Integration Note

Manufacturer:	RCS
Model Number(s):	**TZ45R Thermostats / Leviton VRC0P-1LW (+3) RS-232 Adapter**
Minimum Core Module Version:	5.8
Document Revision Date:	2/18/2013

OVERVIEW AND SUPPORTED FEATURES

The RCS TZ45R thermostats are wireless Z-Wave thermostats capable of controlling 1 or 2 stage heat pumps or conventional heating and cooling systems, and 2nd or 3rd stage AUX heat. The TZ45R thermostats are remote controllable over Z-Wave 900mhz wireless mesh networks via the use of a Z-Wave RS-232 adapter, enabling 2-way control and feedback from **g!**. The **g!** system supports up to **16** wireless thermostats.

Note: Z-Wave RF operates at 900MHz. Any other devices operating on the same frequency may cause interference and need to be removed. Leviton recommends the system in installations of 7500 square feet or less and installing devices typically no more than 30 feet apart. Please refer to the Leviton **Vizia RF Systems Guide** (www.ViziaRF.com) for other installation considerations and details on proper setup of the Z-Wave networks. Additional information can be found at www.z-wave.com.

THE TZ45R DRIVER SUPPORTS THE FOLLOWING FEATURES:

Auto Discovery: Thermostats may be auto-detected and added into **g!**

History View: The history view shows the inside temperature, outside temperature, unit run times, and cooling and heating setpoints.

Mode Control: The climate system can be set to run in the following heating and cooling modes: **Heat** only, **Cool** only, **Auto**, **Off** or **EHeat** (Heat Pump Only). Fan Modes: **On**, **Auto**, **Circulate**

  Note: **Circulate** must be enabled on the thermostat.

Remote Sensors: The TZ45R thermostat driver supports remote sensors in the *Internal Sensor* mode only.

Schedule Control: Scheduling is supported from the Viewer. The TZ45R Built-in Schedule **must** be disabled to use **g!** scheduling.

Shared Z-Wave Network: A single Leviton Vizia RF Z-Wave network may contain Door Locks, Thermostats, and Lights. All three may be controlled over a single RS-232 Z-Wave adapter. See the appropriate Z-Wave Door Lock and Z-Wave Lighting Integration Notes for details.

Temperature Control: Temperature control can be managed by schedules tied to house modes or by manual control based on time (Timed Temporary Hold, Temporary Hold and Permanent Hold).

THE TZ45R DRIVER DOES NOT SUPPORT THE FOLLOWING FEATURES:

Any feature not specifically noted as "supported" is not supported.

Name Detection: All thermostats will populate during auto-discovery with their Z-Wave node number as their name. Thermostat names do not read into **g!** at this time.

Decimal Temperature Control: TZ45R thermostats do not support decimal temperature set points.

INSTALLATION OVERVIEW

1. Install the TZ45R thermostats and wire HVAC according to standard RCS TZ45R documentation.

2. Test the thermostat and climate system to ensure that the thermostats correctly turn on the appropriate heating or cooling equipment, and open or close the appropriate valves / dampers.

3. Install a Leviton VRC0P-1LW (+3) RS-232 Z-Wave adapter in a location convenient for both a serial run to the **g! Controller** and within range of other Z-Wave devices.

   Note: Be sure that the "+3" notation is present on the back of the VRC0P-1LW. (See the Leviton application note for additional information: http://communities.leviton.com/docs/DOC-2392).

4. Run a Cat-5 or serial cable to the location of the Z-Wave RS-232 location.

5. Using a Primary Controller, such as a programming remote (ex. Leviton VRCPG), ControlThink's ThinkEssentials or Leviton's Vizia RF+ Installer Tool (v1.1.0.0) create a Z-Wave network and add thermostats and the RS-232 adapter according to standard procedures.

   Important! Disconnect the g! system from the VRC0P controller when <u>any</u> Z-Wave network configuration is occurring.

6. Connect the Serial Cabling to the Z-Wave RS-232 adapter electrically. See the wiring diagrams.

7. Configure **g!** for the thermostats and confirm communication between the thermostats and the **g! Controller**.

8. Test the system by changing the set points, modes and schedules on the viewer and various thermostats, confirming that the various components in the system respond as expected.

Z-WAVE REPEATERS

Many Z-Wave devices function as repeaters, meaning an incoming signal can be passed to another Z-Wave device within range. The maximum distance a signal can be sent from one Z-Wave device to another varies depending on the brand/model of the device used. **See the manufacturer's documentation for the devices you intend to use for specifics.**

The signal can be extended from the controller to the device being controlled by a maximum of four passes, known as "hops." (From the controller to the first device, the first device to the second, the second device to the third and from the third device to the one actually being sent the signal.)

Depending on the network configuration, occasionally it may be necessary to manually program the "hops" to optimize reliability. **Refer to the documentation that came with your specific programming tool for details.**

Note: Because Z-Wave door locks require repeaters that are "beaming-compatible" and that support beaming of encrypted signals we recommend using only repeaters (lamp modules, switches, etc.) that support these features if door locks will be a part of the installation. **See the manufacturer's documentation for the devices you intend to use for specifics.**

NOTES REGARDING THE TRACKING OF Z-WAVE DEVICES:

In general **g!** keeps track of the states of all of the Z-Wave Network Devices; however there is latency in the reporting back of the devices from the Z-Wave network. The result is that **g!** updates its states as the devices report back. This is evident when watching the viewer interface after a change is made at the device. The viewer controls will update sequentially over a few seconds (or more on larger systems) as the devices report their states.

CONNECTION DIAGRAMS
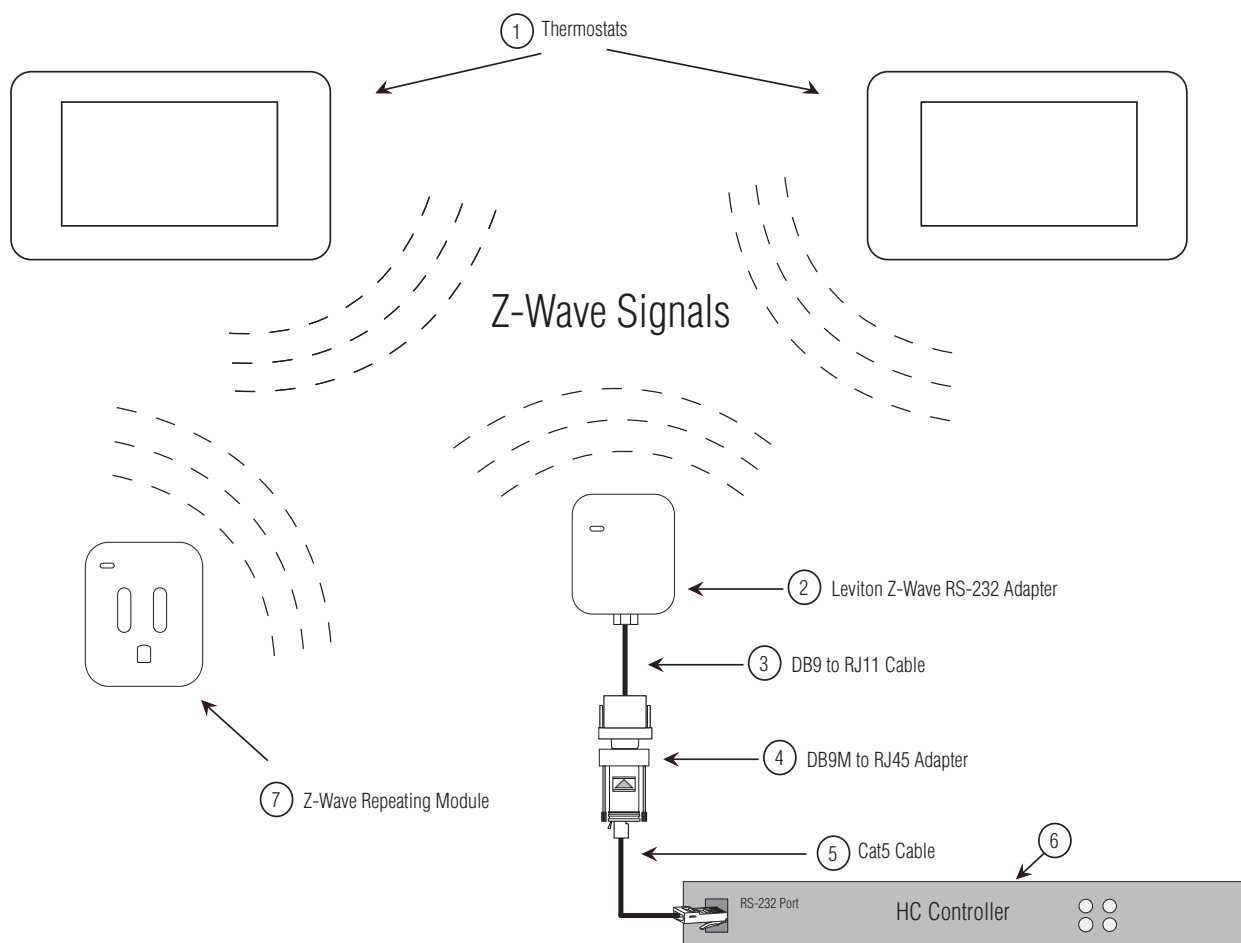
BILL OF MATERIALS

	Device	Manufacturer	Part Number	Protocol	Connector Type	Notes
1	Thermostat	RCS	TZ45R	Z-Wave	RF	
2	Z-Wave RS-232Adapter	Leviton	VRC0P-1LW (+3)	RS-232/Z-Wave	RJ-11 Female	
3	RJ-11 to DB9 Cable	Leviton	N/A	RS-232	RJ-11 Male / DB9 Female	Included w/ VRC0P+3
4	DB9 to RJ-45 Adapter	ELAN	HA-CB-307	RJ-45 Female x DB9 Male		
5	Cat5 Cable Assembly	Installer	N/A	RS-232	RJ-45Male x RJ-45 Male	Must terminate all 8 conductors
6	Controller	ELAN	HCxx	RS-232	RJ-45 Female	Use Comm port 1, 2, 3, etc.
7	Z-Wave Repeating Module	Various	Various	Z-Wave	RF	Beaming and Encrypted Signal Support Recommended
	Programming Remote	Leviton	VRCPG-BSG	Z-Wave	RF	Not Shown - Needed to set up Z-Wave Network
8	**OR**					
	ControlThink's ThinkEssentials	Leviton	CTZUS-1US	Z-Wave	RF	Not Shown - Needed to set up Z-Wave Network
	OR					
	Vizia RF+ Installer Tool	Leviton	VRUSB-1US	Z-Wave	RF	Not Shown - Needed to set up Z-Wave Network

Note: Update the VRC0P-1LW (+3) to the latest firmware prior to creating the Z-Wave network. Updates are found on the Leviton web site.

http://www.leviton.com/OA_HTML/SectionDisplay.jsp?section=42159&minisite=10251

Minimum Version: $Leviton(C) 2008 V2.33S/Z-Wave 3.11

Z-WAVE NETWORK PROGRAMMING

Program the Z-Wave according to standard procedures. Regardless of device function, the basic setup of Z-Wave networks is the same. Various limitations may be imposed based on the programming tool used. **Refer to the documentation that came with your specific programming tool for details.**

Typically a Z-Wave network is programmed using its Programmer/Remote Control (such as the Leviton VRCPG-BSG remote, ThinkEssentials Software or Vizia RF+ Installer Tool) to enroll / include devices in the Z-Wave Network. The methods for using the VRCPG, ThinkEssentials and Vizia RF+ Installer Tool are detailed below. Note that these instructions assume you are familiar with Z-Wave programming concepts. If you require further detail or clarification, you may wish to see Leviton Vizia RF (www.ViziaRF.com), or RCS TZ45R documentation / technical support for assistance.

> **Important! Programming using the Leviton *VRCPG-BSG* Remote is NOT supported for thermostats when Z-Wave locks are to be included in the system**

While the VRCPG-BSG does allow you to enroll locks in a Z-Wave network it does not allow you to associate the locks with the VRC0P module.

PROGRAMMING USING THE LEVITON VRCPG-BSG REMOTE:
Setup steps below are created using a VRCPG-BSG remote. Your steps may vary somewhat if your remote model differs, but the basic process should be the same.

1. **Confirm all devices are at factory default and have not been setup in any Z-Wave Network.**

2. To include the TZ45R thermostats in the network:

    a. Start up the Leviton Remote and begin the **Installation Checklist**.

        i. Perform **Step 1** of the Installation Checklist, **Include Dimmers/Switches**, and include the first thermostat in the network.

        ii. When prompted by the remote, on the TZ45R thermostat:

            1. Press the **Menu** button.

            2. Navigate to and select the **Z-Wave Install** menu option.

            3. At the "Add Thermostat to Z-Wave Network" prompt select **Yes**.

> **Note:** It is best practice to give the thermostat a descriptive name when prompted, like Master Bedroom, for future reference. Note that this name is not saved in the thermostat and will not be automatically read into **g!** You should keep notes of the location of each thermostat and their Node IDs, as the only identification available to **g!** is the Node ID.

3. Repeat Step 2 for each additional TZ45R to be added to the network.

4. To include the VRC0P-1LW (+3) in the network:

    a. Set the VRC0P-1LW to programming mode by pressing and holding the button (clear tab on face of unit) until the light blinks amber.

    b. Perform **Step 2** of the Installation Checklist, **Include Controller**, to include all Controllers into the network. Controllers include the RS-232 interface module (VRC0P-1LW (+3)).

5. Perform **Step 3** of the Installation Checklist, **Update Controller**, to update all of the controllers following the inclusion of all devices. This will create the proper mapping between devices.

6. In a thermostat only network, you may skip **Step 4** (Create Areas) and go to **Step 5** (Set Associations) of the Installation Checklist.

7. Perform **Step 5** of the Install Checklist, **Set Associations**, to associate each thermostat with the controller.

8. You may complete or skip **Step 6** (Security) of the Installation Checklist as desired.

9. Choose **Step 7** of the Installation Checklist, **Install Complete**.

10. Test all devices for proper operation. From the **Main Menu** of the VRCPG remote you should be able to select **Thermostats** and get current temperature data and change modes (heat, cool etc) for each thermostat on your network.

PROGRAMMING USING THINKESSENTIALS AND USB Z-WAVE ADAPTER:

Setup steps below are created from version 2.5 of ThinkEssentials. If you are running a different version, your steps may be somewhat different than below, but the basic process is the same.

1. **Confirm all devices are at factory default and have not been setup in any Z-Wave Network.**

2. Either create a New Network or Open an Existing Network file.

3. To include the TZ45R thermostats in the network:

    a. In the ThinkEssentials software, from the **Design Tab** select the **Add Device** button.

    b. On the TZ45R thermostat:

        1. Press the **Menu** button.

        2. Navigate to and select the **Z-Wave Install** menu option.

        3. At the "Add Thermostat to Z-Wave Network" prompt select **Yes**.

4. Repeat Step 3 for each additional TZ45R to be added to the network.

5. To include the VRC0P-1LW in the network:

    a. Set the VRC0P-1LW (+3) to programming mode by pressing and holding the button (clear tab on face of unit) until the light blinks amber.

    b. In the ThinkEssentials software, from the **Design Tab** select the **Add Device** button. The software will confirm the VRC0P-1LW has been included in the network and its icon will be displayed in the **Design Tab**. The software will automatically assign a Node ID during this process.

Note: It is best practice to give the thermostat a descriptive name when prompted, like Master Bedroom, for future reference. Note that this name is not saved in the thermostat and will not be automatically read into **g!** You should keep notes of the location of each thermostat and their Node IDs, as the only identification available to **g!** is the Node ID.

6. Associate each thermostat to the Controller.

   a. Move to within three feet of the thermostat.

   b. Right-click on the Thermostat icon and select "Properties"; in the lower right-hand corner of the display, the status message "Loading status from the device" appears; wait until the status message changes to "Done loading status."

   c. Switch to the "Device Associations" tab.

   d. Select "Button #1" in the drop down menu.

   e. Press the "Edit" button – a pop up appears.

   f. Left-click on the Controller icon to make the association, then click on "Done" in the pop up.

7. Test all devices for proper operation. From the **Design Tab** you should be able to right-click on each thermostat and choose **Advanced Thermostat Options** to see current temperature data and change modes (heat, cool, etc.) for each thermostat on your network.

PROGRAMMING USING LEVITON'S VIZIA RF+ INSTALLER TOOL (v1.1.0.0) AND USB Z-WAVE ADAPTER:

Setup steps below are created from version 1.1.0.0 of the Vizia RF+ Installer Tool. If you are running a different version, your steps may be somewhat different than below, but the basic process is the same.

1. **Confirm all devices to be added are at factory default and have not been setup in any Z-Wave Network.**

2. Either create a New Network or Open an Existing Network file.

3. To include the TZ45R thermostats in the network:

   a. In the Vizia RF+ software select the **Include Device** button.

   b. On the TZ45R thermostat:

      i. Press the **Menu** button.

      ii. Navigate to and select the **Z-Wave Install** menu option.

      iii. At the "Add Thermostat to Z-Wave Network" prompt select **Yes**.

4. Repeat Step 3 for each additional TZ45R to be added to the network.

5. To include the VRC0P-1LW (+3) in the network:

   a. Set the VRC0P-1LW to programming mode by pressing and holding the button (clear tab on face of unit) until the light blinks amber.

   b. In the Vizia RF+ software select the **Include Device** button. The software will confirm the VRC0P-1LW has been included in the network and it will be displayed in the All Devices node of the programming tree. The software will automatically assign a Node ID during this process.

Note: It is best practice to assign the thermostat a descriptive name, like Master Bedroom, for future reference. Note that this name is not saved in the thermostat and will not be automatically read into **g!** You should keep notes of the location of each thermostat and their Node IDs, as the only identification available to **g!** is the Node ID.

6. Associate each thermostat to the Controller.

   a. In the Vizia RF+ software *right click* on the VRC0P module under **All Devices** in the programming tree.

   b. Select **RS-232 Setup** from the menu.

   c. In the **LevSerialInterfaceConfig** dialog box:

      i. Verify that the RS-232 Module drop down shows that the VRC0P module is selected.

      ii. Check the box for each thermostat Node ID to be associated to the VRC0P module.

      iii. Click the **Set Association** button.

      iv. Close the dialog box.

7. Test all devices for proper operation. Select each thermostat from the All Devices node of the programming tree and change modes (heat, cool, fan, etc.) for each thermostat on your network.

g! CONFIGURATION DETAILS

The following table provides settings used in the **g!** Configurator when connecting to a Z-Wave thermostat network. Please refer to the Configurator Reference Guide for more details.

In the table below:

- o "<Select>" Select the appropriate item from the list (or drop-down) in the Configurator.
- o "<User Defined>", etc. Type in the desired name for the item.
- o "<Auto Detect>", etc. The system will auto detect this variable.

Devices	Variable Name	Setting	Comments
Communication Device	Name	<User Defined> (Default: New Device)	
	Type	Serial Port	
	Communication Type	Leviton Z-Wave RS-232 Network	
	Location	<User Defined> (Not Required)	
	Comm Port	<Select>	Com 1, 2, 3 etc.
HVAC Units	Name	<User Defined>	
	Model	Generic HVAC Unit	
	Controls Heat	<Select from list>	Set to YES if controlling Heat
	Controls Cooling	<Select from list>	Set to YES if controlling Cooling
	Controls Fan	<Select from list>	Set to YES if controlling Fan
<Discover Devices>			Click the **Discover Devices** button on the Communication Device
Thermostats	Name		Discover Devices will set a Default name of "Z-Wave Thermostat #1, #2", etc.
	Location	<User Defined> (Not Required)	
	Comm Device	<Auto Detect>	
	Thermostat #	<Auto Detect>	
	Settings	<Select from list>	Use to Enable/Disable Fan Circulate and Emergeny Heat buttons on Viewers
	Heating Unit	<Select from list>	
	Cooling Unit	<Select from list>	
Schedules	Set up HVAC Schedules Under Each T-Stat		
Global Options	Units	<Select from list>	Fahrenheit or Celsius
	Temporary Hold Mode	<Select from list>	Timed Hold or Hold until next schedule period
	Temporay Hold Default Time	<Select>	
	Outside Temperature Sensor	<Select from list>	Choose Optional sensor if installed or choose internet
	Outside Humidity Sensor	<Select from list>	Choose Optional sensor if installed or choose internet

TESTING THE Z-WAVE SYSTEM

On occasion it may be necessary to test the Z-Wave system "outside" of the **g!** interface to verify communication between the thermostats and the controller (the VRC0P-1LW). The following steps are intended to provide a method to test the basic communication status of the Z-Wave network.

1. Complete your Z-Wave network set-up as described above, ensuring all thermostats and controllers have been added to the network.

2. Connect a serial cable from your computer to the VRC0P-1LW's RJ-11 to DB9 cable. Use a USB to Serial adapter if required.

3. Set up a terminal program (ex: HyperTerminal) with the following settings:

   a. 9600 baud; 8 data bits; No parity; 1 stop bit; Flow Control – None

   b. ASCII Sending Set Up

      i. Send line ends with line feeds

      ii. Echo typed characters locally

4. Send test commands to verify correct operation:

   Note: Terminal programs other than HyperTerminal may display differently. The important thing is that the "<E000" displays, indicating a correctly formatted command was entered. The "<X000" indicates that the VRC0P module communicated correctly with the thermostat.

   a. To set a thermostat to OFF:

      i. In HyperTerminal type: >NxSE64,1,0 where "x" is the Node ID of the thermostat being controlled and press Enter.

         1. Feedback in HyperTerminal should be <E000 followed on the next line by <X000 and then <E000 on the third line.

         2. The selected thermostat shows that it is OFF.

   b. To set a thermostat to HEAT:

      i. In HyperTerminal type: >NxSE64,1,1 where "x" is the Node ID of the thermostat being controlled and press Enter.

         1. Feedback in HyperTerminal should be <E000 followed on the next line by <X000 and then <E000 on the third line.

         2. The selected thermostat shows that it is set to HEAT.

   c. To set a thermostat to COOL:

      i. In HyperTerminal type: >NxSE64,1,2 where "x" is the Node ID of the thermostat being controlled and press Enter.

         1. Feedback in HyperTerminal should be <E000 followed on the next line by <X000 and then <E000 on the third line.

         2. The selected thermostat shows that it is set to COOL.

d. To query the STATUS of a thermostat:

    i. In HyperTerminal type: >NxSE64,2 where "x" is the Node ID of the thermostat being controlled.

        1. Feedback in HyperTerminal should be <E000 followed on the next line by <X000 and then <E000 on the third line. The fourth line should be Nxxx:064,003,yyy where "xxx" is the Node ID of the thermostat (single and double digit Node IDs will have leading zeros) and "yyy" is the status of the thermostat.

            a. 000 = OFF

            b. 001 = HEAT

            c. 002 = COOL

If you receive feedback where E000 (as noted above) is something different it indicates that the command was not entered correctly.

If you receive feedback where X000 (as noted above) is something different it indicates that the VRC0P is not communicating correctly with the thermostat.

Correct any problems **prior** to integrating with the **g!** system. Contact the manufacturer(s) of the product(s) you are installing for additional help with troubleshooting your Z-Wave network.

COMMON MISTAKES

1. Improper Z-Wave setup. _Ensure that you fully program and test your Z-Wave network for proper operation **prior** to integration with **g!**_

2. Placing the Z-Wave RS-232 Adapter out of range of other Z-Wave devices. Z-Wave devices create a wireless, self-healing mesh network, and should be placed where they are in range to communicate with multiple other devices for best results.

3. Adding thermostats / repeaters to the network after adding controllers. If thermostats / repeaters are added after controllers the controllers must be updated.

4. Using a VRC0P-1LW that does not have the (+3) notation.

5. Failing to update the VRC0P-1LW firmware. Minimum Version: $Leviton(C) 2008 V2.33S/Z-Wave 3.11

6. Failing to Disable thermostat schedule when using **g!** schedule.

7. Enabling / Disabling Fan Circulate (Cycle) or Emergency Heat (Heat Pumps Only) on the thermostats but setting incorrectly in Configurator and vice versa.

Z-Wave Thermostat Comparison Chart							
	Feature						
Model	Auto Mode	Fan Modes	Remote Sensor	Decimal Temperature	Unsolicited Feedback	Green / Energy Save Mode*	Built-In Schedule
2GIG	No	On / Auto	No	Yes[4]	No	No[6]	Yes[8]
Honeywell	Yes[1]	On / Auto / Circulate	No	Yes[5]	Yes	No	Yes[8]
RCS	Yes	On / Auto / Cycle[2]	Yes[3]	No	Yes	Yes[7]	Yes[9]
Trane	Yes	On / Auto / Cycle[2]	No	No	Yes	Yes[7]	Yes[8]
Wayne Dalton	No	On / Auto	No	No	No	Yes[7]	No

*   See information on the following page.

1. Can be enabled.
2. Cycle must be enabled in thermostat programming.
3. Temperature only.
4. Feedback to .5° Celsius and Fahrenheit.
5. Feedback to .5° Celsius.
6. When Z-Wave is activated the "Save Energy" button on the thermostat is disabled.
7. Activated by selecting on thermostat.
    a. RCS – Set to **AWAY** mode on the thermostat.
    b. Trane – Select **Energy Saving Mode** on the thermostat.
    c. Wayne Dalton – Press the **Save Energy** button on the thermostat.
8. Can be enabled. (Factory default is disabled.)
9. Can be disabled. (Factory default is enabled.)

*GREEN / ENERGY SAVE MODE

This feature functions as follows:

When the user enters the "Green / Energy Save" mode:

1) The thermostat switches to a second "energy saving" set point.

2) **g!** puts the thermostat into "Permanent Hold" mode.

When the user returns to "Normal" mode:

1) The thermostat goes back to the normal set point.

2) **g!** puts the thermostat into "Run Program" mode.

The thermostat is in "Green / Energy Save" mode and user changes operating mode (heat / cool / off) on a g! UI:

1) Thermostat is put back into "Normal" mode, and begins using the normal set point.

2) **g!** puts the thermostat into "Run Program" mode.

The thermostat is in "Green / Energy Save" mode and user changes operating mode on the thermostat:

1) Thermostat puts itself back into "Normal" mode, and begins using the normal set point.

2) **g!** puts the thermostat into "Run Program" mode.

(Wayne Dalton only)

The thermostat is in "Green / Energy Save" mode and user changes set point on a g! UI:

1) Thermostat stays in "Save Energy" mode.

2) The set point changes as desired.

3) **g!** stays in "Permanent Hold" mode.

The thermostat is in "Green / Energy Save" mode and user changes set point on the thermostat:

1) Thermostat stays in "Save Energy" mode.

2) The set point changes as desired.

3) **g!** stays in "Permanent Hold" mode.