeater)

Wireless Communication

WPTs communicate every 15 min



Recommended Installation Workflow

1. Start with site survey
    - Walk the site and note the types of thermostats to be retrofitted
    - Determine where to place Repeaters, Hub and Green Box
    - Determine power requirements, number (and type) of Repeaters and Green Boxes required

2. Stage components in the office as much as possible

3. Install and configure Green Box and Hub
    - The Hub and Green Box should be installed first as the core of the network
    - Define unique IDs to assign to each WPT and Repeater

4. Install and configure Repeaters
    - Verify power has been installed
    - Install and configure the Repeaters to setup WPT wireless network

5. Install WPTs
    - Physically remove old thermostats and connect/mount WPTs in their place
    - Configure WPTs to communicate with the wireless network

6. Commission system
    - Calibrate WPTs
    - Verify full system functionality

7. Customer walkthrough
    - Train customer
    - Setup customer specific items (alarms, schedules, etc.)

Technical Training

Site Surveys

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Purpose

Goals:

- Gather information about project for quoting and install
  - Walk through the site
  - Verify wireless signal strengths
  - Determine locations for GBC(s) and repeaters
  - Determine HVAC compatibility, thermostat type and count
  - Discuss networking requirements w/ IT
  - Determine the wireless network

Deliverables/Outcomes:

- Marked up maps indicating GBC, repeater and thermostat locations
- Network information for GBC

Equipment needed for site survey

- Wireless Range Test Kit (RKIT)
- Colored pens and highlighters to mark up map
- Floor plans / maps
- Allen wrench set and screwdriver (to look at various thermostats)
- Controls drawing if possible

Pre-survey list

Customer information	
Customer name:	
Customer address:	
Contact name:	
Contact phone number:	
Schedule	
Survey dates:	
Installation dates:	
Pre-visit questions	
Site maps received?	
Certifications needed (safety, etc.)?	
On-site training required?	
Parking permits needed?	
Accessibility issues for personnel?	
Equipment needs to be sent to bonded area?	

Survey Checklist : Step 1 – HVAC system info

Questions/Info request	Information
Details of compressed air system	
Type of HVAC system (single duct, VAV, hot-deck, cold-deck, etc.)	
Main pressure	
Balance point or mid-point on control settings for stat	
Spring rate (if they know)	
Stat type (manufacturer and model number)	
Power and network connection verification	

Remember

- The WPT thermostats are zone control only
- The thermostat controls the terminal unit in the same exact way as the old Johnson or Honeywell pneumatic thermostat.
- For terminal units having both heating and cooling controls (i.e fan coil unit, VAV w/ reheat), consider using the WPT deadband thermostat.
- The WPT thermostat has an standard pneumatic thermostat built inside. Like any pneumatic thermostat, this is a proportional control device only. The WPT does not have integral reset (PI control) parameters.

Thermostat Identification

Use the following guidelines for proper selection of the WPT model

1) Is the Thermostat to be retrofitted a Wall/Room Thermostat?
   - Note: WPT does not replace the Remote Bulb thermostats

2) Is it a one-pipe (low air capacity) or two-pipe (high air capacity) thermostat?

3) Is the control action direct or reverse acting?

   - Verify existing thermostat operation by adjusting the setpoint dial and noting the operation. This is particularly important if there is no model number readily available on the thermostat.

   - Direct acting: An increase in temperature above setpoint results in an increase in the branch line air pressure.
     Example:
     Room temperature 72.0
     Setting the setpoint to 55.0 (branch pressure increases)
     Setting the setpoint to 85.0 (branch pressure decreases) Normally open heating valve

   - Reverse acting: An increase in temperature above setpoint results in a decrease in the branch line air pressure.
     Example:
     Room temperature 72.0
     Setting the setpoint to 55.0 (branch pressure decreases)
     Setting the setpoint to 85.0 (branch pressure increases) Normally closed heating valve

Survey Checklist – Step 2: Network info

Questions/Info request	Information
Will it run on a BAS network or standalone?	
BACnet client – what are they using	
Is it a dedicated network or open LAN (port 80 open?)	
Server Location	
IP address, Default Gateway, DNS	
MAC address	
BACnet virtual network number	
WPT Network ID	

Survey Checklist : Step 3 – Wireless survey

Questions/Info request	Information
Stat count (and type of each stat)	
Repeater count (and type of repeaters needed)	
Green Box count	
How many floors – on maps	

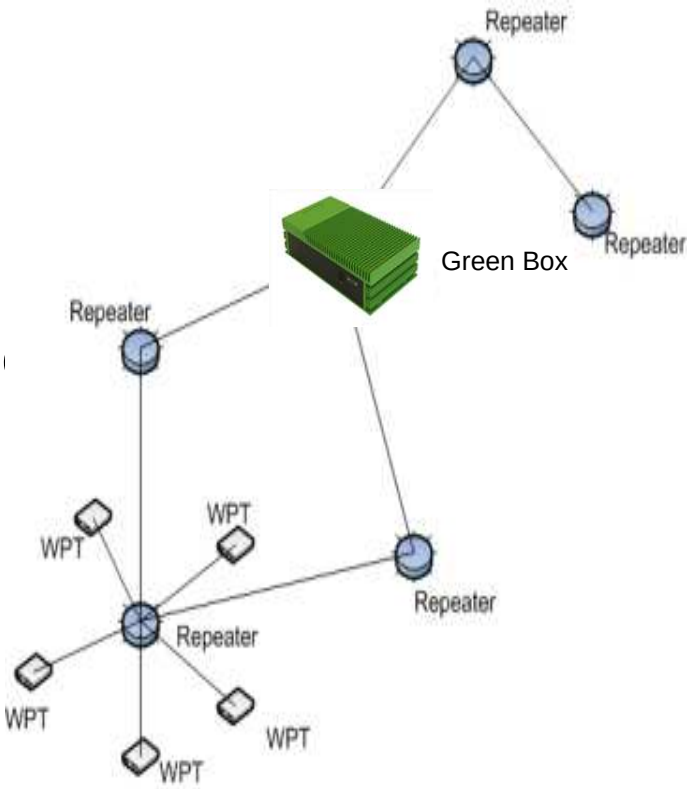
WPT: Survey

- Thermostats
  - Information collection – already installed, fixed locations
  - Floor plan, site map
    - Thermostat count, RA, DA, 1-pipe, 2-pipe

- Repeaters, Green Box and Hubs
    - Green Box, Hub & Repeater Locations are flexible (location to be determined)
    - RF signal should drive installation locations
      1. Signal strength between WPTs and to neighboring RWALs and Hub
      2. Wireless Routing
      3. Accessibility & Power

WPT Wireless Network Planning Overview

- Wireless network planning involves selecting good locations for the Repeaters and Hub
- Depending on the building, the wireless range and the number of Repeaters require may differ
- More than one Green Box may be used at larger sites. Each Hub and its associated Repeaters are considered a separate network.



Wireless Performance in Buildings

- Cypress wireless has been installed in many different types of sites
  - low-rise office buildings
  - high-rise commercial buildings
  - industrial plants

- Typical wireless ranges for a single “hop” are:

Line of Sight	300 ft open halls 150 ft in open office floor 100 ft in corridors
Drywall / Paneling	100 ft, through five walls
Brick Walls	60 ft, through three walls
Ceilings	25 ft, through single ceiling

- Repeaters allow for multiple “hops” which extend the communications range of the system

Factors Reducing Wireless Range

- Wireless range is affected when metal obstacles are in the line of transmission.

- A solid sheet of metal and some rebar reinforced concrete present the greatest obstacles.

- Try to note the following objects and avoid them in the line of transmission:
  - Hollow lightweight walls filled with insulating metal foil
  - Office equipment and furniture such as book shelves, file cabinets, metal partitions, computer racks
  - Metal reinforced concrete walls, pillars and columns
  - Glass walls with metal coating
  - Plumbing and electrical risers
  - Elevator shafts and stairwells
  - Mechanical and electrical equipment rooms

The bigger the metal obstacles in the transmission path, the shorter the wireless range.

WPT: Survey

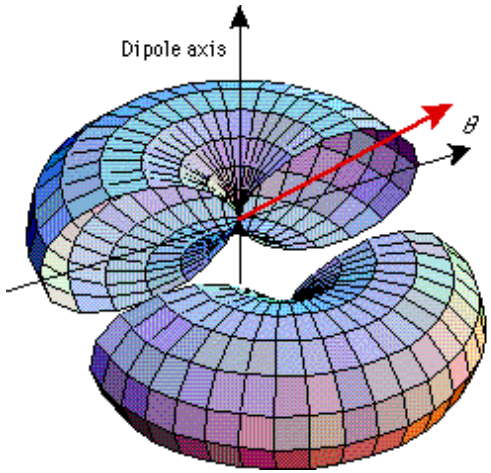
- Wireless Range Test Kit (RKIT)
  - Tool for determining received signal strength indication (RSSI) between points
  - Enhanced RKIT; Instructions printed on the RKIT devices; continuous updates for 30 seconds
  - RSSI levels (1-5)
    - 3 - 5 (Acceptable quality)
    - 1 - 2 (Poor quality, unacceptable)
    - "--" indicates no wireless coverage

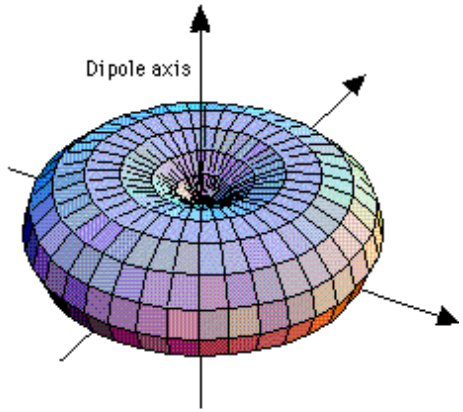
RSSI	5	4	3	2	1
Indoor	100 ft	140 ft	160 ft	180 ft	200 ft

Average RSSI levels for typical office building (1-2 walls)

  - Avoid holding the RKIT near the antenna
    - Influence from the body could adversely affect the radio range

- Antenna radiation patterns





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Wireless Survey Steps

1. Identify potential locations for the repeaters and Hub on the floor plan
2. Place the Receiver at the target location for the Hub
3. Take the transmitter to thermostat locations and start transmitting
4. If the RSSI drops below 3, a repeater is needed
5. Move the Receiver to all potential repeater locations and repeat step 3 and 4

Site Survey Kit

Lab - 1

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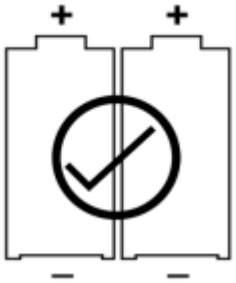
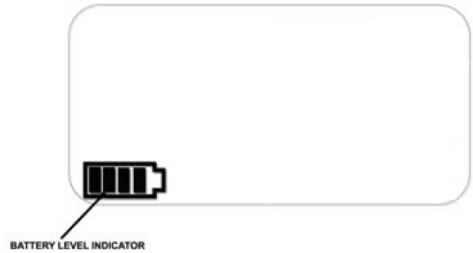
Lab Objectives

- Introduction to the RKIT
- Install batteries and power on transmitter and receiver
- Select an RKIT ID
- Start/Stop range test
- Perform mock wireless survey

Install batteries and power on the devices

1. Open the yellow Pelican case and locate the Transmitter – there will be a sticker on the side that says “Transmitter”
2. Open the cover by unscrewing the bottom cover screw with the 1/16” Allen driver included in the kit
3. Insert the batteries as shown in the figure to the right (positive end pointing up for both batteries), and close the top cover.
4. Notice that battery level indicator is now lit up on the LCD. This indicates that the RKIT is in “low–power idle mode”
5. Repeat the above steps for the Receiver





Reference: WPT Wireless Range Tester Kit User Manual - Section 3.1

Select an RKIT ID

Up to 3 RKITs can be used simultaneously as long as they have different RKIT IDs (A, B or C). Setup your RKIT to use the ID that is written on the front cover of the Transmitter and Receiver.

1. While the Transmitter 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.
3. Once the correct ID is chosen, press the **OVR** button to store the new ID, and the device will go back to low–power idle mode.
4. Repeat steps 1-3 for the Receiver

Reference: WPT Wireless Range Tester Kit User Manual - Section 4.2

Start/Stop Range Test

1. Turn on Receiver by pressing the ▲ button once. The LCD will display the RKIT ID.
2. Turn on the Transmitter by pressing the ▲ button once. The LCD will show the RSSI scale. The override indicator will flash every time a data packet is sent (once per second).
3. Turn off the Receiver by pressing the ▲ button, which will return the device to low-power idle mode. Notice that "--" is displayed on the LCD. This is because the Transmitter can no longer find the Receiver.
4. Turn off the Transmitter by pressing the ▲ button, which will return the device to low-power idle mode.

Reference: WPT Wireless Range Tester Kit User Manual - Section 4.4

Perform Mock Wireless Survey

1. Turn on the Receiver and Transmitter
2. Leave the Receiver on the table and walk around the room with the Transmitter
3. Take note of the RSSI value as you walk further away from the Receiver
4. Place the Transmitter behind a concrete wall and take note of the RSSI value
5. Place your hand over the front cover and take note of the RSSI value

Reference: WPT Wireless Range Tester Kit User Manual - Section 5

Mock Site Survey

Write down the RSSI at each location as directed by the training coordinator:

Location 1 RSSI _____

Location 2 RSSI _____

Location 3 RSSI _____

Questions

1. What happens to the RSSI when you put your hand over the cover of the Transmitter?

   _____

2. What does the Transmitter display when it can no longer see the Receiver?

   _____

3. How many Wireless Range Test Kits can be used at the same time in the same area?

   _____

4. How long does the Receiver remain active when it no longer detects data packets from the Transmitter ? (Hint: see section 4.5 in the WPT Wireless Range Tester Kit User Manual)

   _____

5. How long does the Transmitter remain active when the Receiver is no longer detected? (Hint: see section 4.5 in the WPT Wireless Range Tester Kit User Manual)

   _____

6. What is the acceptable RSSI range? (Hint: see section 5 in the WPT Wireless Range Tester Kit User Manual)

   _____

Survey Checklist : Step 4 – Put it all together

Questions/Info request	Information
Create WPT Node ID list	
Create repeater ID list	
Maps marked up with	
Approximate repeater, GBC and stat locations	
Indicators/comments where power is needed	
Building material construction (if unusual)	
Potential wireless barriers	
Accessibility issues (if any)	

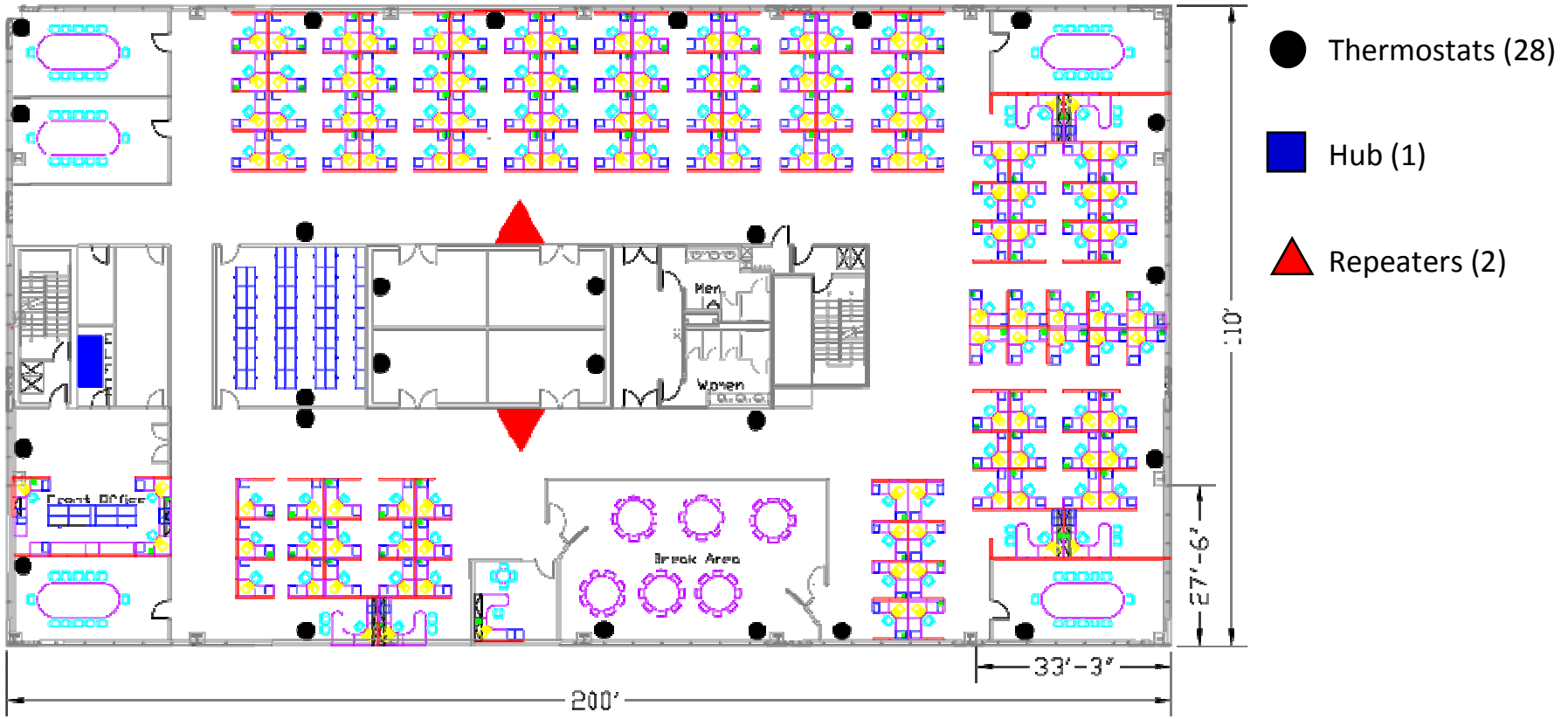
- Afterwards, ready to finalize order quantities

Sample lists

NodeID	NetworkID	NodeName	Location	BACnetID
3029	1	TU3.29	3rd FLoor	3029
3028	1	TU3.28	3rd FLoor	3028
3027	1	TU3.27	3rd FLoor	3027
3026	1	TU3.26	3rd FLoor	3026
3025	1	TU3.25	3rd FLoor	3025
2025	1	TU2.25	2nd Floor	2025
2024	1	TU2.24	2nd Floor	2024
2023	1	TU2.23	2nd Floor	2023
2022	1	TU2.22	2nd Floor	2022
2021	1	TU2.21	2nd Floor	2021
201A	1	TU2.20	2nd Floor	2020
1009	1	TU.9	1st Floor	1009
1006	1	TU.6	1st Floor	1006
1005	1	TU.5	1st Floor	1005
1003	1	TU.3	1st Floor	1003

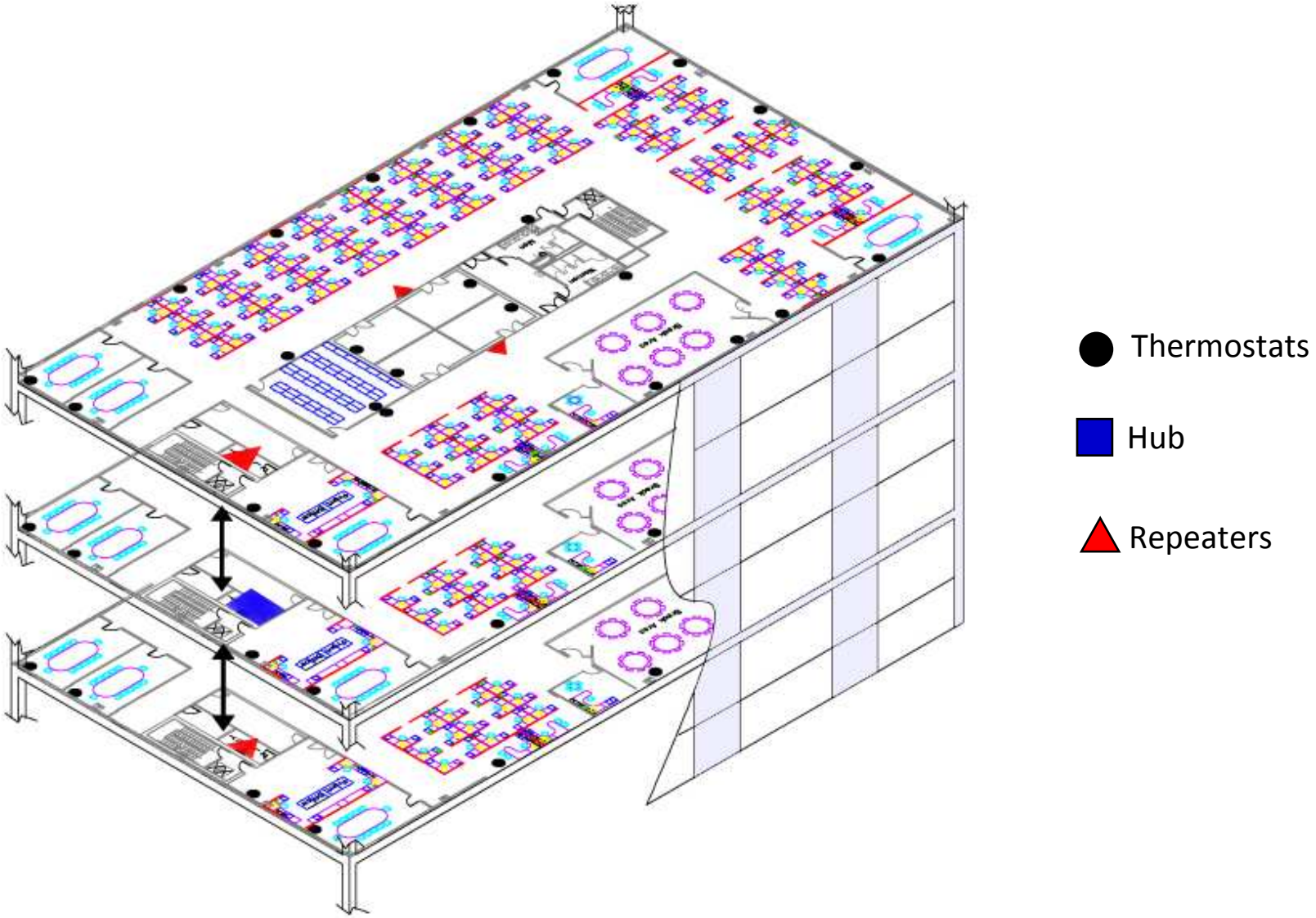
RepeaterID	NetworkID	Location
11	1	1st Floor
12	1	First Floor
23	1	2nd Floor
24	1	2nd Floor
35	1	3rd Floor
36	1	3rd Floor

Typical Layout of WPT Network in a Building



WPT Wireless Network in a Typical Office Building

Typical layout of WPT Network in a Building



WPT Wireless Network in a typical multi-floor office building

Best practices

- When you have locations with multiple GBC make sure you use different Network ID numbers on each GBC.
  - Even buildings within 1000ft may receive crosstalk
- Many times the core will be cool only and perimeter will have cooling with reheat requiring different thermostat types. Both should be checked.
- If a section of a building has been remodeled check thermostats to verify type (direct acting or reverse acting).
- Locating the GBC in the center of the building close to power and a LAN.

ID assignments

- WPT
  - Useful to number per floor or area (1xxx = 1st floor, 2xxx = 2nd floor…)
  - If possible, number in a clock-wise manner through the floor or some other logical pattern to help with maintenance
- RWAL
  - Left most digit doesn't matter, but right most digit should be numbered with the lower number closest to the Hub
    - Repeaters with an ID ending with 1 will be discovered first
    - Do not repeat the right most digit in a repeater ID number for a given network

Troubleshooting Tips

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. Transmitter always displays "--" and Receiver is not flashing its override indicator.	RKIT ID mismatch.	Make sure the RKIT ID on both devices are the same
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.

Reference: WPT Wireless Range Tester Kit User Manual - Section 7

Wrap up

- Site surveys are an important step to properly identify the installation requirements
- Site survey checklist captures key information that needs to be collected
- Network configuration : Considerations and limits
  - WPTs per server: 225
  - RWALs per server: 14
  - WPTs per RWAL: 15
  - WPTs per server (HUSB): 15
  - Maximum hop count: 6

Technical Training

Staging

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Purpose

Goals:

- Prepare as much as possible off-site
  - Setup the GBC with pre-defined IDs (Hub, Repeater, WPT)
  - Configure GBC network settings
  - Optionally pre-configure Repeater IDs

Deliverables/Outcomes:

- GBC is preconfigured

Equipment needed

- GBC
- Hub
- Computer and network cable OR
- Monitor, keyboard and mouse

Accessing GBC and the WPT Web Portal

Option 1: GBC connected to LAN

1. Launch *Microsoft Internet Explorer* from a PC connected to the WPT Green Box.
2. Enter the GBC IP address or computer name in the address bar. The GBC computer name is "*wptserver*" by default.
    - Default username: demo
    - Default password: demo

Option 2a: GBC not connected to LAN

1. Use a network cable to directly connect from a laptop.
2. Once connected, on the laptop, follow Option 1

Option 2b: GBC not connected to LAN

1. The WPT Green Box can be directly accessed by connecting a monitor, keyboard and mouse.
2. Launch *Microsoft Internet Explorer* on the desktop. The WPT Web Portal will loaded by default.

How to change the GBC IP address

- The WPT Green Box IP ports are configured as DHCP by default. A static IP address can be set up by the installer.
- WPT Green Box IP Address can be changed by connecting from any machine in the network using Microsoft Remote Desktop connection
  (Start → All Programs → Accessories → Remote Desktop Connection)
  - Default username: cypress
  - Default password: cypress123

Staging – GBC and RWAL setup

Lab -2

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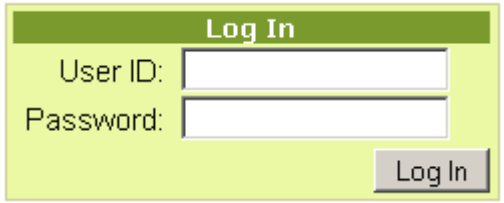
Objectives

- Launch and log into WPT web application
- Set up RWALs
- Configure Repeater IDs on the RWAL

Steps:

1. Setup server
2. ID the RWALs

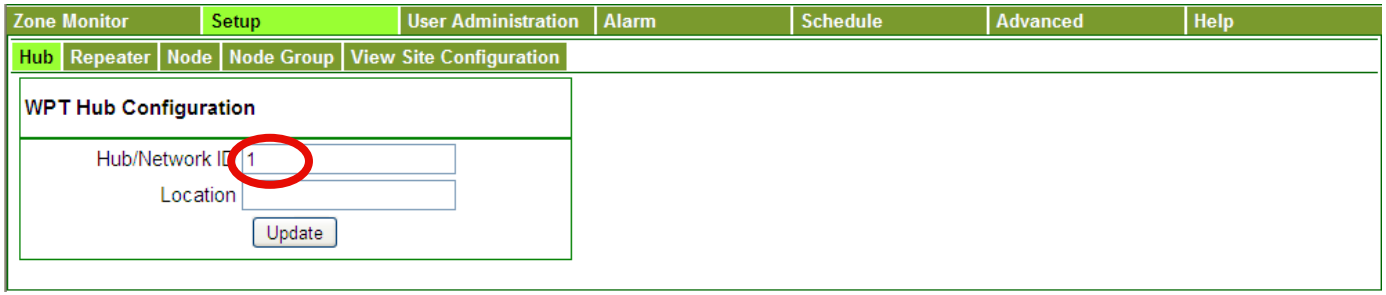
Accessing the WPT Web Portal



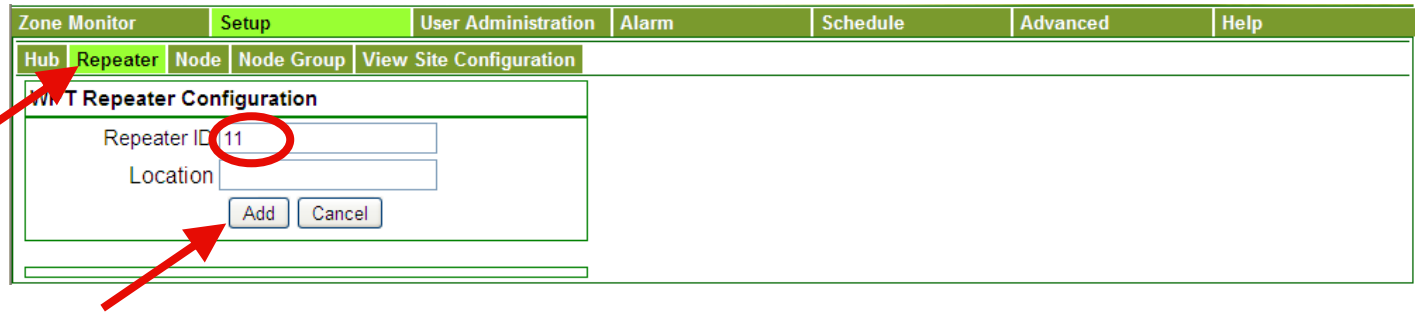
1. Open Internet Explorer and type http://192.168.1.100/ (IP address for training purposes only) and hit Enter
2. Enter the username: “demo”
3. Enter the default admin password: “demo”
4. Click “Log In”

Verify Network ID and add Repeater IDs

1. Click “Setup” then “Hub” and note the Hub/Network ID



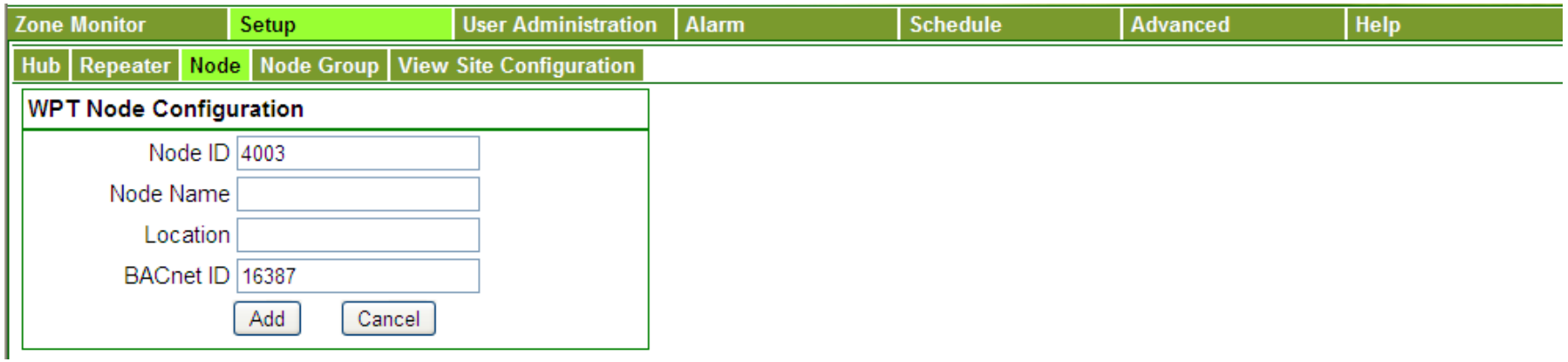
2. Click “Repeater” and enter the Repeater ID as shown on the cover of your RWAL



3. Click Add

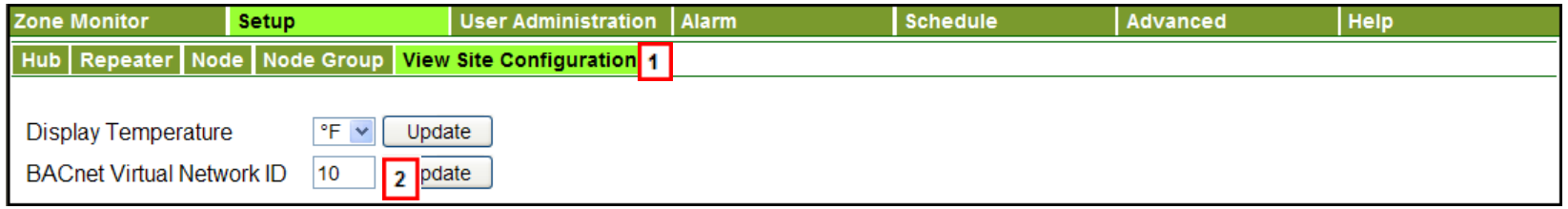
Create Node IDs

1. Click Node
2. Enter the Node ID as shown on the cover of your WPT
3. Enter your name as the Node Name
4. Enter “test” as the Location
5. Enter the BACnet ID as shown on the cover of your WPT
6. Click Add



Verify the Virtual Network ID

1. Click on View Site Configuration
2. Note the BACnet Virtual Network ID

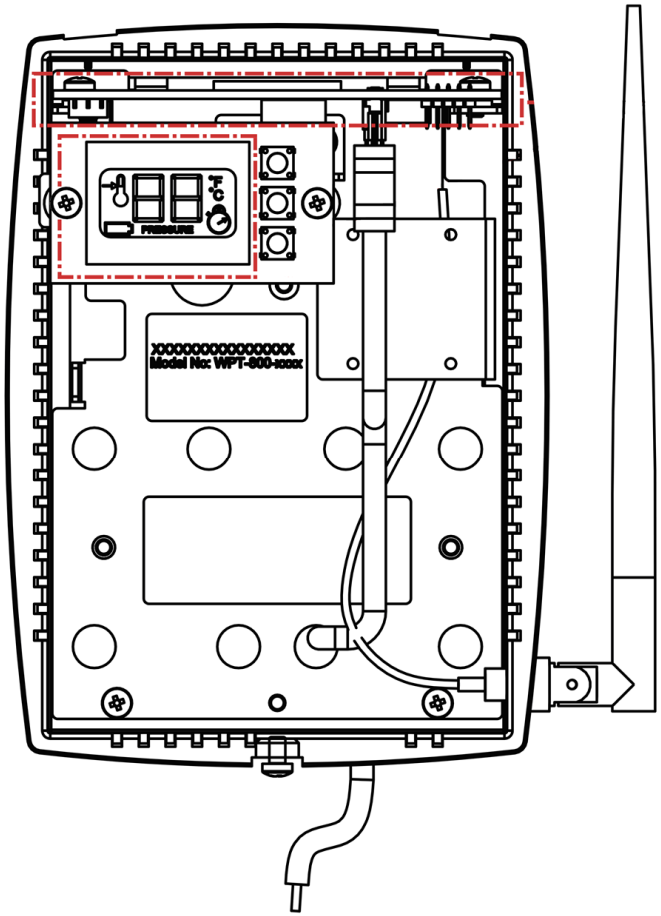


Note: Sites with multiple GBCs on BACnet make sure

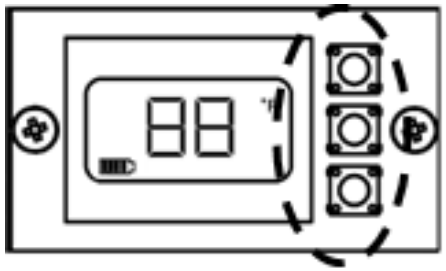
- All WPTs have unique BACnet IDs
- Each Green Box Server has a unique BACnet Virtual Network ID

Step 2: RWAL setup: Turn on the RWAL

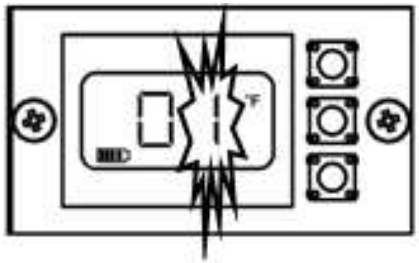
1. Open the RWAL cover by unscrewing the bottom cover screw with a 1/16” Allen driver.
2. Connect the RWAL to power
3. Verify the LCD turns on



Programming Repeater Network ID



Press and release all three buttons simultaneously to enter programming mode.



Network ID Programming Mode

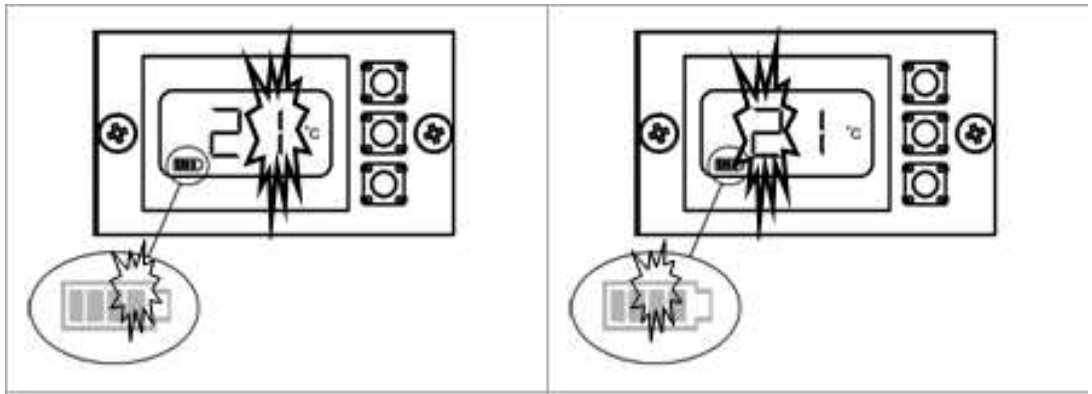
1. Press and release all three buttons simultaneously
2. Using the top and bottom buttons, enter the Network ID that you wrote down from the WPT web console

   NOTE: Network ID can never be “0”.
3. Press center button to confirm.

NOTES:

1. The Repeater is factory configured with Network ID 1. You can leave the Network ID unchanged by pressing the **center** button.
2. The Repeater will exit programming mode automatically if there is no action for 1 minute

Programming Repeater ID



Configuring RWAL ID D1 | Configuring RWAL ID D2

1. Using the top and bottom buttons, change the right most digit (D1) to match the right digit of the Repeater ID as written on the front of the RWAL and press the center button to confirm
2. Using the top and bottom buttons, change the left most digit (D2) to match the left digit of the Repeater ID as written on the front of the RWAL and press the center button to confirm

NOTE: The Repeater will exit the programming mode automatically if there is no action for 1 minute.

Questions

1. What are the range of values allowed for the right and left most digit of the Repeater ID (D1 and D2)? (Try it out)

   _____

2. What is displayed on the LCD on the RWAL if the Network ID does not match the Network ID on the GBC?

   _____

3. For sites with multiple GBCs, what ID needs to be unique?

   _____

4. Can 2 WPTs on the same GBC have the same BACnet ID? Why?

   _____

Best practices

- Configure network settings on the GBC prior to install
- Before going on-site, make enough copies of the following for installers
  - Node ID list
  - Floor plans
- Use different network IDs for multiple GBCs
  - Select IDs accordingly to avoid cross talk. WPTs have been known to communicate between buildings

Troubleshooting tips

- To turn on the GBC make sure to press and hold the switch until the green LED lights up on the front
- All GBCs are shipped with the following defaults:
  - Windows login
    - Username “cypress” and password “cypress123”
  - WPT web application
    - Username “demo” and password “demo”
  - Computer name “wptserver”
- All repeaters are shipped with the following defaults:
  - Repeater ID of A1
  - Network ID of 1
- All WPTs are shipped with the following defaults:
  - Default node ID of 1001
  - Network ID of 1

Wrap up

- Staging can help the install go smoother by setting things up ahead of time
- There are several different ways to connect to access the WPT web application
- When using multiple GBCs over BACnet,
  - All WPTs have unique BACnet IDs
  - Each Green Box Server has a unique BACnet Virtual Network ID

Technical Training

Installation – Server (GBC) and Hub

CYPRESS
ENVIROSYSTEMS

Purpose

Goals:

- Install server and hub

Deliverables/Outcomes:

- Server and hubs mounted with power and network

WPT Green Box Setup

- GBCs can be mounted to a wall
  - Unscrew the feet and attach the brackets
  - Mount the GBC at eye level or higher to avoid physical interference
- Connect GBC to 110 VAC
- Connect Hub to any USB port
- Connect GBC to LAN using either of the two network ports

GBC connections

WPT Green Box
(Front view)

Connect the Hub
(into any USB port)

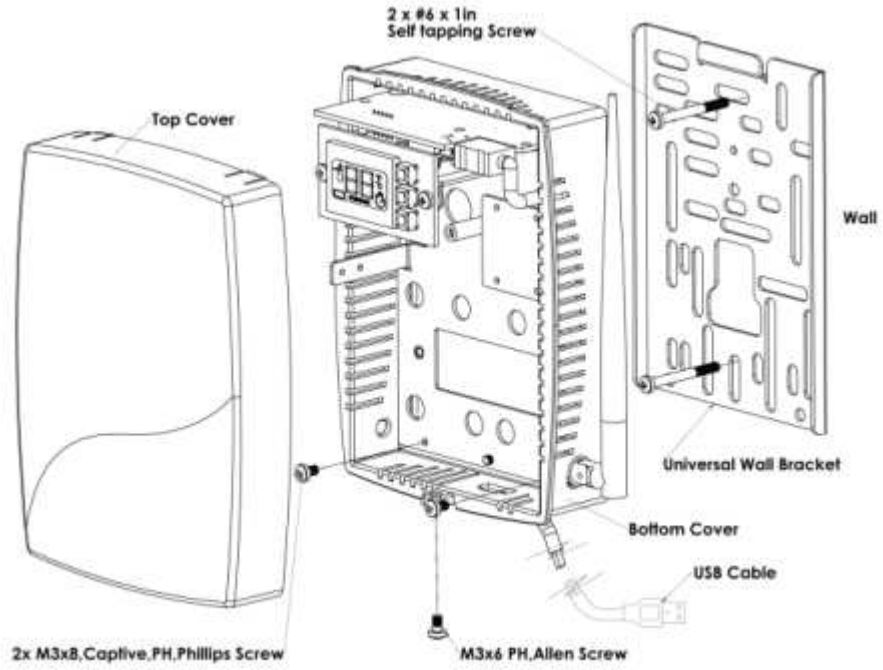
Connect a network cable
(either port, both DHCP by default)

Connect the power cable

WPT Green Box
(Back view)

Hub (HUSB) Installation

1. Mount the Hub on the wall at eye level or higher.



2. Turn ON the Green Box.

3. Connect the Hub to the Green Box's USB port.

Best practices

- Place the Hub and GBC in a central location on the site with power and preferably nearby LAN connection
- Mount Hubs and GBCs (if applicable) at eye-level or higher to avoid furniture obstructions
- Avoid solid metal obstacles in the line of transmission
- Don’t mount Hubs within 3 ft of computers or A/V equipment (which may produce interfering radio waves)
- Pick a safe and secure location away from weather, possible water leaks and doors that are used for freight

Troubleshooting

Error Code	Possible Cause	Solution
E2	Radio Error – Not able to send/receive data	Restart the unit with removing and inserting the USB cable to the WPT Green Box. If the error continues the device requires replacement. Contact the distributor.
E3	Ping Error – Not able to locate a free RF channel to use due to high RF interference	Change the position of the Hub.
E4	Connect Error – Not able to connect to the nearest Repeater	The Hub auto recovers after a few refresh cycles, if this error occurs after successful installation. Consider adding/ changing the repeater location in the zone, if the error persists.
E5	USB Error – Not able to communicate with the WPT Green Box	Check USB cable. Change to a different USB port. Replace the Hub if problem persists.

Reference: HUSB Installation Manual - Section 3

Technical Training

Installation - Repeaters

CYPRESS
ENVIROSYSTEMS

Purpose

Goals:

- Install and power the repeaters

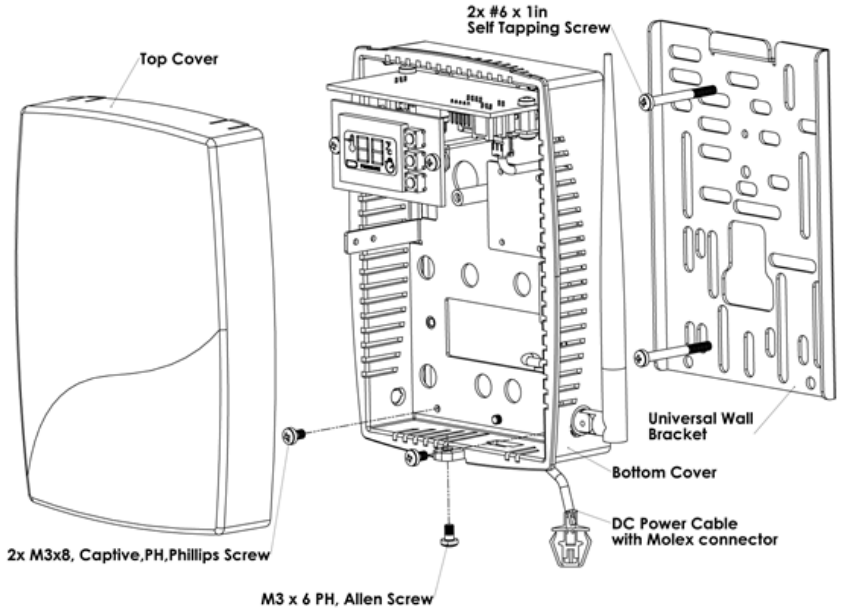
Deliverables/Outcomes:

- Repeaters installed and powered

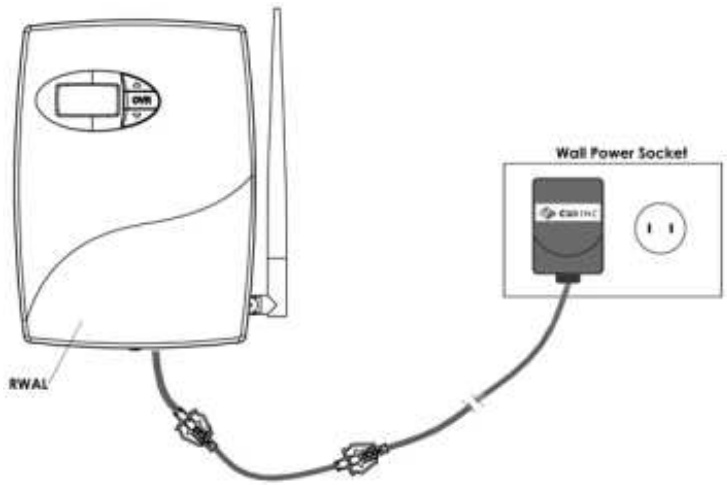
Equipment needed

- Repeaters
- Map
- Power (110VAC or 24VAC)

Wall Powered Repeater (RWAL)



Mounting the Repeater



Powering the Repeater from a 110 V wall socket

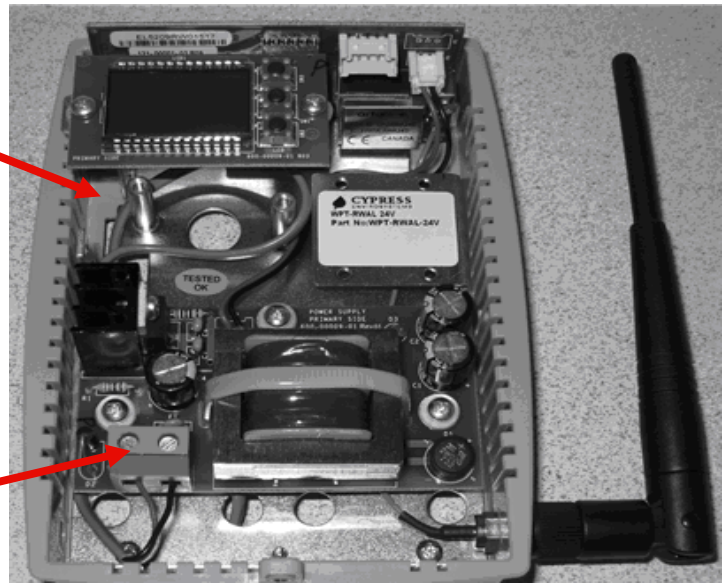
NOTE: Consider using wire mold to conceal the power cable

What not to do

24V Powered Repeater (RWAL 24V)

Route cable service loop to provide strain relief

Non-polarity sensitive connector



Route cable through mounting bracket

Recommendation: Budget 5VA for each RWAL with daisy chained power

Wire Length	AWG
Up to 50'	20
50' to 200'	18
over 200'	16

24Vac multi-drop wire length table

Best practices

- Repeaters may be mounted above ceiling tiles to keep them out of the way
  - Repeaters must be mounted securely when installed above the ceiling and may not rest loosely on ceiling tiles
  - Put a label next to the tile to indicate where the repeater is.

- Mount according to local codes

- Avoid solid metal obstacles in the line of transmission

- Don’t install Repeaters along the same side of the wall as that of the WPT (wireless coverage is better in front vs. side of WPT)

Troubleshooting

Code	Reason	Solution
dy	This code indicates that the RWAL is performing a discovery operation and it should not be disturbed.	This display goes off automatically after a few seconds.
E0	Discovery error – Not able to connect to nearest RWAL or Hub	Force Discover to retry. Check if RWAL or Hub is working. Reset the RWAL. Place the RWAL or Hub in a different position, if feasible.
E1	Time synchronization error – Not able to synchronize the RWAL time with the wireless network	The RWAL recovers from this error within a few refresh cycles, if this error occurs after successful commissioning of the system.
E2	Radio error – Not able to send/receive data	Restart the unit by unplugging and plugging the adapter. If the error persists, contact the original distributor for replacement.
E3	Ping Error – Not able to locate a free RF channel to use due to high RF interference	Change the position of the RWAL.
E4	Connect error – Not able to connect to the nearest Hub or RWAL	The RWAL recovers after a few refresh cycles, if this error occurs after successful installation. Consider adding a RWAL in the zone if the error persists.

Technical Training

Installation - WPTs

CYPRESS
ENVIROSYSTEMS

Purpose

Goals:

- Mount the WPTs to the wall
- ID the WPTs
- Verify pressures

Deliverables/Outcomes

- WPTs mounted on wall and ready for commissioning

Equipment needed

- Basic hand tools
- 1/16” Allen wrench
- Suitable wall anchors
- Extra 5/32” tubing with springs and adaptors
- IR thermal gun (for troubleshooting)
- Small battery powered or shop vacuum (if possible for cleanup)

Installing the WPT – Step 1

Remove the existing thermostat and wall plate

(Figure shows 2-pipe thermostat. Procedure is the same for a 1-pipe thermostat.)

1. Remove the old thermostat cover (typically requires 0.050” or 1/16” Allen driver)
2. Remove old thermostat from wall base plate.
3. Unscrew wall mounting plate from wall.
4. Remove tubing from old thermostat bracket and HOLD ON TO THE TUBING. If it is tight it will pop back into the wall and you will need to retrieve it.
5. HOLD ON TO THE TUBING and cut off tubing 1/2” back from the old thermostat bracket. We want fresh tubing ends to fit onto the WPT tubing port.
6. If tubing is short you will need to extend the length by adding a coupler and a short 4 to 6 inch length of tubing. Don’t forget the internal spring in the tubing, this keeps the tubing from kinking and closing the main air flow off to the thermostat.
7. HOLD ON TO THE TUBING. Now you are ready to install the WPT wall Bracket

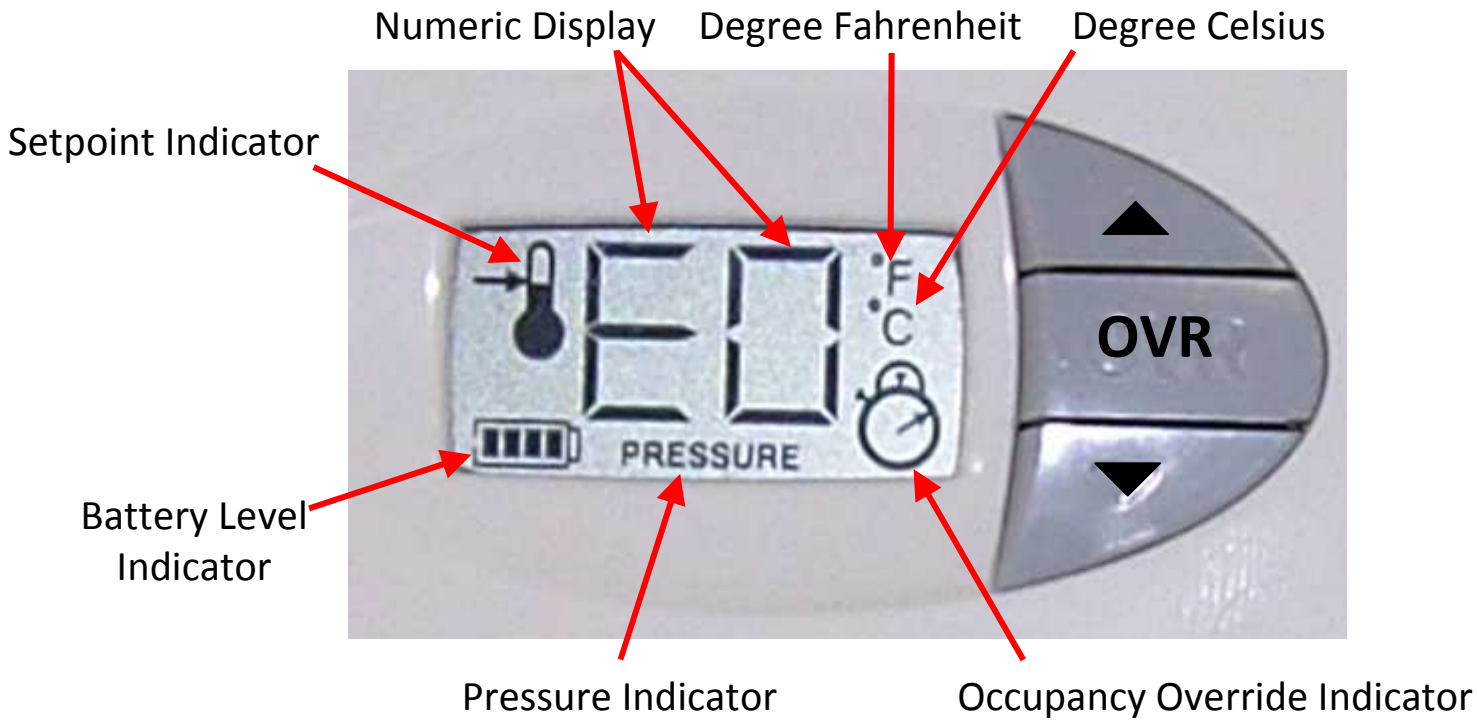
Installing the WPT – Step 2

Mount universal adapter plate, connect pneumatic lines to WPT, mount WPT to wall, and install WPT cover plate

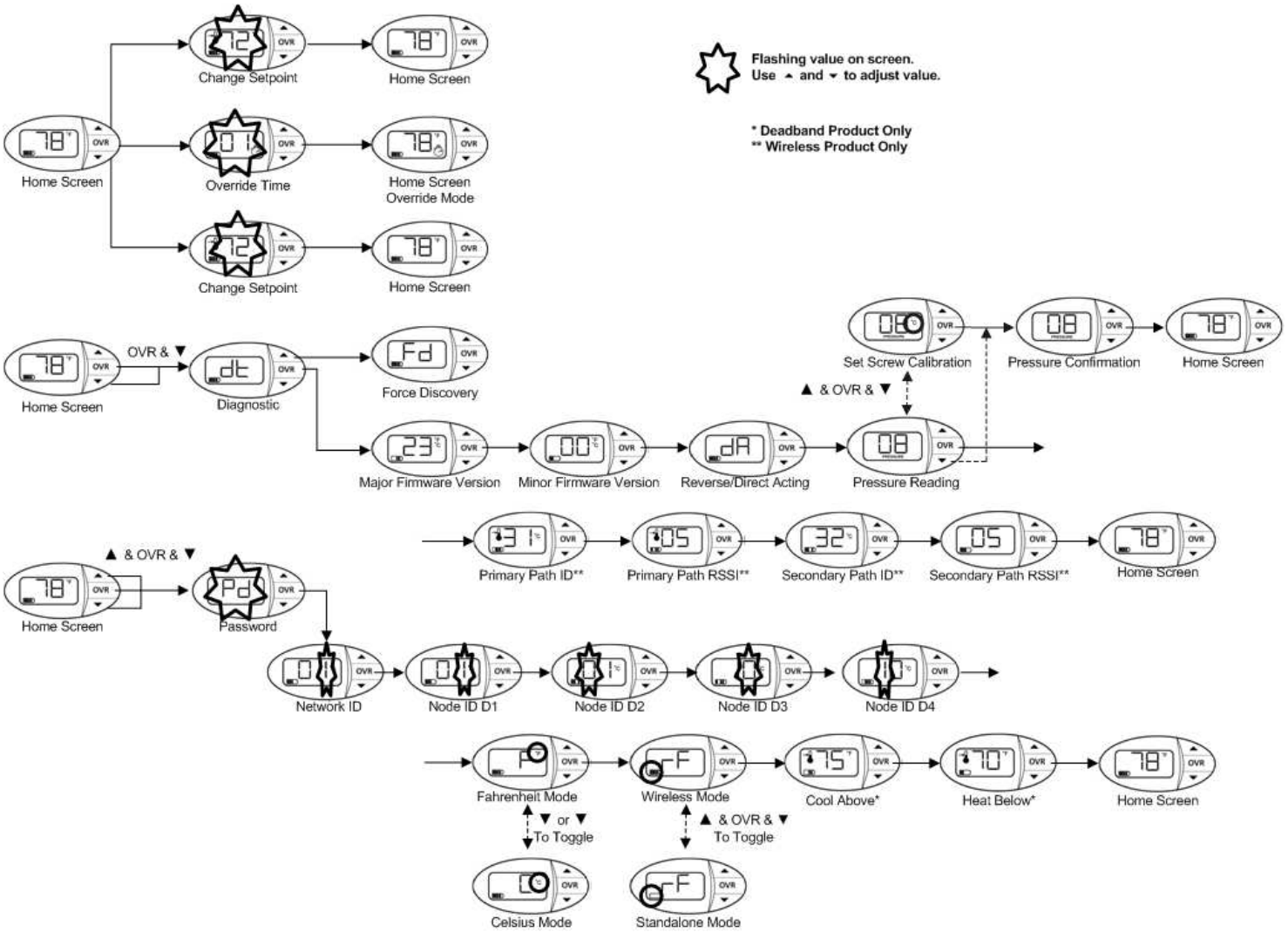
(Figure shows 2-pipe thermostat. Procedure is the same for a 1-pipe thermostat.)

1. HOLD ON TO THE TUBING Slide the tubing through the center of the large hole in wall mounting bracket. It is important that the tubing has room to slide back into wall cleanly so it does not get pinched off as you mount the WPT to the wall bracket.
2. HOLD ON TO THE TUBING and attach the mounting bracket to wall using existing anchors (if possible).
3. HOLD ON TO THE TUBING and place the tube with air blowing, on to the larger of the 2 fittings on to the back of the WPT (the port on the left for a 2 pipe WPT). This is the main air inlet (supply line).
4. Place the 2nd tube onto the branch port (which should be blowing air) on the back of the WPT thermostat (the port on the right).
5. DOUBLE CHECK THAT BOTH TUBES ARE PRESSED ALL THE WAY ON AND BOTTOMED OUT ON THE FITTING.
6. Slide the tubing back through the plate and into the wall.
7. Check to make sure the tubing slides into the wall smoothly and does not get kinked.
8. The WPT slides over the wall bracket at the top and catches allowing the WPT to hang and set into place and secured with the 2 captured screws at the bottom. Do not over tighten the screws, just snug to tighten.

WPT LCD Display



WPT Menu Structure



WPT Setup

Lab - 3

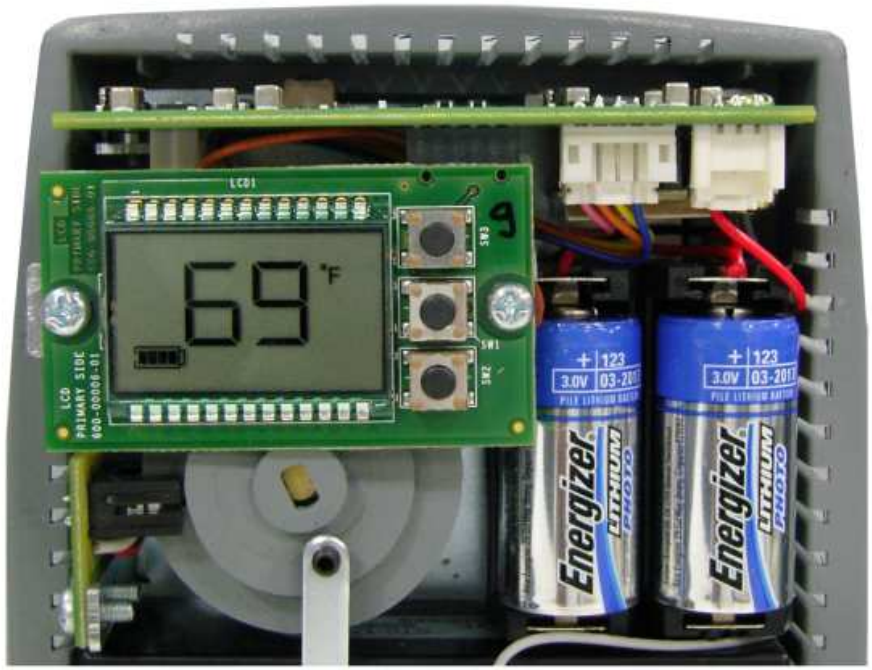
CYPRESS
ENVIROSYSTEMS

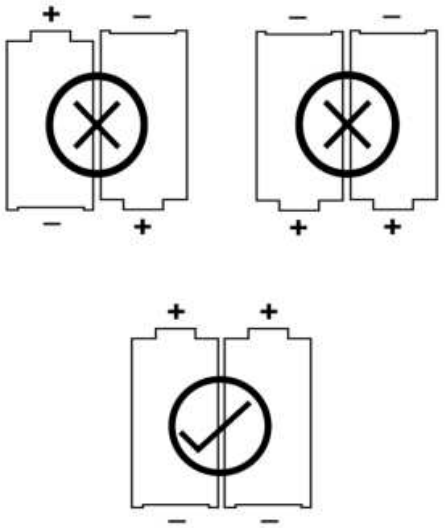
Objectives

- Install batteries
- Configure Node IDs
- Check branch pressure

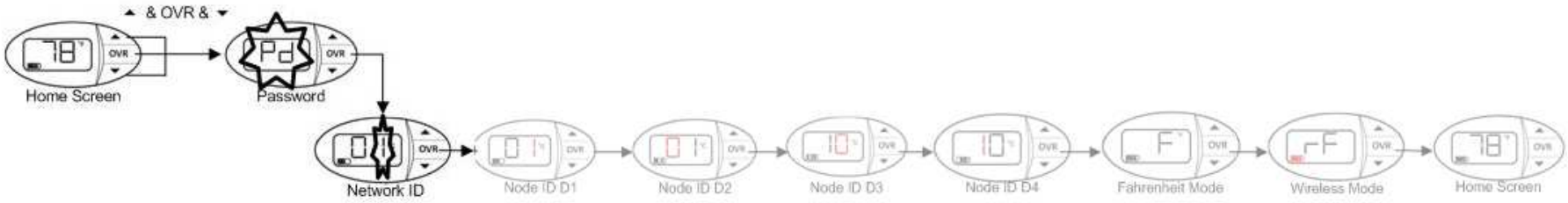
Installing the Batteries in the WPT

1. Open the WPT cover by unscrewing the bottom cover screw with a 1/16” Allen driver.
2. Install batteries as seen below

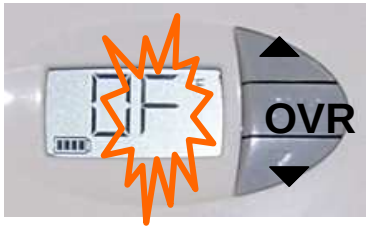




Programming WPT Network ID



1. Press all 3 buttons and the LCD will display “Pd”
2. See section 2.2.1 in the WPT Installation Manual for the password
3. Using the ▲ and ▼ buttons, enter the Network ID that you wrote down from the WPT web console
4. Press **OVR** button to confirm and move to the next programming step

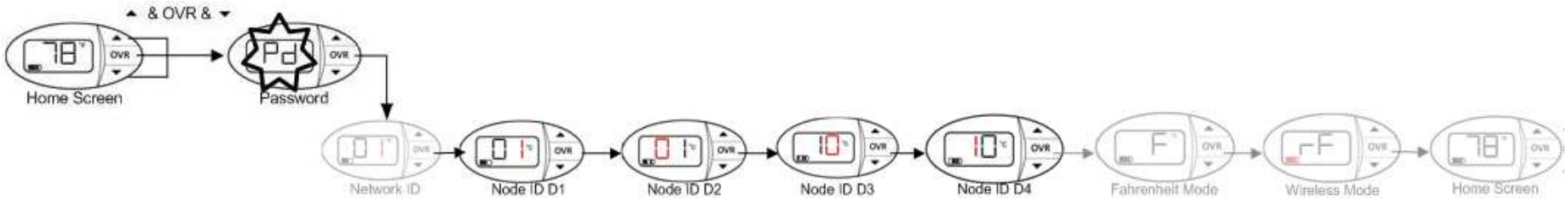


Network ID Programming Mode

NOTES:

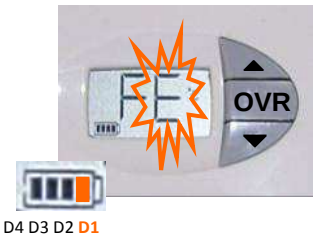
1. The WPT is factory configured with Network ID 1. You can leave the Network ID unchanged by pressing the **OVR** button.
2. The WPT will exit programming mode automatically if there is no action for 1 minute.

Programming WPT Node ID



1. Using the ▲ and ▼ buttons, change the WPT Node ID to match what is written on the outside of the thermostat , starting with the right most digit (D1)
   - D1 can not be 0
2. Press **OVR** button to confirm and move to the next digit
3. Repeat until all for digits of the Node ID have been entered.

NOTE: The WPT will exit programming mode automatically if there is no action for 1 minute.



D4 D3 D2 **D1**

D4 D3 **D2** D1

D4 **D3** D2 D1

D4 D3 D2 D1

Check branch pressure

1. Press and hold ▼ and **OVR** buttons simultaneously for 2 seconds before releasing – to enter the diagnostic mode

2. Press the **OVR** 4 times until you see PRESSURE on the bottom of the LCD

3. Verify that the WPT can build up pressure. If there is a leak in the branch line and the WPT cannot build pressure, it cannot be calibrated.

Questions

1. How do you change the setpoint on a WPT when it is in Unoccupied mode? (Hint – see the WPT Installation Manual section 3.2)

   _____

2. What is the problem if a WPT shows E0?

   _____

3. If the desired node ID is 4123, what order do you enter the Node ID into the WPT?

   _____

Common WPT Display Messages

Code	Description
dy	“dy” indicates that the WPT is performing a discovery operation and it should not be disturbed.
dt	“dt” indicates that the WPT is performing a diagnostic operation.
Fd	“Fd” indicates that the WPT is performing a forced discovery operation.
UL	“UL” indicates that the keypad is unlocked by the user.
LC	“LC” indicates that the keypad is locked.
Pd	“Pd” indicates a password is required to proceed.

Best practices

- Use springs inside connector tubing to keep from collapsing and pinching over time
- Clean up area customer area after install (if needed)
- Post install mechanical contractor to air balance the HVAC system for best system performance
- Take note of the zones that have possible HVAC problems and notify appropriate personnel

Wrap Up

- Pneumatic tubing can easily slip into the wall during the WPT install so hold on to it
- WPT Node IDs are entered starting with the right most digit
- Check branch pressure after installing the WPT

Technical Training

Commissioning the WPTs

CYPRESS
ENVIROSYSTEMS

Purpose

Goals:

- Calibrate and verify the WPT is controlling and functioning properly
  - Verify HVAC operation – make sure no lines are pinched
  - Calibrate the WPTs
  - Verify HVAC operation – make sure calibration worked
  - Verify the signal strength of each WPT

Deliverables/Outcomes:

- Calibrated thermostats with good RF signal

Verify HVAC operation using the WPT (DA)

1. Adjust WPT setpoint to 55 degree and wait and watch.
2. Check Branch pressure
   - A direct acting thermostat will be in cooling mode and will build branch pressure (verify pressure is at 15 lbs or higher)
   - A/C actuator will start to open fully (at around 13 lbs)
   - You should see the supply air temp drop to 65 degree or lower (check with an IR temperature gun)
3. Adjust WPT setpoint to 85 degree and wait and watch.
4. Check Branch pressure
   - A direct acting thermostat will be in heating mode and branch pressure will drop to 0 lbs.
   - At around 5 lbs the heating valve should open and air temp should warm up.
   - At 0 lbs the valve is open full and the supply air temp should warm to 90 degree or higher (check with an IR temperature gun)

If branch pressure will not build on the WPT

- Loosen and lift WPT off wall bracket, as you pull away from wall look behind WPT to check for kinked main air line.
- Remove branch line and place your finger over the port and repeat # 2 above.
  - If pressure will build with your finger over the port, then there is a possible branch line leak.
  - If there is no pressure, then replace the WPT and return the unit

WPT Calibration and Commissioning

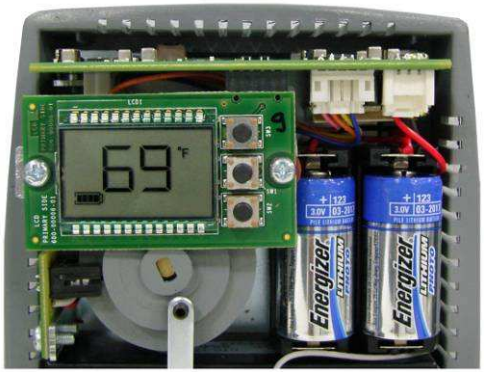
Lab - 4

CYPRESS
ENVIROSYSTEMS

Objectives

- Calibrate WPT
- Manually discover wireless network (force discover)
- Check WPT signal strength
- Additional WPT features
  - Turn on/off Standalone
  - Lock/Unlock keypad
  - Diagnostic data

Calibrating the WPT – Step 1



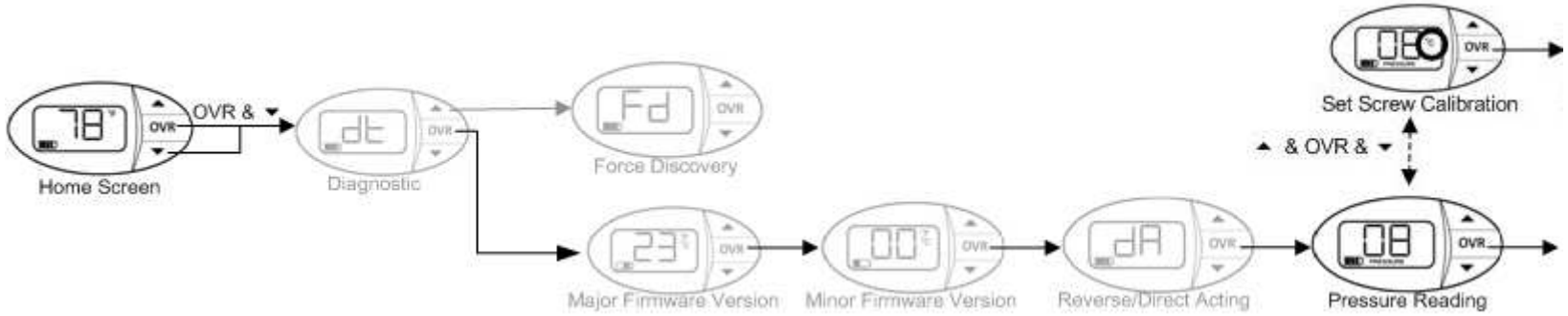
1. Remove the front cover of the WPT and make sure that the WPT is acclimated to the ambient temperature.
2. Turn on the air compressor

Notes

1. Acclimating the thermostat can take 30 minutes or more after attachment to the wall. The bimetallic strip is very sensitive to body heat. Keep hands and breathe away from WPT to minimize calibration error.
2. The black throttling range adjuster has been factory set to the location marked on the lever. The factory setting provides a Throttling Range (TR) of 4°F. This TR adjuster MUST NOT BE MOVED in order to ensure proper operation and accuracy of the WPT. The throttling range is the amount of temperature change required for the WPT to produce a full output change.
3. Single pipe WPT might take a longer time to respond during calibration. Please allow sufficient time to calibrate the WPT accurately.

Reference: WPT Installation Manual - Section 2.3

Calibrating the WPT – Step 2



To enter Calibration Mode, perform the following:

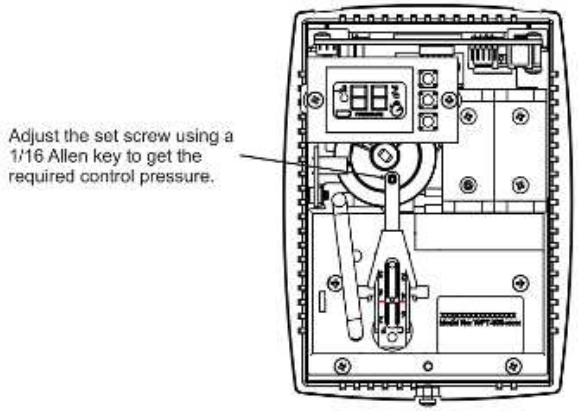
1. Press the ▼ button and OVR button together for two seconds, then release. The display will show ‘dt’.

2. Press OVR four times. The LCD displays the branch pressure in PSI along with PRESSURE indicator. The display shows “--" if the motor is in motion when trying to access branch pressure.

3. Press all three buttons simultaneously to enter Calibration Mode. The “C” icon will flash rapidly while in this mode.

Reference: WPT Installation Manual - Section 2.3

Calibrating the WPT – Step 3



Reference: WPT Installation Manual - Section 2.3

1. Use a 1/16” Allen wrench and very carefully turn the calibration set screw on the thermostat lever, until the branch pressure is equal to the desired control point. Use extreme caution not to allow the lever to rotate sideways while adjusting the setscrew.

2. Each battery segment on the LCD represents 0.25 PSI resolution, as shown above.

3. When the desired control pressure is achieved, press the OVR button to exit and save the value.
   - A confirmation screen will appear and flash the stored control pressure for 3 seconds. Repeat the calibration procedure if this value does not match the desired control pressure.

4. Replace the WPT front cover.

NOTE: The WPT will automatically exit Calibration Mode if the center button is not pressed after 3 minutes. The control pressure will NOT be saved and the WPT will return to the home screen.

Manually discover the network (Force Discovery)

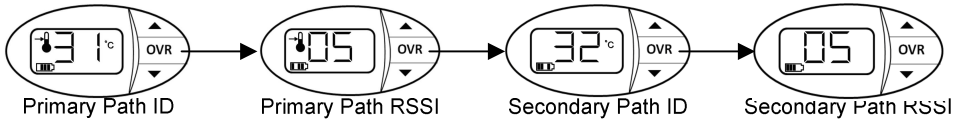
1. On the RWAL, press and release the center and bottom buttons at the same time. The LCD will show “dt”.

2. Press the top button once. The LCD will show “Fd”

3. On the WPT web application click on “Zone Monitor” then on “Network Status”. Take note of the timestamp for your RWAL. It should have updated.
4. On the WPT, press and release the center and bottom buttons at the same time. The LCD will show “dt”
5. Press the top button once. The LCD will show “Fd”
6. On the WPT web application click on the “Dashboard” button. Take note of the timestamp for your WPT. It should have updated.

NOTE: Force discovery helps in establishing the Wireless connectivity during installation/troubleshooting.

Checking Signal Strength



Each WPT attempts to find a primary and secondary wireless path back to the Hub. The paths and associated signal strengths (1-5) from the WPT are displayed in the “dt” menu.

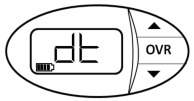
1. Press and hold the ▼ button and OVR button together for two seconds before releasing. The display will show ‘dt’.
2. Press the OVR button 5 times to see the primary path. °C icon is displayed, indicating that the ID is being displayed (either a repeater ID or the Hub ID).
3. Press the OVR button again to see the wireless signal strength from the WPT to the primary path.
4. Press the OVR button again to see the secondary path. °C icon is displayed, indicating that the ID is being displayed (either a repeater ID or the Hub ID).
5. Press the OVR button again to see the wireless signal strength from the WPT to the secondary path.

NOTE: This menu is not available in Standalone mode.

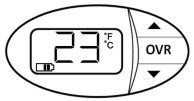
Reference: WPT Installation Manual - Section 3.6

Diagnostic Information

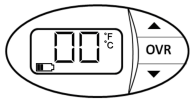
1. To view diagnostic info press and hold ▼ and **OVR** buttons simultaneously for 2 seconds before releasing.



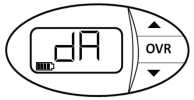
2. The LCD displays '**dt**' to indicate the diagnostic mode.



3. Press **OVR** once to view the major firmware version.



4. Press **OVR** a second time to view the minor firmware version.



5. Press **OVR** for a third time to view the control polarity (direct/reverse).

This table shows the value displayed in the control polarity window depending on the type of WPT used.

		RA	DA
Demo Node (Demonstration Only)		dr	dd
Normal	Conventional	rA	dA
	Deadband	r1	d1

6. Press **OVR** for a fourth time to view the current branch pressure in PSI
   - Press the ▼ button. The LCD will flash the stored control pressure for 3 seconds and return to the home screen. The battery segments on the LCD represent 0.25 PSI resolution.

NOTES

1. The WPT will exit diagnostic mode automatically if there is no action for 1 minute.
2. The display shows "--" if the motor is in motion when trying to access branch pressure.

Lock/Unlock WPT LCD Keypad

Additional WPT feature

Try Locking the LCD Keypad

1. Press and hold the ▲ and ▼ buttons together for 2 seconds and release.
2. The keypad is locked and the LCD displays “LC” for 2 seconds.
3. When the keypad is locked, the user will not be able to use the buttons on the thermostat to change the setpoint or enter Occupancy Override.
4. When the keypad is locked, if the user tries pressing any buttons, “LC” appears to indicate that buttons are locked.

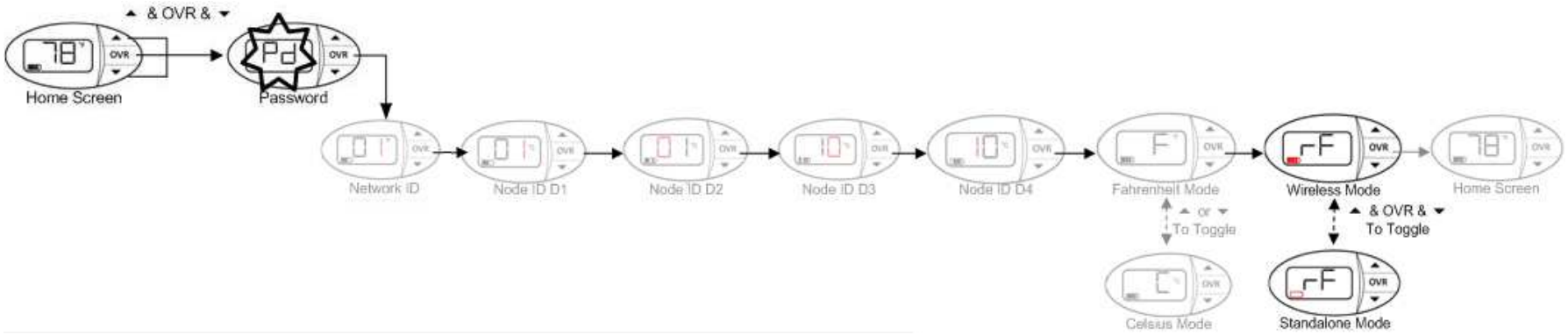
Now Unlock the LCD Keypad

1. Press and hold the ▲ and ▼ buttons together for 2 seconds and release.
2. The keypad is unlocked and the LCD displays “UL” for 2 seconds.

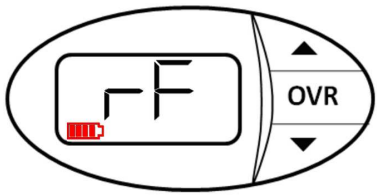
NOTE: The LCD buttons can also be locked/unlocked from the WPT Green Box.

Reference: WPT Installation Manual - Section 3.5

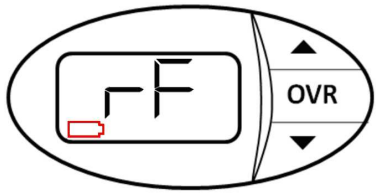
Configuring the WPT for Standalone Mode



1. Press all three buttons simultaneously to enter programming mode.
2. See section 2.2.1 in the WPT Installation Manual for the password
3. Press **OVR** six times to enter wireless mode screen.
4. Press all three buttons simultaneously to toggle between wireless and standalone modes.
5. Press **OVR** to confirm.



Wireless mode



Standalone mode

NOTES:

- The WPT will exit programming mode automatically if there is no action for 1 minute.
- This mode is not a power saving mode

Reference: WPT Installation Manual - Section 2.2.4

Questions

1. What is considered a good signal strength?

   _____

2. What does it mean when the WPT shows “dy” on the LCD?

   _____

3. How do you check to see what control pressure the WPT was calibrated to?

   _____

4. What does it mean if the primary and secondary paths are the same?

   _____

Best practices

- Identify the correct CONTROL POINT or BALANCE POINT to correctly calibrate the WPT
- Install thermostats in a given area, and leave the cover off (if possible) so the thermostat can stabilize. Come back later to calibrate the thermostat, double check operation and attach the cover.
- Do NOT pull, push or try to slide the arm to fluctuate the air pressure as this may damage the bimetallic strip
- Use the up and down buttons to rotate the cam during the install process and troubleshooting

Wrap up

- Wait until the WPT is acclimated to the room temperature before calibrating
- When calibrating be careful not to touch the bimetallic strip
- WPTs should be properly calibrated to the control point as defined during the site survey
- Before leaving the WPT make sure the ambient temperature is displayed (and not E0)

Technical Training

Commissioning at the GBC

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ENVIROSYSTEMS

Purpose

Goals:

- Complete final system check
  - Verify all WPTs communicating
  - Verify all RWALs communicating
  - Make sure temperature setpoints are correct

Deliverables/Outcomes:

- System ready for customer walkthrough and training

Proposed Install Checklist – final checkout

P=Passed **F**=Failed **U**=Unable to Check **N/A**=Not Applicable

Item #	Installation Checklist	Results
1	Have all thermostats reported in the last 15min	
2	Do the RSSI statistics from the Node Status page show good links for all nodes? RSSI greater than 3 for last 24HR, current RSSI greater than 3 for all hops	
3	Validate thermostat count for Repeaters and Husbs. Do any exceed 15?	
4	Validate hop count. Make sure no more than 6 repeaters are needed for any WPT	
5	Have the all the WPTs been calibrated?	
	Are all WPTs showing battery life of OK?	
6	Plot or scan tables for pressure, setpoint and ambient values for each WPT installed. Do the values make sense? DA --> Ambient above setpoint, pressure should be **above** the calibration pressure RA --> Ambient above setpoint, pressure should be **below** the calibration pressure	
7	Have all repeaters reported in the last 15min	
8	Is the last digit of each repeater ID unique?	
9	Have all the necessary updates been made to the job site map?	
10	Have all WPTs been noted on the map?	
11	Have all RWALs been noted on map?	
12	Are all Network IDs unique across multiple GBCs?	
13	Are the repeater locations listed in the server descript enough?	
14	Has the customer been properly trained?	
15	Is there follow-up work needed?	

- Before-You-Leave Checklist
  - Preliminary list, but should be appended with installer feedback
  - Simple “rules of thumb” that can prevent call-backs

CYPRESS ENVIROSYSTEMS

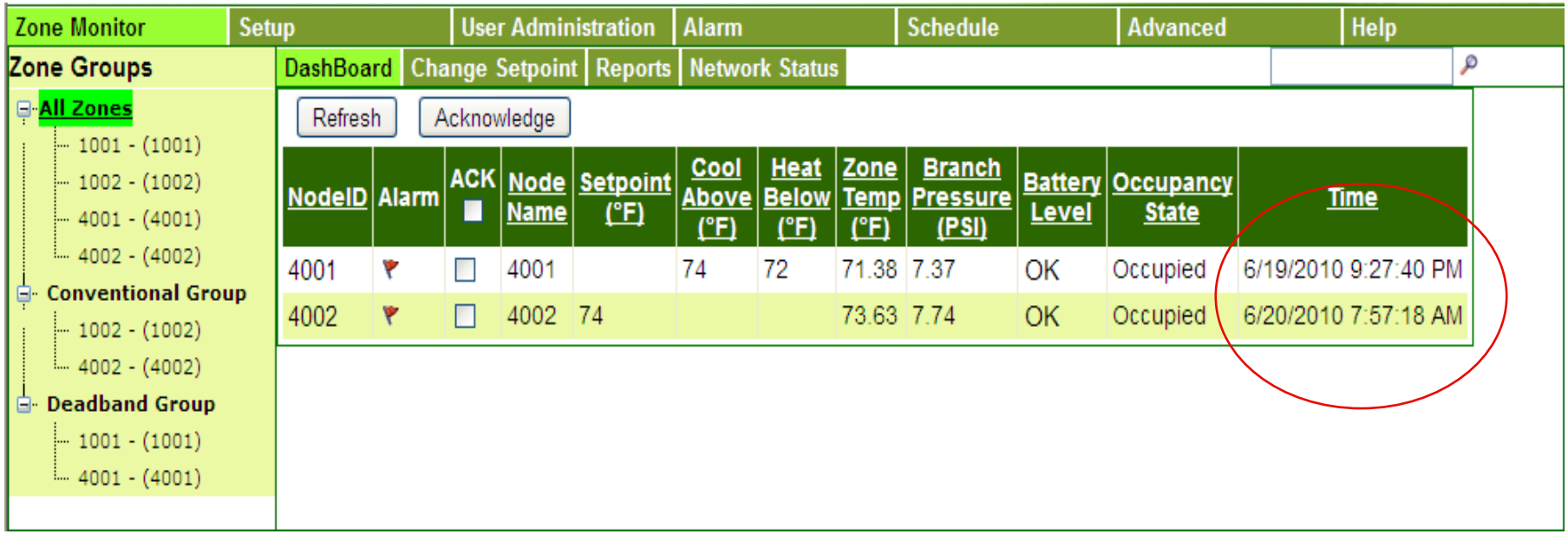
Checking the thermostats

Item #	Installation Checklist	Results
1	Have all thermostats reported in the last 15min	
2	Do the RSSI statistics from the Node Status page show good links for all nodes? RSSI greater than 3 for last 24HR, current RSSI greater than 3 for all hops	
3	Validate thermostat count for Repeaters and Husbs. Do any exceed 15?	
4	Validate hop count. Make sure no more than 6 repeaters are needed for any WPT	
5	Have the all the WPTs been calibrated?	
	Are all WPTs showing battery life of OK?	
6	Plot or scan tables for pressure, setpoint and ambient values for each WPT installed. Do the values make sense? DA --> Ambient above setpoint, pressure should be **above** the calibration pressure RA --> Ambient above setpoint, pressure should be **below** the calibration pressure	

WPT: RF Validation Methods (1 of 4)

Zone Monitor Dashboard

- Verify all WPTs are reporting
- Verify all timestamps are within 15 min



WPT: RF Validation Methods (2 of 4)

Alarm Notification Flag – Verify WPT data over time

- Route and Hop Count
- RSSI per hop

Zone Monitor | Setup | User Administration | Alarm | Schedule | Advanced | Help

Zone Groups

DashBoard | Change Setpoint | Reports | Network Status

ALL Zones
- 1001 - (1001)
- 1002 - (1002)
- 1003 - (1003)
- 1004 - (1004)
- 1005 - (1005)
- 1006 - (1006)

Refresh | Acknowledge

NodeID	Alarm	ACK	Node Name	Setpoint (°F)	Cool Above (°F)	Heat Below (°F)	Zone Temp (°F)	Branch Pressure (PSI)	Battery Level	Occupancy State	Time
1001			1001	84			68.23	0.53	OK	Unoccupied	1/29/2011 12:31:15 PM
1002			1002	84			68.23	0.53	OK	Unoccupied	1/29/2011 12:31:16 PM

Node Readings for Today

Time	Alarm	Setpoint (°F)	Cool Above (°F)	Heat Below (°F)	Zone Temp (°F)	Branch Pressure (PSI)	Battery Level	Manual Override	Occupancy State	Override Hours	Routing Path	RSSI
1/29/2011 12:31:15 PM	YES	84			68.23	0.53	OK	OFF	Unoccupied	0	31 A9 06	5.38 4.84 5.21
1/29/2011 12:16:16 PM	YES	84			68.00	0.53	OK	OFF	Unoccupied	0	31 A9 06	5.38 4.84 5.21
1/29/2011 12:01:15 PM	YES	84			68.00	0.53	OK	OFF	Unoccupied	0	31 A9 06	5.38 4.84 5.21
1/29/2011 11:46:15 AM	YES	84			68.00	0.53	OK	OFF	Unoccupied	0	31 A9 06	5.38 4.84 5.21

Every 15 minutes

WPT: RF Validation Methods (3 of 4)

Node Status Page – Latest WPT Data Packets

- Verify number of WPTs per RWAL or Hub <= 15
- Verify RSSI
  - Current Min – Weakest link of latest packet, Hop Identified "*"
  - 24-Hour Min – Lowest RSSI over last 24-hours, Hop Unknown
  - 24-Hour Avg Min – Average RSSI of the Weakest Link over 24-hours

Zone Monitor | Setup | User Administration | Alarm | Schedule | Advanced | Help

Keypad Lock/Unlock | Setpoint Limits | Auto Calibration | Archive | Command Status | Auto-DR Configuration | Diagnostic Data | Node Status

NodeID	Node Name	Setpoint (°F)	Cool Above (°F)	Heat Below (°F)	Zone Temp (°F)	Calibration Offset (°F)	Branch Pressure (PSI)	Battery Level	Routing (* Current Min Link)	RSSI Current Min	RSSI 24-Hour Min	24-Hour Avg Min	Time
1001	1001	84			69.80		0.53	OK	31*A9 06	4.67	4.00	4.61	1/28/2011 10:01:16 AM
1002	1002	84			69.80		0.53	OK	31*A9 06	4.67	3.67	4.61	1/28/2011 10:01:17 AM
1003	1003	84			69.80		0.53	OK	31*A9 06	4.67	4.17	4.61	1/28/2011 10:01:18 AM
2001	2001	84			72.05		0.00	OK	32 06	4.34	1.71	4.11	1/28/2011 10:02:15 AM
2002	2002	84			72.05		0.00	OK	32*06	4.17	1.71	4.17	1/28/2011 10:02:15 AM
2003	2003	84			72.05		0.00	OK	32*06	4.17	1.57	2.50	1/28/2011 10:02:16 AM
2004	2004	84			72.05		0.00	OK	32*06	4.34	1.86	4.22	1/28/2011 10:02:17 AM
2005	2005	84			72.05		0.00	OK	32*06	4.17	2.50	4.22	1/28/2011 10:02:18 AM
2006	2006	84			72.05		0.00	OK	32*06	4.17	3.00	4.22	1/28/2011 10:02:19 AM
2007	2007	84			72.05		0.00	OK	32*06	4.34	1.57	4.22	1/28/2011 10:02:20 AM
F001	F001	84			72.95		0.00	OK	06	4.50	4.50	4.50	1/28/2011 10:00:15 AM
F002	F002	84			72.95		0.00	OK	06	4.50	4.34	4.50	1/28/2011 10:00:16 AM
F003	F003	84			72.95		0.00	OK	06	4.50	4.34	4.50	1/28/2011 10:00:17 AM
F004	F004	84			72.95		0.00	OK	06	4.50	4.34	4.50	1/28/2011 10:00:18 AM
F005	F005	84			72.95		0.00	OK	06	4.50	4.34	4.50	1/28/2011 10:00:19 AM

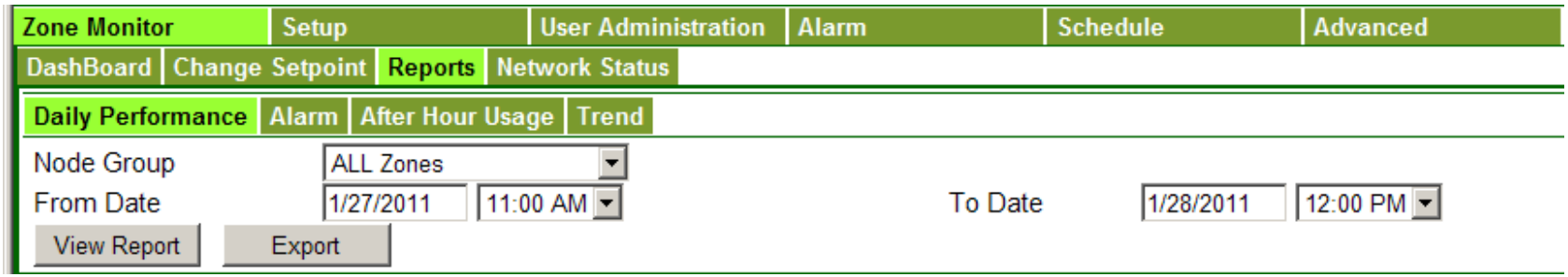
OK Link

Weak Link

Strong Link

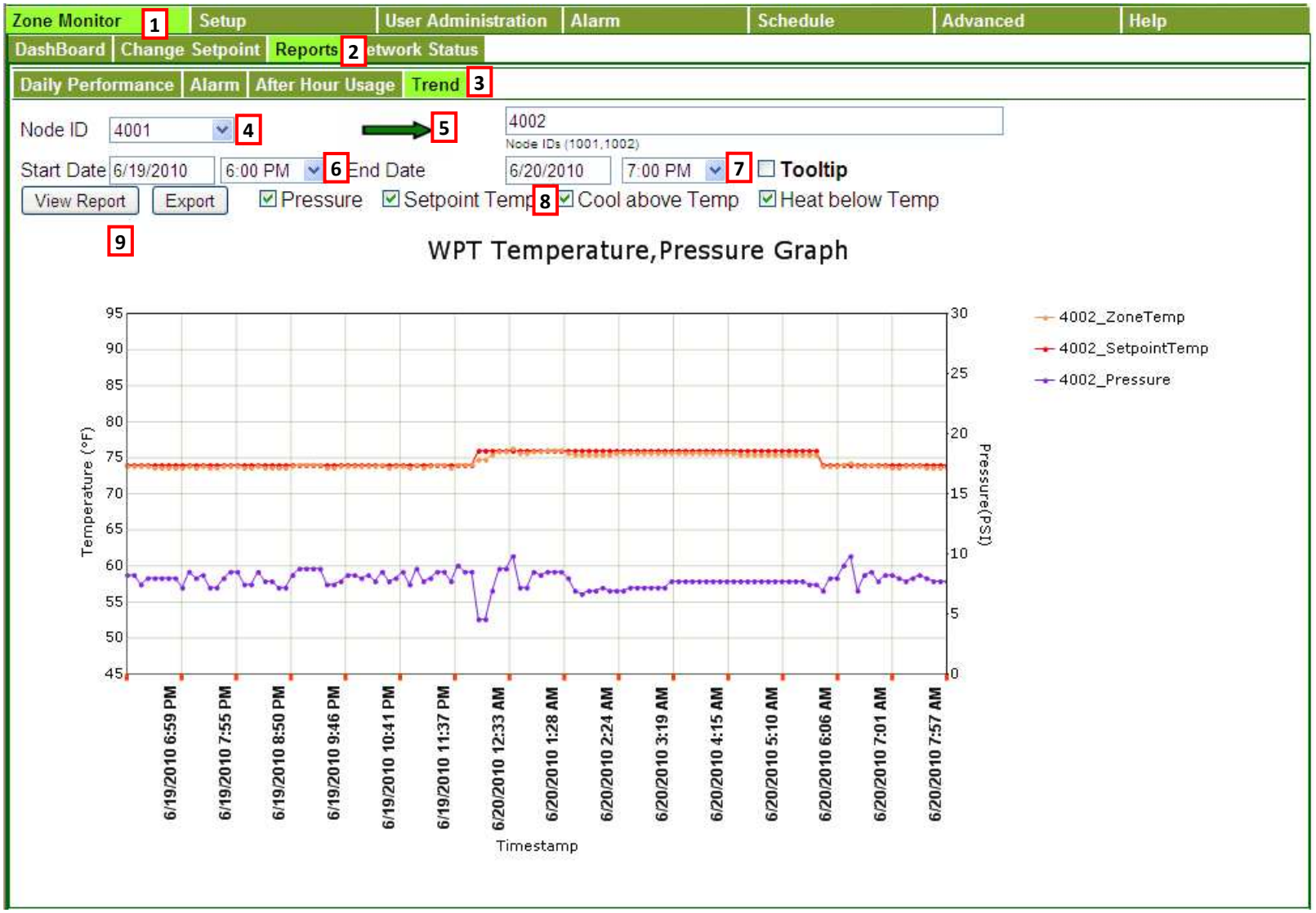
WPT: RF Validation Methods (4 of 4)

- Daily Performance Exports – Verify extended WPT data over time
  - Route and Hop Count
  - RSSI
  - Battery
  - Missing data (are timestamps missing?)

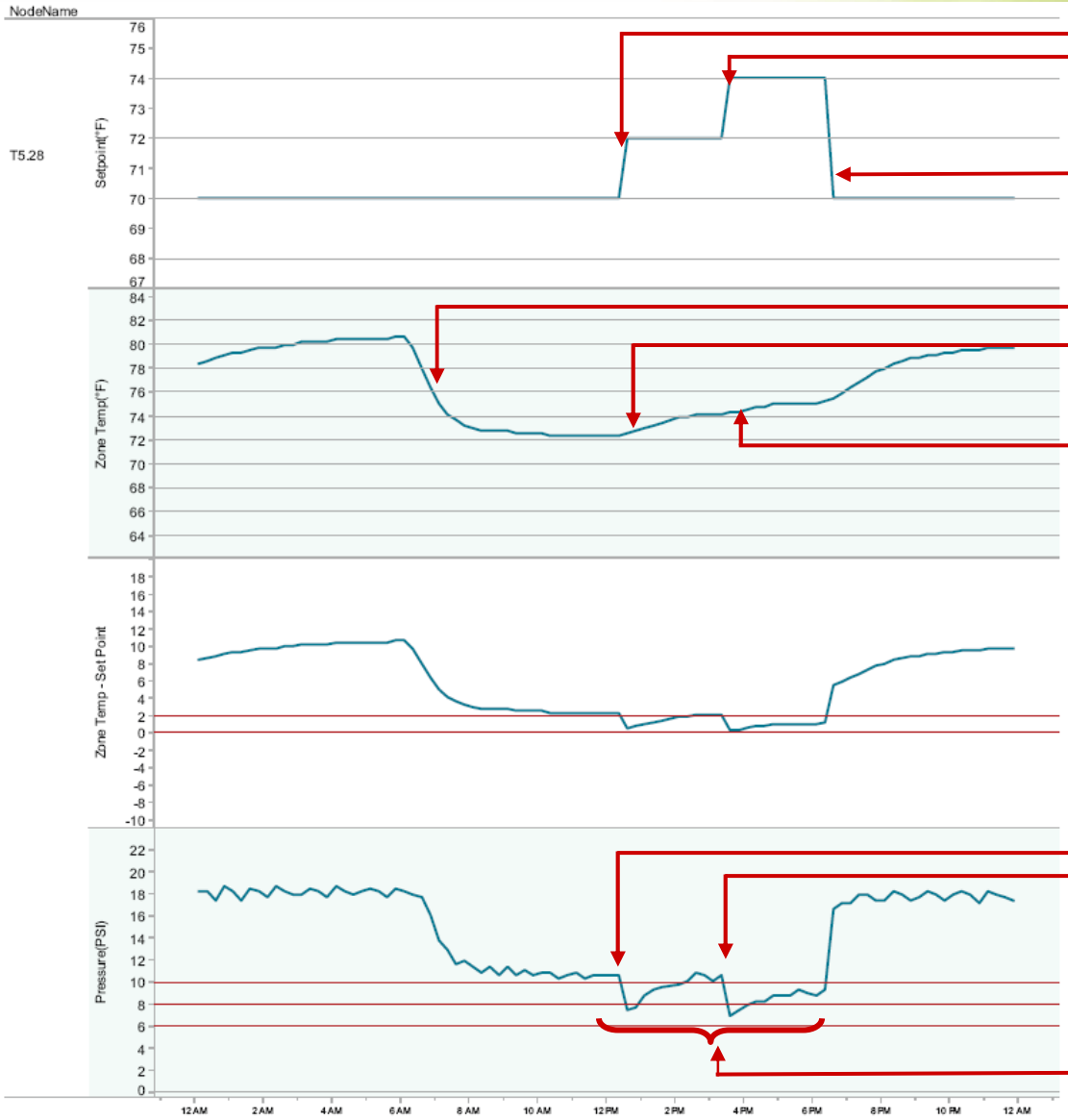


	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Time	NodeID	Node Name	Setpoint	Cool Above	Heat Below	Zone Temp	Branch Pressure	Battery	Occupancy	Hop-1	Hop-2	Hop-3	RSSI-1	RSSI-2	RSSI-3
2	1/29/2011 10:01	1001	1001	84			67.78	0.53	OK	Unoccupied	31	A9	6	5.38	4.84	5.21
3	1/29/2011 10:16	1001	1001	84			67.78	0.53	OK	Unoccupied	31	A9	6	5.33	4.84	5.25
4	1/29/2011 10:31	1001	1001	84			67.78	0.53	OK	Unoccupied	31	A9	6	5.38	4.84	5.25
5	1/29/2011 10:46	1001	1001	84			67.78	0.53	OK	Unoccupied	31	A9	6	5.38	4.84	5.21
6	1/29/2011 11:01	1001	1001	84			67.78	0.53	OK	Unoccupied	31	A9	6	5.38	4.84	5.21

WPT: control/calibration verification



Using Trends – Proper Response (example)



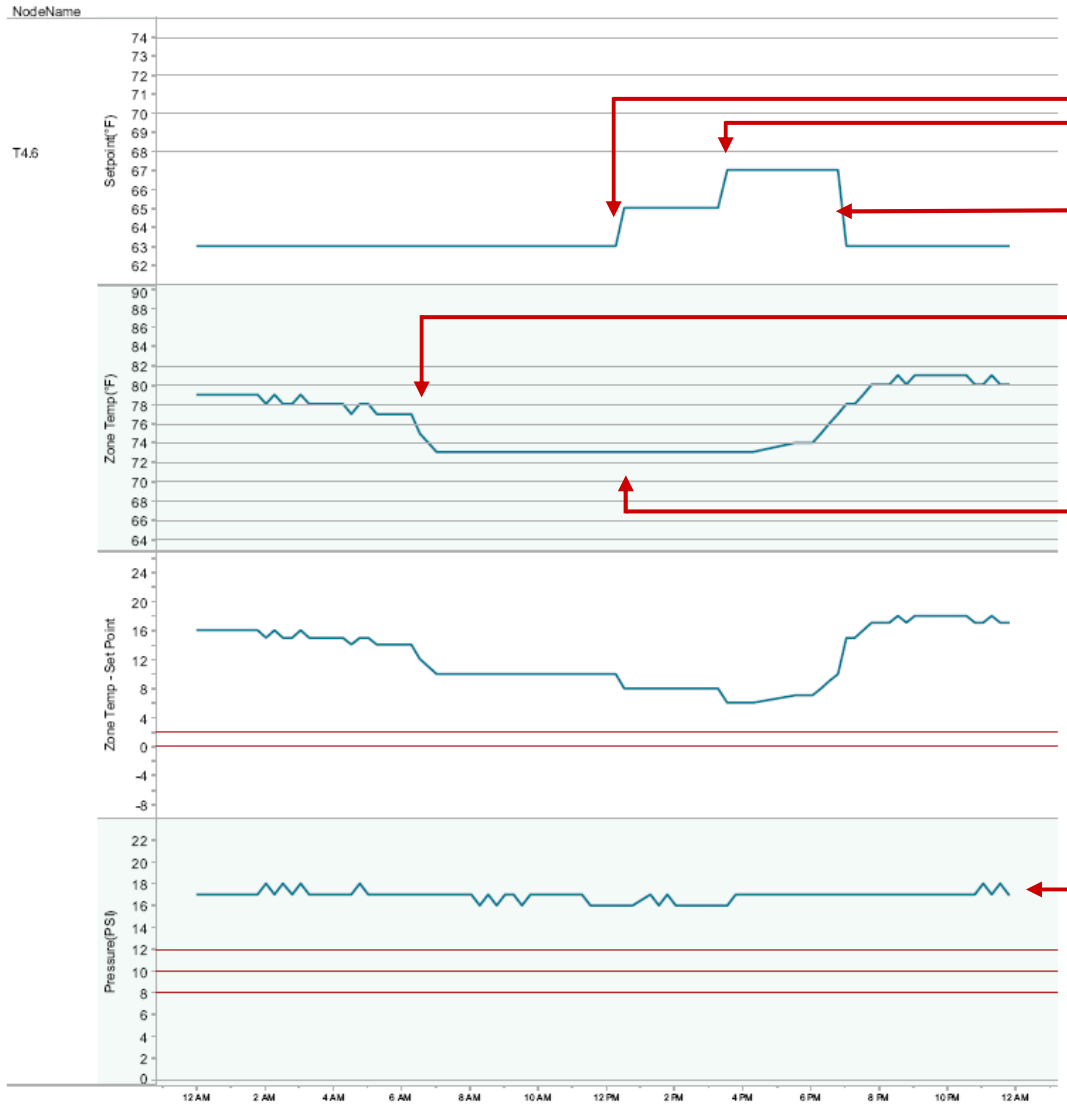
SETPOINT TEMPERATURE
- •1st DR Event bumped up setpoint 2 deg
- •2nd DR Event bumped up additional 2 deg
- •Completion of Event – back to normal

ZONE TEMPERATURE
- •Morning A/C comes on
- •Temp climbs after initial DR event
- •Continues climbing after 2nd DR event

DELTA SETPOINT MINUS ZONE TEMP
- Should maintain to within 2 degrees of setpoint throughout

BRANCH PRESSURE
- Drops after first event called
- Drops after second event called
- Stays about neutral 8psi during entire DR period.

Using Trends – Insufficient Cooling (example)



SETPOINT TEMPERATURE

- 1st DR Event bumped up setpoint 2 deg
- 2nd DR Event bumped up additional 2 deg
- Completion of Event – back to normal

ZONE TEMPERATURE

- Morning A/C comes on
- A/C working, but never makes it to 63 deg setpoint. Stabilizes at 73 deg.

DELTA SETPOINT MINUS ZONE TEMP

- Best able to achieve is about six degrees higher than setpoint.

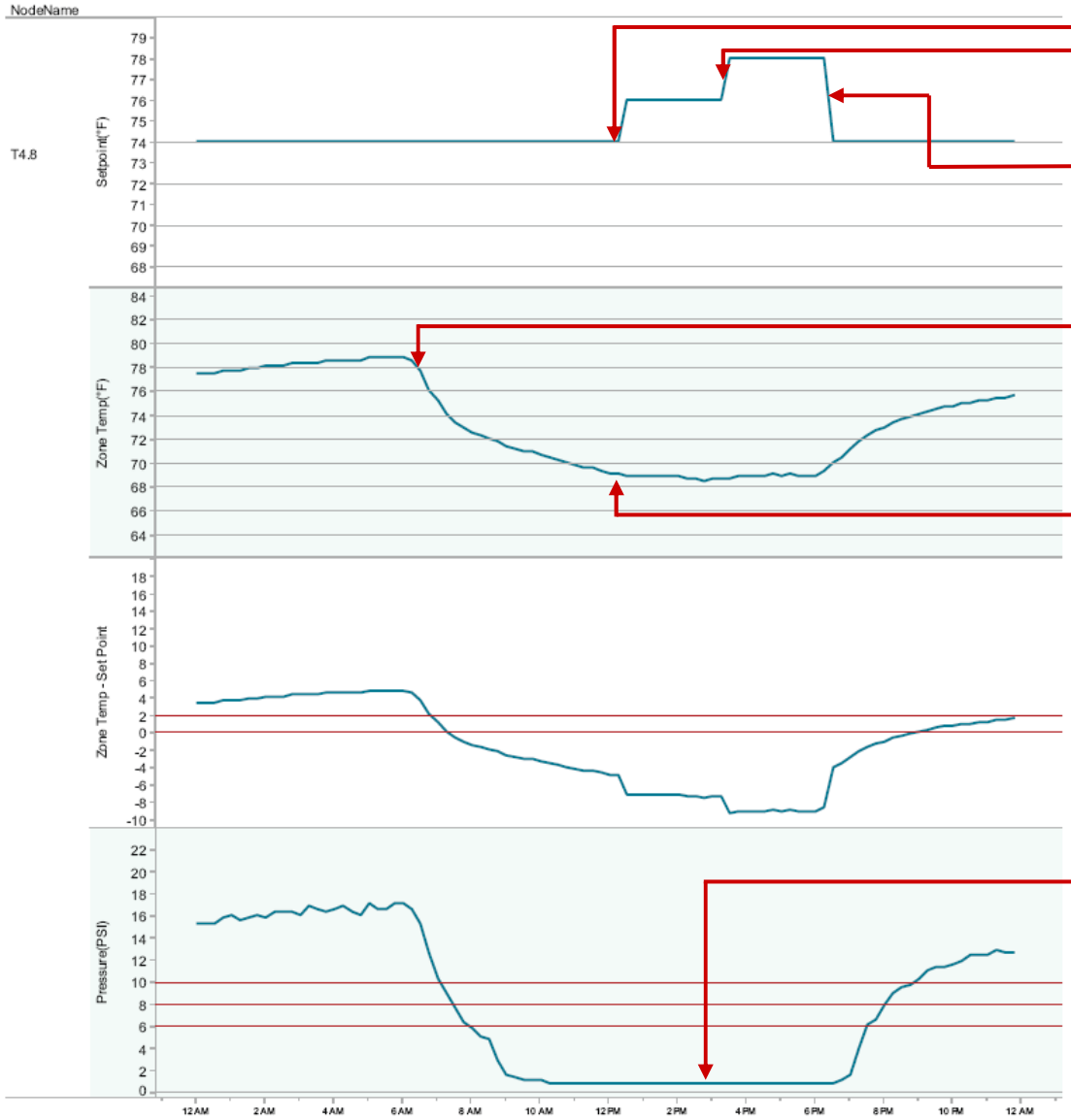
BRANCH PRESSURE

- Always maxed out i.e. calling for maximum cooling.

Causes:

- Setpoint too low
- Faulty Reset Velocity Controller
- Mechanical Equipment Fault
- Undersized cooling capacity design

Using Trends – Too Much Cooling (example)



SETPOINT TEMPERATURE

- 1st DR Event bumped up setpoint 2 deg
- 2nd DR Event bumped up additional 2 deg
- Completion of Event – back to normal

ZONE TEMPERATURE

- Morning A/C comes on
- Temp keeps dropping, even below setpoint

DELTA SETPOINT MINUS ZONE TEMP

- Temperature way too cold, much below setpoint most of the day

BRANCH PRESSURE

- Thermostat is trying to compensate for over cooling all day long.

Causes/Remedy:
- Faulty Reset Velocity Controller
- VAV Box Fault
- Adjacent Zone Overcooling

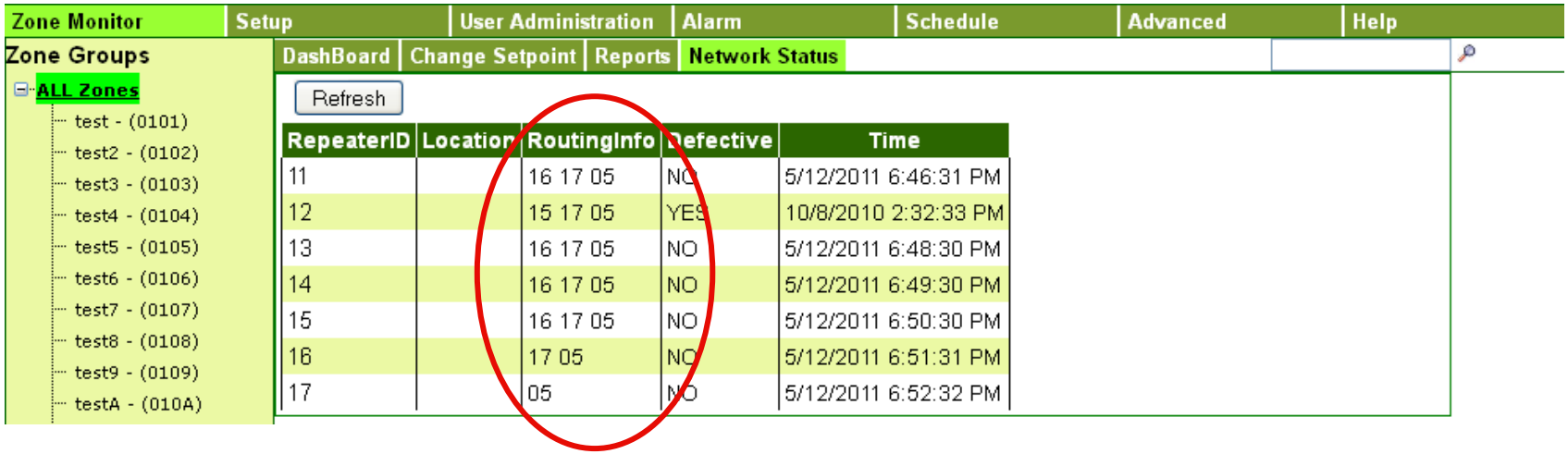
Checking the repeaters

Item #	Installation Checklist	Results
7	Have all repeaters reported in the last 15min	
8	Is the last digit of each repeater ID unique?	

Repeater: RF Validation Methods

Network Status Page – Latest RWAL Health Packets

- Verify RWAL Health Packet received every 15-minutes
- Verify Routing Info / Hop Count
  - Ideally Hop Count (total number of repeaters in the Routing Info Column not including the hub) should not exceed 6
- Check for duplicate RWAL ID – Rightmost Digit ONLY



Additional material to verify

Item #	Installation Checklist	Results
9	Have all the necessary updates been made to the job site map?	
10	Have all WPTs been noted on the map?	
11	Have all RWALs been noted on map?	
12	Are all Network IDs unique across multiple GBCs?	
13	Are the repeater locations listed in the server descript enough?	
14	Has the customer been properly trained?	
15	Is there follow-up work needed?	

Best Practices

- To ensure you have enough data at the GBC allow 24 hours of communication
- Use trending to verify the WPT is controlling properly
- Leave with a copy of the database backup

Troubleshooting tips

- Additional diagnostic information can be seen by clicking the Alarm Flag icon. It will show the following
  - Last 24 hours of WPT data including routing information
  - Setpoint changes
  - Alarm flags

Wrap up

- Verify all repeaters are communicating with the GBC
- Verify all WPTs are communicating to the GBC
- Verify the hop count for each WPT is 6 or less
- Verify the number of stats communicating to a repeater or directly to the hub is 15 or less

Technical Training

Customer walkthrough/signoff

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Purpose

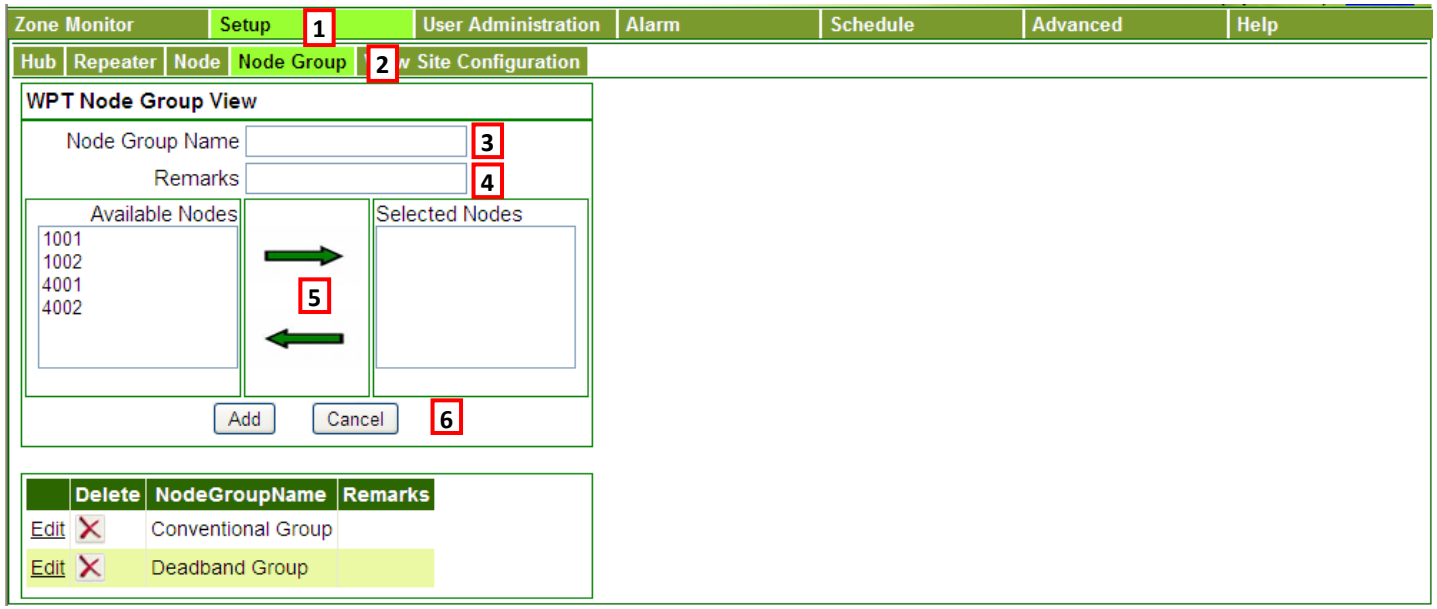
Goals:

- Walk customer through completed install
- Train customer on WPT web application
  - Setup node groups and alarms (if needed)
  - Set setpoint limits (if needed)
  - Set schedules (if needed)

Deliverables/Outcomes:

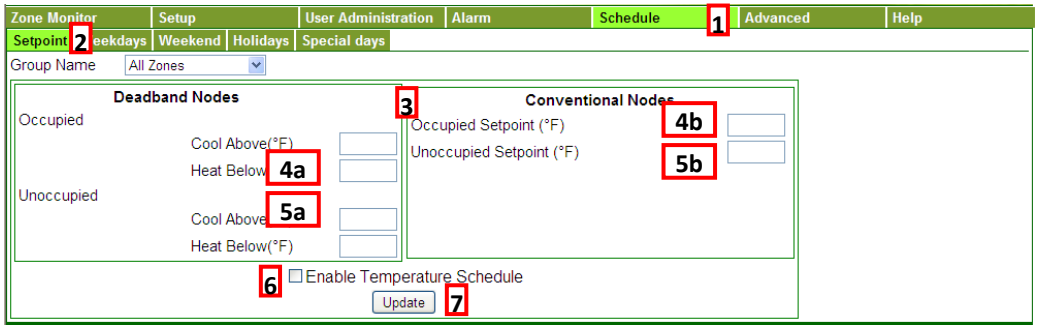
- Compile maps (floor plans) with locations of GBC-Repeaters and thermostats along with a list of node numbers and locations and deliver to customer.
- Compile a binder with installation manuals and maps for the customer. Include all contact information.
- Create backup of information after all checks of system is complete.

Create Node Groups

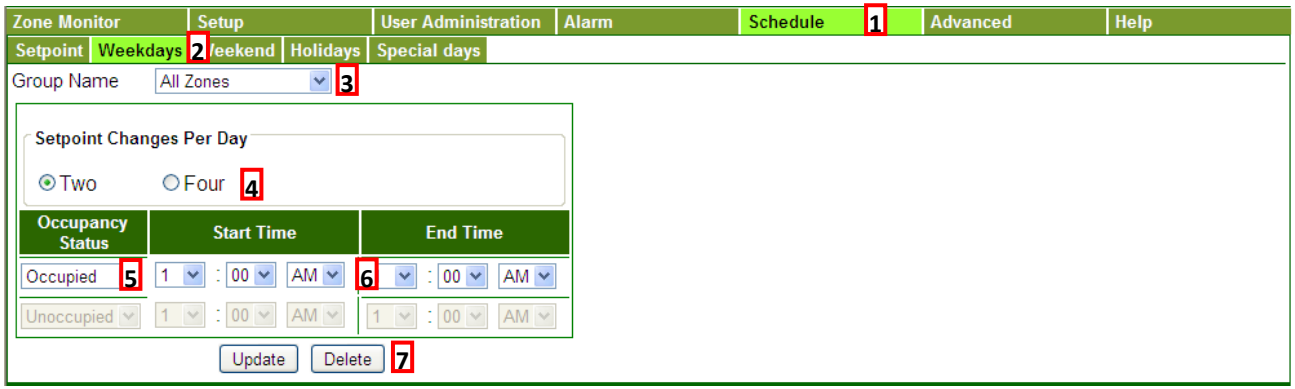


Configure schedule

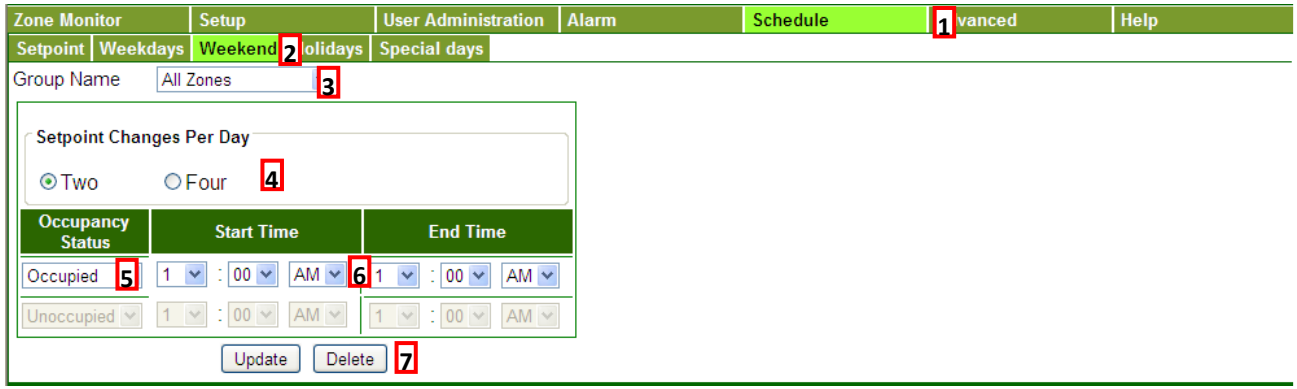
Configure Occupied / Unoccupied Setpoints and/or Deadbands



Configure Weekday Schedule

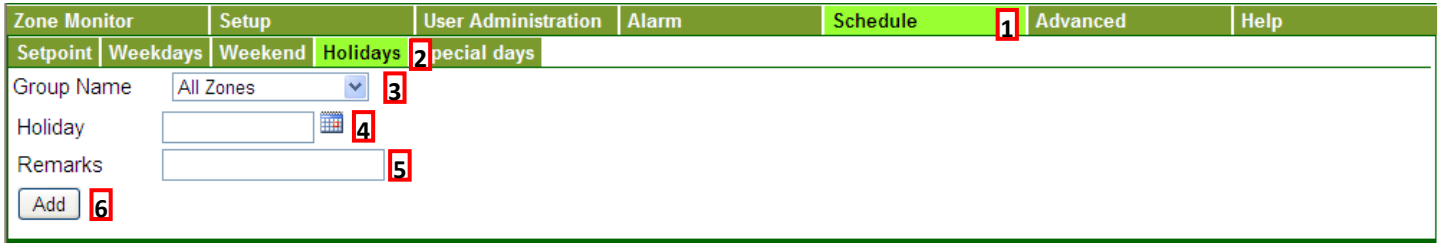


Configure Weekend Schedule

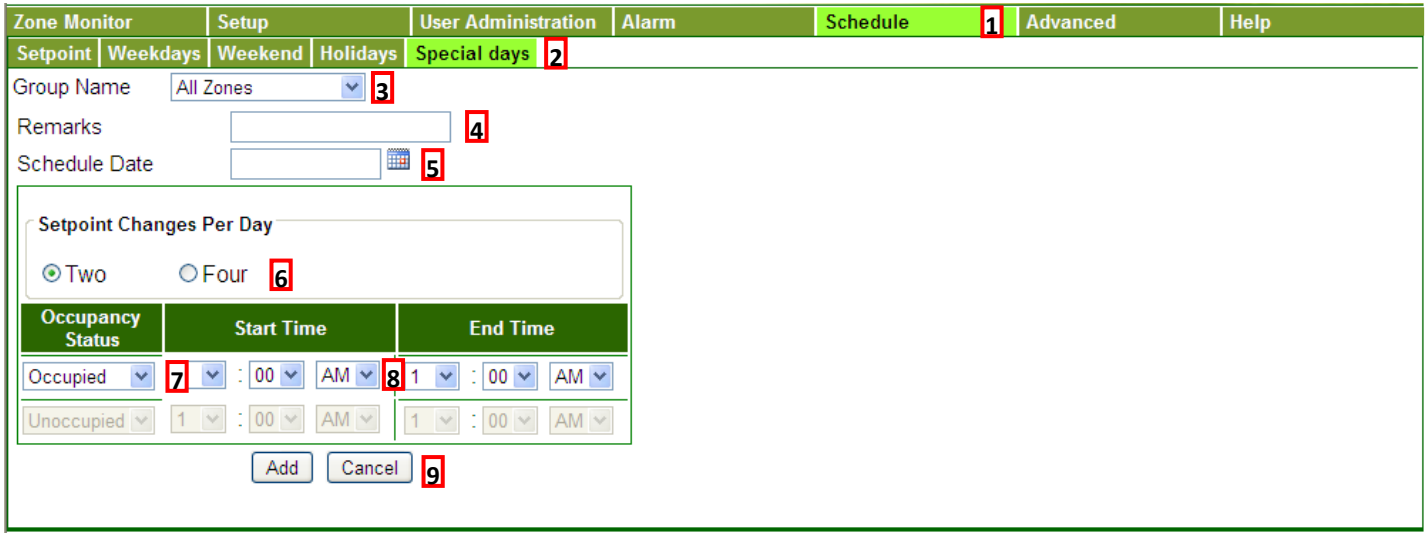


Configure Schedule

Configure Holiday Schedule

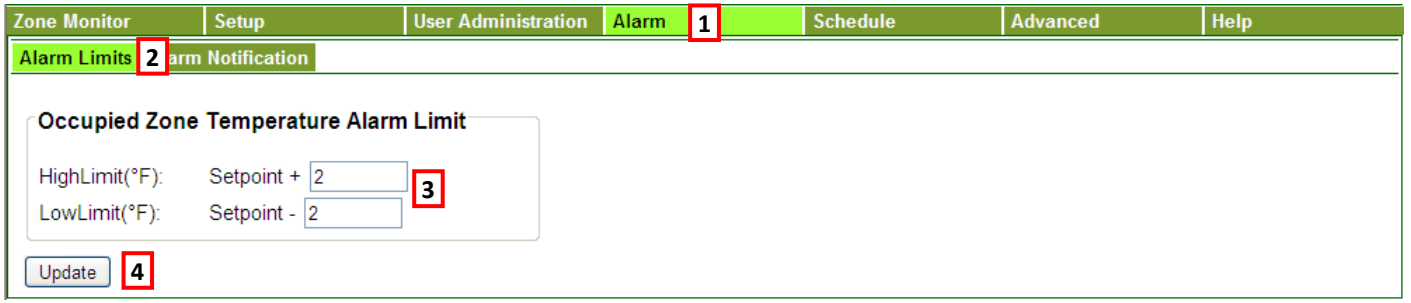


Configure Special Day Schedule

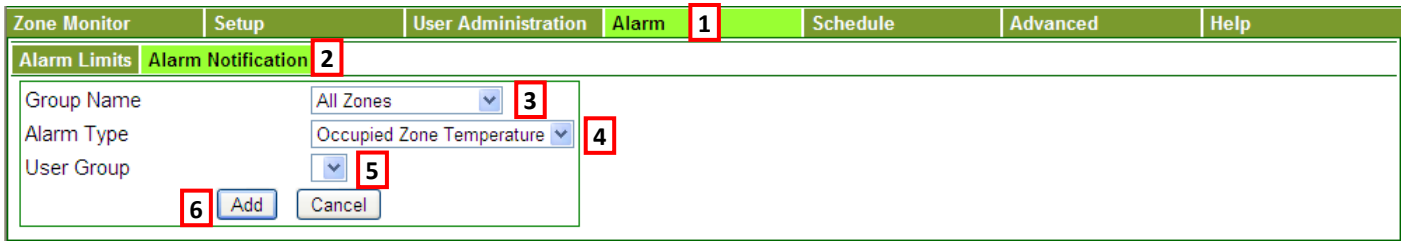


Configure Alarms

Alarm Limits



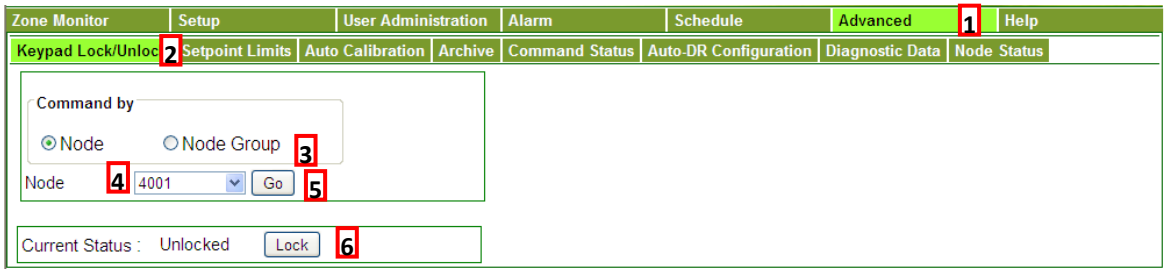
Alarm Notifications



Advanced Features

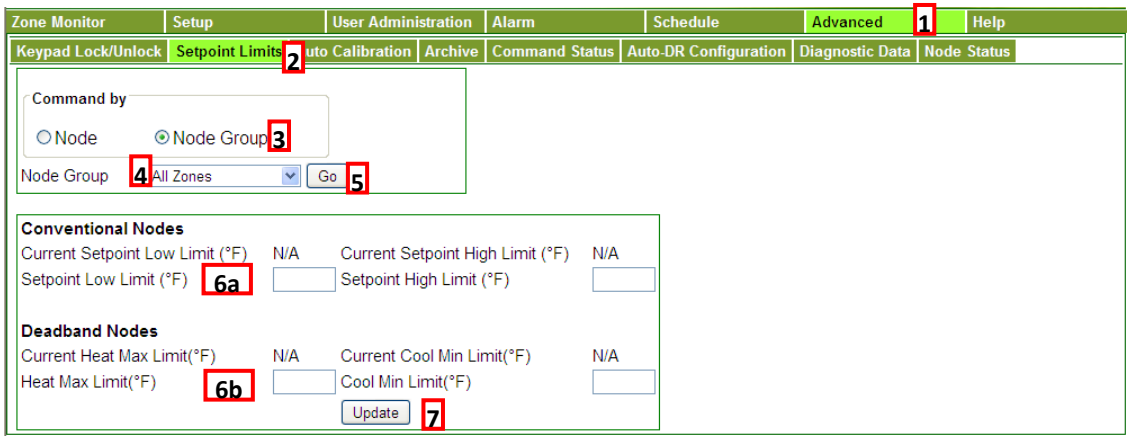
WPT LCD Keypad Lock/Unlock

- To lock/unlock the buttons on the thermostat so that users don't accidently change the settings



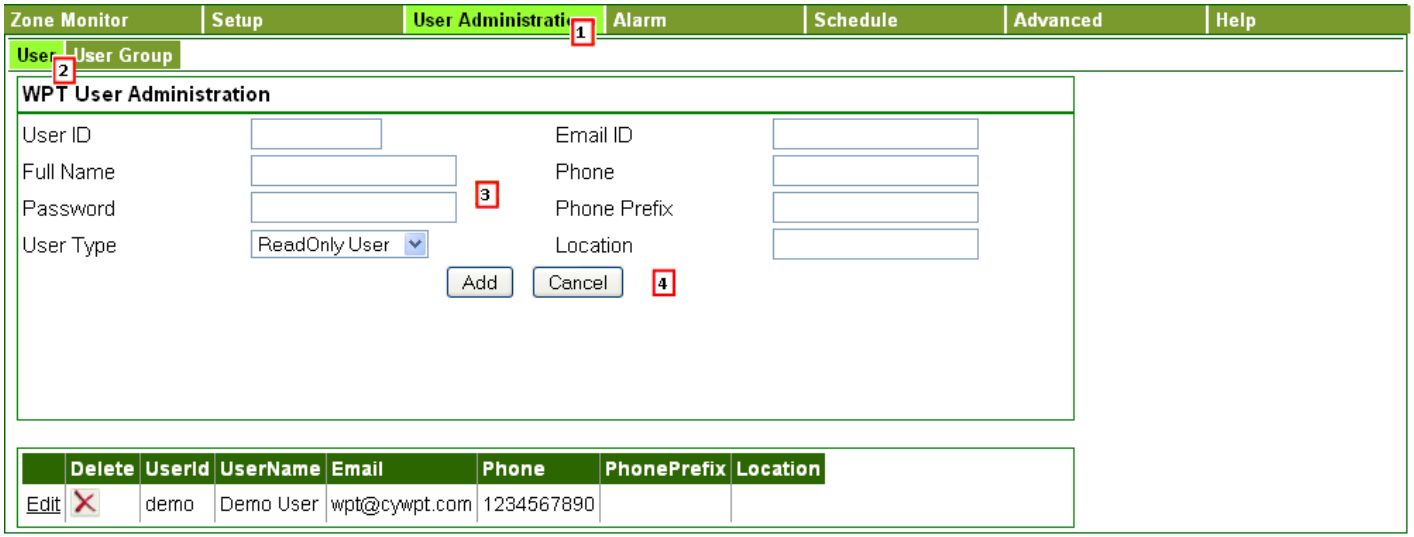
Configure Setpoint Limits

- To set the limits within which the users can change the setpoint values

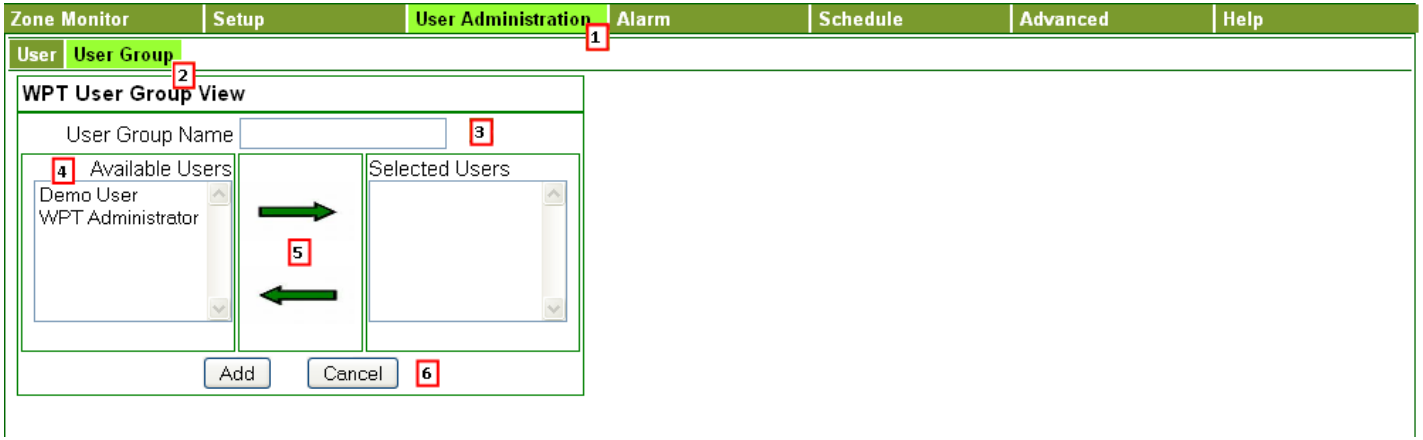


User Administration

Adding Users



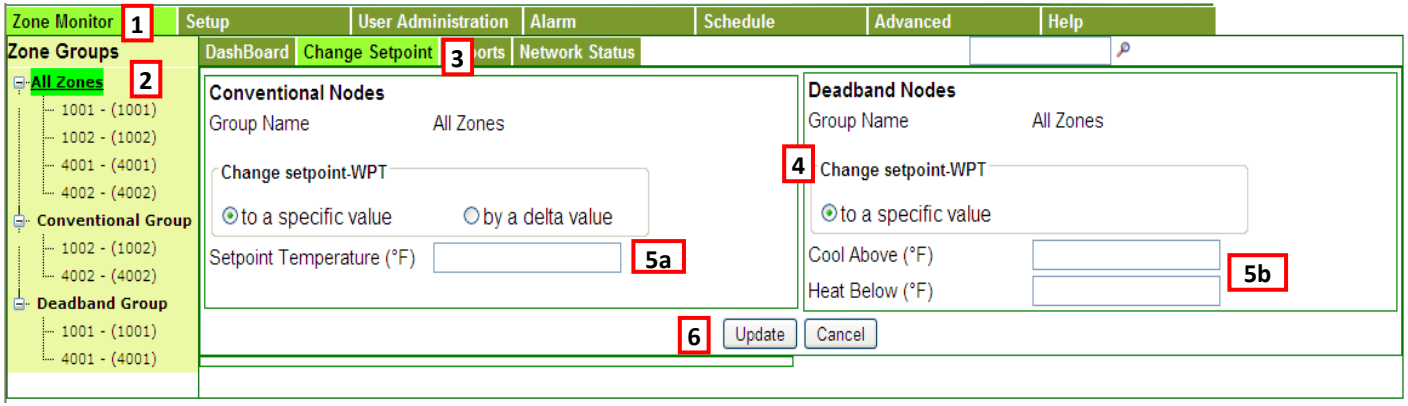
Creating User Groups



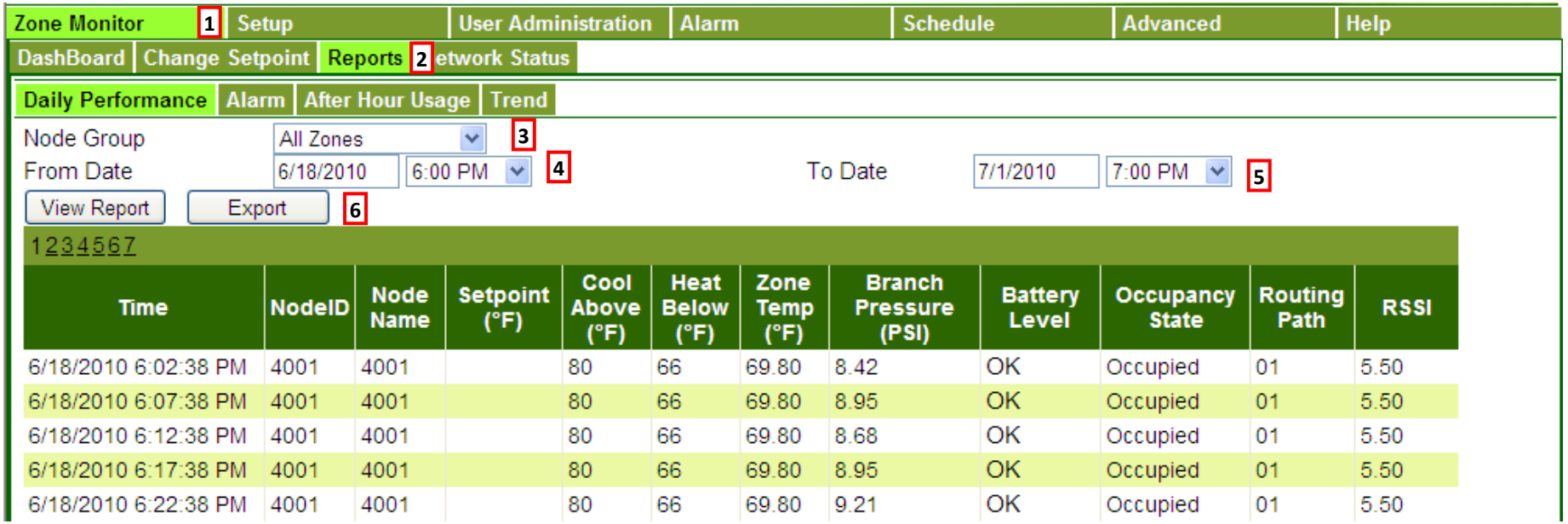
Manually Change Setpoints or Deadbands

Changing the setpoint or deadband

- The setpoint or deadband can be changed for selected zone or for all zones in a group.
- Setpoint can be changed either by a delta value or to a specific value.

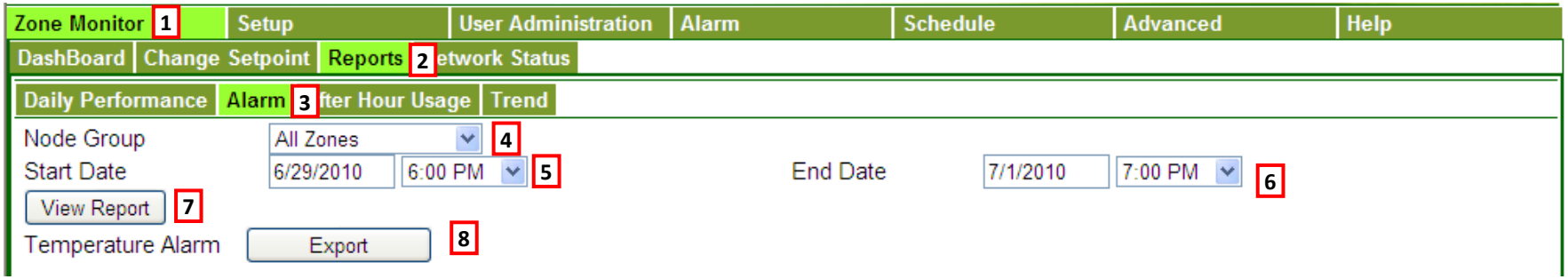


View Daily Performance Report



Time	NodeID	Node Name	Setpoint (°F)	Cool Above (°F)	Heat Below (°F)	Zone Temp (°F)	Branch Pressure (PSI)	Battery Level	Occupancy State	Routing Path	RSSI
6/18/2010 6:02:38 PM	4001	4001		80	66	69.80	8.42	OK	Occupied	01	5.50
6/18/2010 6:07:38 PM	4001	4001		80	66	69.80	8.95	OK	Occupied	01	5.50
6/18/2010 6:12:38 PM	4001	4001		80	66	69.80	8.68	OK	Occupied	01	5.50
6/18/2010 6:17:38 PM	4001	4001		80	66	69.80	8.95	OK	Occupied	01	5.50
6/18/2010 6:22:38 PM	4001	4001		80	66	69.80	9.21	OK	Occupied	01	5.50

View Alarm Report

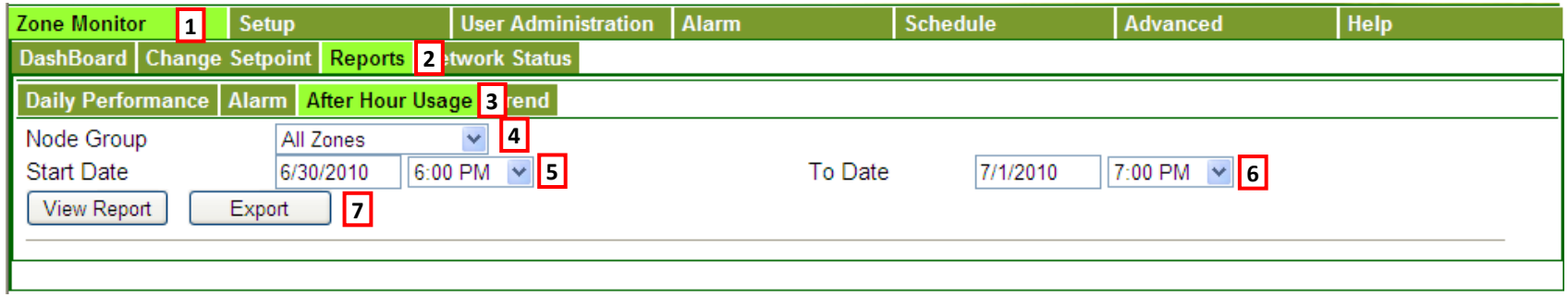


Offline Node Alarm Export 9

NodeID	NodeName	AlarmValue	AlarmStartTime	ACKTime	AlarmEndTime
1001	1001	ON	6/20/2010 2:31:14 PM		
1002	1002	ON	6/20/2010 2:31:14 PM		
4001	4001	ON	6/20/2010 2:31:14 PM		
4002	4002	ON	6/20/2010 2:31:14 PM		

Battery Alarm Export 10

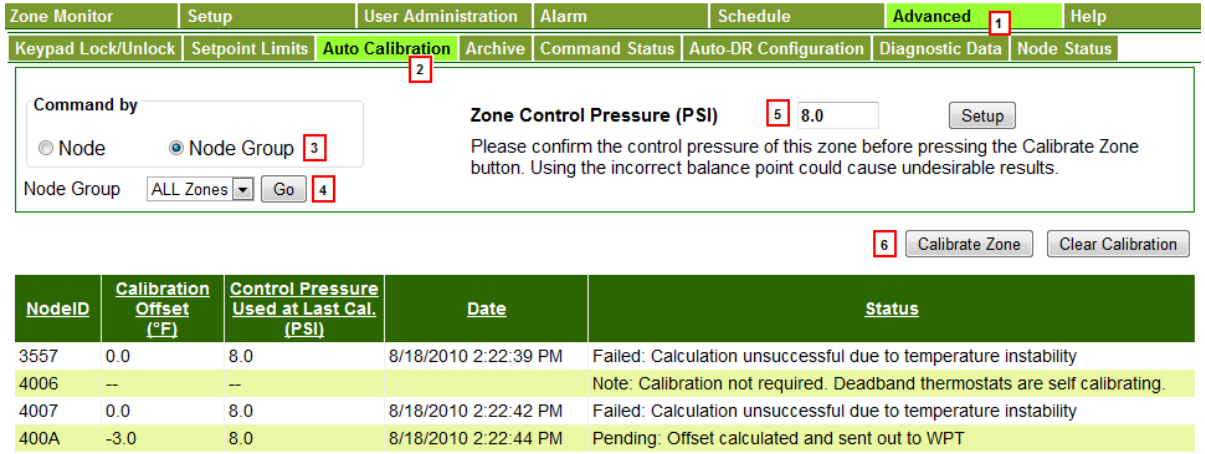
After Hour Usage Report



Advanced Features

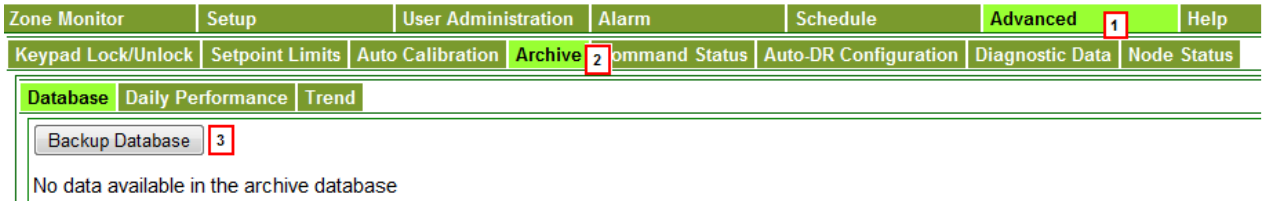
Auto Calibration

- To initiate auto calibration based on the historical data and the desired control pressure



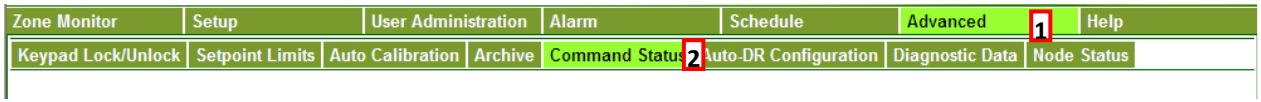
Backup Database

- To protect against data loss



Command Status

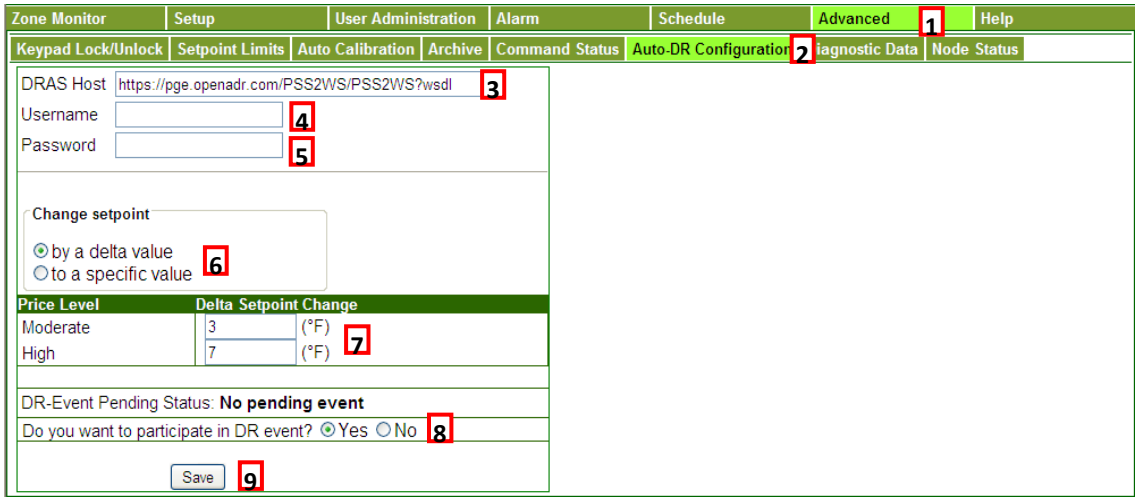
- To view advanced configuration commands for given to nodes



Advanced Features (cont'd)

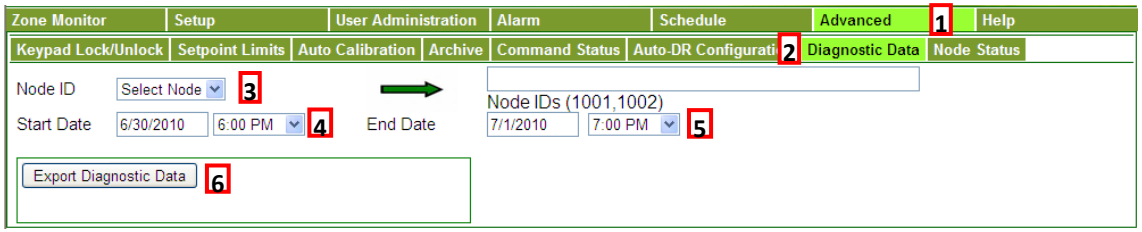
Auto-DR Configuration

- To configure the DRAS Host address, username and password
- Options to change the setpoint either by delta or to a fixed value



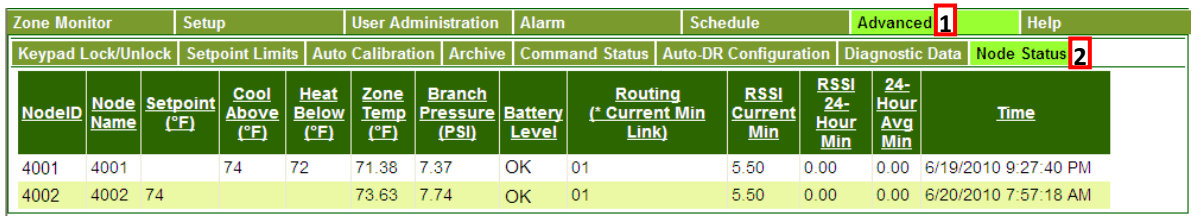
Diagnostic Data File

- Export diagnostic data to Excel



Node Status

- View WPT wireless diagnostic data



NodeID	Node Name	Setpoint (°F)	Cool Above (°F)	Heat Below (°F)	Zone Temp (°F)	Branch Pressure (PSI)	Battery Level	Routing (* Current Min Link)	RSSI Current Min	RSSI 24-Hour Min	24-Hour Avg Min	Time
4001	4001		74	72	71.38	7.37	OK	01	5.50	0.00	0.00	6/19/2010 9:27:40 PM
4002	4002	74			73.63	7.74	OK	01	5.50	0.00	0.00	6/20/2010 7:57:18 AM

Best practices

- Run a trend of a few WPTs to view the history over a couple of days to see how the system is working.
- Cross check all thermostats between setpoint and room temp.
  -Is the room temp within 2 deg of setpoint?
- Cross check all thermostats between room temp and branch pressure.
  -Is the branch pressure following the room temp correctly?
- Check to make sure all thermostats are reporting to server.
  -Node Status will help you verify network condition
- Train the customer on how to use the system

Technical Training

BACnet Integration

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GBC BACnet integration

BACnet integration steps

- GBC virtual ID selection
- Discover nodes & points and add to system
- Validate data communication
- Add trend graphs
- Schedule considerations with BACnet
- Offline detection and reliability
- Update rates and resolution

BMS issues/limitations

- Discovery reliability
- Caching of node configuration
- No longer support COV

Accessing WPT using BACnet/IP

- Each WPT is represented as a BACnet Device.

- Conventional WPT devices support the following I/O Objects
  - 3 x Analog Inputs (Ambient Temp, Branch Pressure and Battery Level)
  - 2 x Analog Outputs (Setpoint, Unoccupied Setpoint)
  - 1 x Binary Input (Occupancy Override)
  - 1 x Binary Output (Occupancy State)

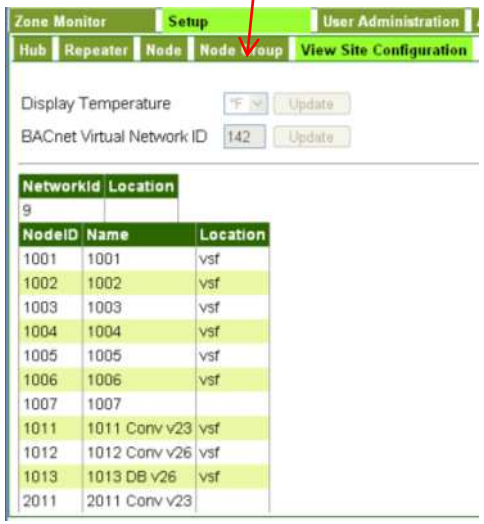
- Deadband WPT devices support the following I/O Objects
  - 3 x Analog Input Object (Ambient Temp, Branch Pressure and Battery Level)
  - 4 x Analog Outputs (Setpoint HeatBelow/CoolAbove, Unoccupied Setpoint HeatBelow/CoolAbove)
  - 1 x Binary Input (Occupancy Override)
  - 1 x Binary Output (Occupancy State)

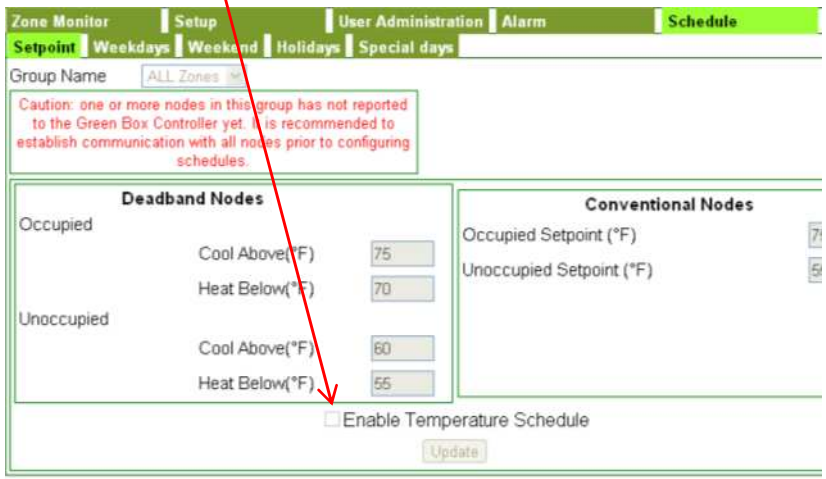
- WPT BACnet Gateway is BBMD enabled.

BMS Integration via BACnet

- GBC configuration
  - Every node must have a network wide, unique BACnet ID assigned.
  - All schedules must be disabled as they will conflict with BACnet generated setpoint/occupancy changes.
  - BACnet Virtual Network ID must be unique for all servers on the network. Allows clients to identify BACnet servers.

	Delete	NodeID	NetworkID	NodeName	Location	BACnetID
Edit		2011	9	2011 Conv v23		22011
Edit		1013	9	1013 DB v26	vsf	21013
Edit		1012	9	1012 Conv v26	vsf	21012
Edit		1011	9	1011 Conv v23	vsf	21011
Edit		1007	9	1007		21007
Edit		1006	9	1006	vsf	21006
Edit		1005	9	1005	vsf	21005
Edit		1004	9	1004	vsf	21004
Edit		1003	9	1003	vsf	21003
Edit		1002	9	1002	vsf	21002
Edit		1001	9	1001	vsf	21001





BMS Integration via BACnet

Offline detection and reliability

- Offline is when the BACnet client is unable to communicate with our GBC BACnet gateway.
    - All devices for the server will be flagged as offline.
- Communication is lost when:
    - Server is restarted or service has stopped.
    - CPU is over utilized
    - Network connection is lost
- Reliability is a state that is maintained by our GBC and monitored by the BACnet client.
    - The GBC will flag a node as unreliable when it detects that no RF packets have been received from a node for 5 consecutive 15minute report intervals.

Best practices

- Configure all WPTs on the GBC first before starting BACnet integration

- Make all WPT BACnet IDs intuitive so they are easy to discover

Support/Resources

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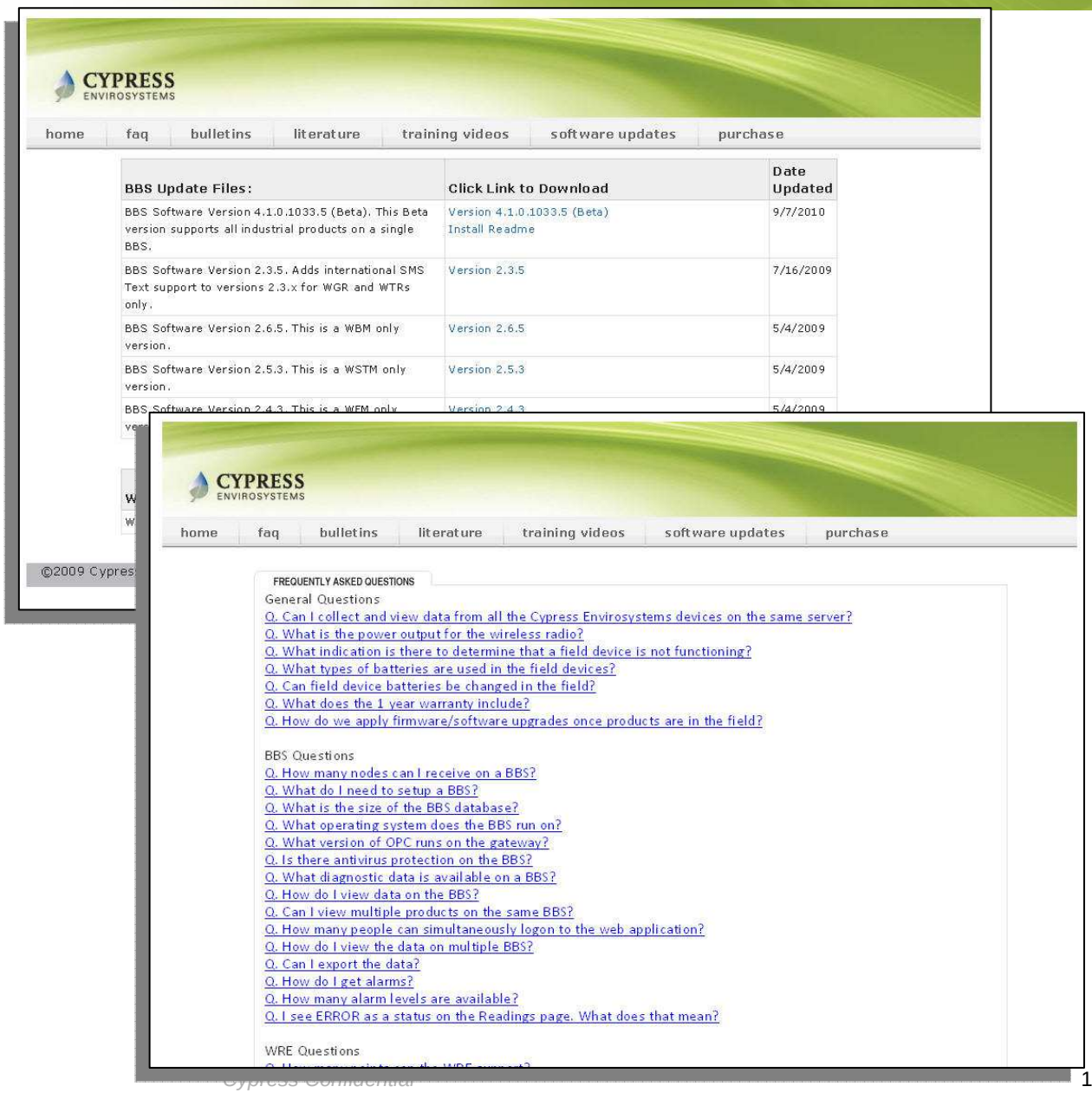
Private Self-Service Website (VAR Portal)

- Password protected for partners only
- Software downloads
- Product Bulletins
- FAQ's
- Training Videos
- Product documentation
- Knowledge Base to store/query prior experience



Partner Portal

Welcome to the Cypress Envirosystems Download Portal.

Use this portal to download all the latest training material, software updates, and FAQs.

What's New?	Date
Added PBN1109-03 for WPT firmware rev 00.26	March 2011
Added PBN1109-02 for new software release 19.3.1	March 2011
Added PBN1103-01 for Blue Box Server OPC issues	Feb 2011
Added PBN1043-01 for RWAL Looping Issue	Nov 2010

Please send all support questions to cys_support@cypress.com

BY USING THIS PORTAL YOU AGREE TO THE LEGAL TERMS AND CONDITIONS OF THIS SITE. Terms of Use

Customer Support

How to contact us

- Main support email address: cys_support@cypress.com
- Support hotline: 888-987-3210 (5am – 5pm PT, M-F except holidays)

Available resources

- Public Website www.cypressenvirosystems.com
  - Product briefs
  - Installation manuals
  - Training manuals
- Online knowledgebase (login required) (end of June)
- Partner portal
  - Product documentation and training
  - FAQs, product manuals and bulletins
  - Software updates

Product returns

- If under warranty, contact support hotline for RMA number
- What info is required to obtain RMAs
  - Product and quantity
  - Installation site and installer
  - Installation date
  - Reported problem (in detail)
  - Actions taken
  - Steps to reproduce the problem (if known)
- Units should be shipped to

Cypress Envirosystems
198 Champion Ct.
San Jose, CA 95134
Attn: Angel Ruiz

Thank you

www.CypressEnvirosystems.com

Appendices

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Reference Documents

Topics	Reference Document	Document Number
Features and benefits of the WPT	Wireless Pneumatic Thermostat Product Brief	PBWPT
Installing and configuring Wall Powered Repeaters (RWAL)	RWAL Installation Manual	910-00002-01
Installing and configuring the Hub (HUSB)	HUSB Installation Manual	910-00003-01
Installing and configuring the WPT	WPT installation Manual	910-00005-01
Estimating the number of Repeaters and selecting the optimum locations for Repeaters and Hub	WPT Wireless Network Planning Guide	910-00006-01
Installing and configuring the WPT Green Box	WPT Green Box Installation Manual	910-00007-01
BACnet Objects and Properties supported by the WPT Green Box	WPT BACnet PICS	910-00008-01
Using the wireless range testers	WPT Wireless Range Tester User Manual	910-00009-01
BACnet configuration	WPT BACnet Gateway Users Guide	910-00012-01

Reference

WPT Model	Description	JCI	Honeywell	Powers	Robertshaw	Barber-Colman	KMC
WPT-800-T2DP	2-pipe Direct Acting	T4002-201	TP970A TP973A	TH192 S	T15 T18	TK1001	CTC-1621
WPT-800-T2RP	2-pipe Reverse Acting	T-4002-203	TP970B TP973B	TH192 S	T16 T19	TK1101	CTC-1622
WPT-800-T1DP	1-pipe Direct Acting	T-4002	TP973A	TH192 S	T15 T18	TK5001	CTC-1611
WPT-800-T1RP	1-pipe Reverse Acting	T-4002	TP973B	TH192 S	T16 T19	TK5010	CTC-1612