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# **CT200-G1 User Guide**

**Radio Thermostat**

**Jul 29, 2019**



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### Getting Started

**Warning:** To avoid electrical shock and to prevent damage to the furnace, air conditioner, and thermostat, disconnect the power supply before installing or servicing the thermostat or any part of the system. This can be done at the circuit breaker for both the furnace and air conditioner.

- Do not reconnect electricity until work is complete.
- Do not short (jumper) across electric terminals at the control on the furnace or air conditioner to test the system. This can damage the thermostat.
- Handle with care, the thermostat is a precise instrument.
- All wiring must conform to local codes and ordinances.
- Use with 4AA alkaline batteries and/or 24-volt AC C wire (or a 12-24 AC or DC source) or millivolt gas systems.
- Each thermostat relay load should be limited to 1.0 amp. Higher amperage can cause damage to the thermostat.

**Tools** needed for installation include:

- Screwdriver Small Phillips screwdriver
- Drill with 1/4" bit (6 mm)

**Location** of Thermostat should follow these guidelines:

- Install the thermostat on an inside wall of an often-used room, about 5 ft. (1.5m) above the floor.
- Do not install where there are unusual heating conditions, such as: in direct sunlight; near a lamp, radio, television, radiator register, fireplace; near hot water pipes in the wall; or near a stove on the other side of a wall.

- Do not locate in unusual cooling conditions, such as: on a wall separating an unheated room; or in a draft from a stairwell, door, or window.
- Do not locate in a damp area This can lead to corrosion that will shorten the thermostat's life.
- Do not locate where air circulation is poor, such as: a corner, an alcove, or behind an open door.
- Do not install the thermostat until all construction and painting is complete.
- This thermostat does not require leveling.

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**Tip:** Locate the thermostat in place of the previous thermostat to avoid having to move wiring to a new location.

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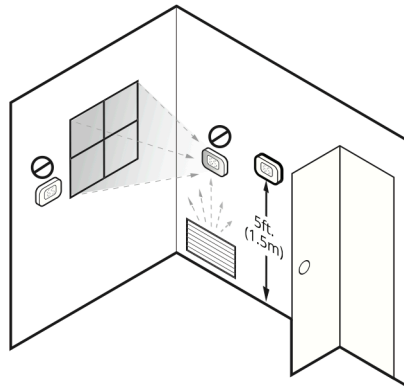


Fig. 1: Recommended Installation Location

## Wiring

**Warning:** Read instructions carefully before removing any wiring from an existing thermostat.

### Preparation

Label all wires before disconnecting them from the existing thermostat.

1. Switch off electricity to the heating and cooling systems at the circuit breaker.
2. Remove the cover from the existing thermostat. Check for locking screws on the side or front that must be loosened first.
3. Attach provided labels to each wire for identification. Refer to the lettered terminal where the wires attach; do not use the color of the wires.
4. Disconnect wires from the existing thermostat, and wind them around a pencil to keep them from falling back inside the wall.
5. Loosen all mounting screws on the old thermostat and remove it from the wall.

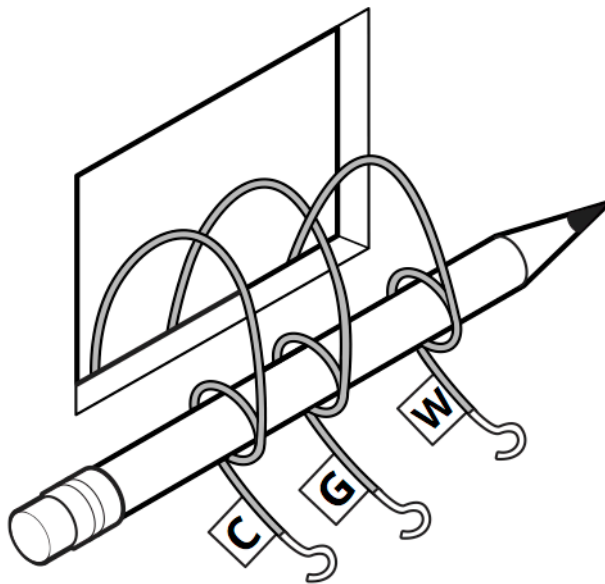


Fig. 2: Wire Preparation

## Mounting Plate

1. Carefully pull the labeled wires through the center hole in the Mounting Plate.
2. Position Thermostat for best appearance to cover the hole in the wall.
3. Mark first and drill a 1/4 in. (6mm) hole at each screw location.
4. If you are mounting the Thermostat to sheet rock or if you are using the old mounting holes, use the plastic anchors provided.
5. Attach the Mounting Plate to the wall with the screws provided.



Fig. 3: Thermostat Mounting Plate



## Prepare Wires

Make sure your wires are labeled. If necessary, find the “other end” connection for each wire on your heating or air conditioning equipment and note the label there.

- Fan out wires so that they are aligned with their terminals.
- Do not bunch wires in front of the mounting plate.
- Feed any slack back into the wall.

Follow these guidelines for safe and secure wire connections:

- Use at least 3 inches of wire for each of your connections to the Thermostat.
- Splice additional wire to allow enough slack.
- Use 16-22 awg for connection to thermostat terminal blocks.
- Remove approximately 1/8 inch of insulation from the tip of each wire.
- Take care not to damage the labels for each wire.

If you have both RH and RC connections, you must set the RC/RH Switch to OPEN. If you do not have both connections, set the switch to CLOSED.

**Warning:** Do not allow wires to touch each other or other parts on the thermostat.

## Connecting Wires

See section “Wiring Diagrams” to identify the wiring diagram for your HVAC system. If necessary, contact customer support for help.

1. Connect a labeled wire only to a matching lettered terminal.
2. Press the lever next to the terminal letter.
3. Insert the wire in the terminal as far as it will go.
4. Release the lever; the wire should be secure and not pull free easily.

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**Note:** The C-wire is optional but preferred for all installations.

The Thermostat can be externally powered with a power source rated from 12V to 24V, AC or DC, at 100ma or greater. If used, connect to the C and RH terminals (no polarity).

The 24VAC “C” wire is the other side of the 24VAC heating transformer and can be found where the other thermostat wires connect at the wall or at the furnace. Do not use the common or ground side of the line voltage.

The Thermostat runs on 4 AA alkaline batteries, the C wire (if available), or both batteries and the C-wire. If you do not have a C wire, you can run a new wire from the HVAC or use a standard 12-24V [AC or DC] wall transformer.

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## Power Supply

While the thermostat can run without batteries on C-wire power, you should install batteries as well to provide power to the unit during outages See the Thermostat Battery Cautions.

1. Install four (4) AA alkaline batteries following the marked polarity in the battery compartments. Insert the battery negative end first against the spring, then push the positive end in
2. With all the wires connected and the unit attached to the wall, it is time to turn the AC power back on Reconnect the power at the breaker you used to switch it off. The Thermostat will power-up in the OFF mode
3. Your Thermostat is not yet configured to operate your HVAC system You must now connect your thermostat to a Z-Wave Network and configure the HVAC and Heat Source settings.

### **Warning:** Batteries

- Always use new Alkaline batteries
- Do not use rechargeable batteries of any type They will not operate the thermostat properly and may lead to damage.
- Do not mix old and new batteries.
- Do not mix battery types, for example Lithium with Alkaline.
- Do not dispose of batteries in fire. Batteries may explode or leak.
- Always replace the batteries as soon as the “Low Batt” warning flashes. The thermostat is a battery-powered device; you should replace the batteries before they run out, as failure to replace batteries can result in excessive heating or cooling of your house.
- Always replace the batteries once a year, even if the “Low Batt” indicator does not flash. Replacing the batteries also helps to prevent leakage that can corrode and damage the thermostat.
- If you are leaving your home for a month or more, you should replace the batteries as a precaution against battery failure in your absence.
- Failing to replace the batteries when necessary could cause the thermostat to lose power or malfunction If the thermostat loses power, then the thermostat will not control the temperature, which could result in your HVAC system not functioning as you intended and lead to possible damage from excessive heating or cooling.
- If the thermostat batteries fail with the heat OFF, this can result in NO HEAT and possible frozen or broken pipes and water damage.
- If the thermostat batteries fail with the cool OFF, this can result in NO COOL and could cause possible damage or excessive temperatures.

## Wiring Diagrams

### 3 Wire Heat for GAS MILLIVOLT or 24VAC systems.

1. Connect the R (or RH) wire to the RH terminal (Heat Power).
2. Connect the W wire to the W terminal (Heat).
3. If available, connect the C wire to the C terminal.

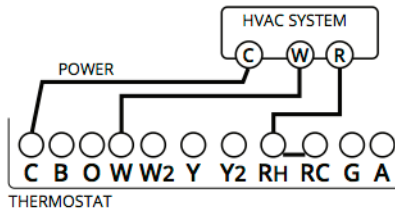


Fig. 4: Three wire HVAC system

### 4 Wire Heat for systems with HEAT with FAN.

1. Connect the R (or RH) wire to the RH terminal (Heat Power).
2. Connect the W wire to the W terminal (Heat).
3. Connect the G wire to the G terminal (Fan).
4. If available, connect the C wire to the C terminal.

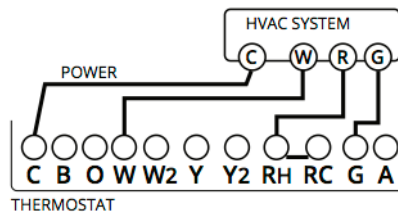


Fig. 5: Four wire HVAC system

### 5 Wire Heat/Cool for systems with HEAT and COOL and shared power.

1. Connect the W wire to the W terminal (Heat).
2. Connect the Y wire to the Y terminal (Cooling compressor).
3. Connect the RH or R wire to the RH terminal (Power).
4. Connect the G wire to the G terminal (Fan).
5. If available, connect the C wire to the C terminal.

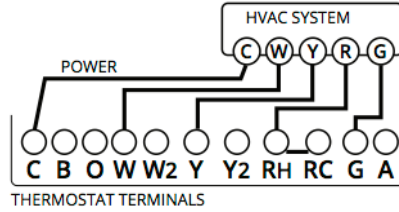


Fig. 6: Five wire HVAC system

**6 Wire Heat/Cool** for systems with HEAT and COOL and separate power.

1. Connect the W wire to the W terminal (Heat).
2. Connect the Y wire to the Y terminal (Cooling compressor).
3. Disconnect the RC and RH terminals.
4. Connect the RH wire to the RH terminal (Heat Power).
5. Connect the RC wire to the RC terminal (Cool Power). 5. Connect the G wire to the G terminal (Fan).
6. If available, connect the C wire to the C terminal.

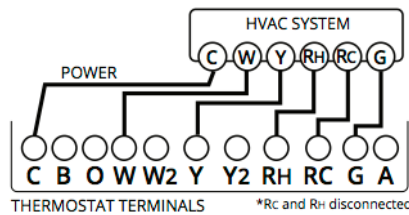


Fig. 7: Six wire HVAC system

**Multi-stage Heat/Cool** for systems with up to 2 stages of HEAT and 2 stages of COOL.

1. Connect the W and W2 wires to the W and W2 terminals (Heat).
2. Connect the Y and Y2 wires to the Y and Y2 terminals (Cool).
3. Connect the RH or R wire to the RH terminal (Power).
4. Connect the G wire to the G terminal (Fan).
5. If available, connect the C wire to the C terminal.

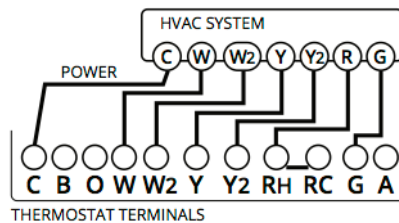


Fig. 8: Multi-Stage HVAC system

**4 Wire Heat Pump without Auxiliary Heat** for systems with up to 2 stages of compression.

**Warning:** If you have both O and B, connect only the O wire to the O terminal and DO NOT connect B to B terminal.

1. Connect the O wire to the O terminal or the B wire to the B terminal (Change-over Valve).
2. Connect the Y wire to the Y terminal (Compressor).
3. Connect the R wire to the RH terminal (Power).
4. Connect the G wire to the G terminal (Fan).
5. If available, connect the C wire to the C terminal.

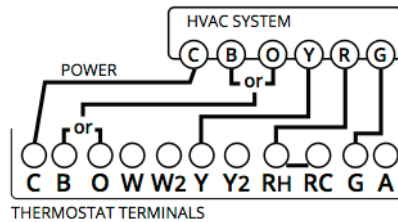


Fig. 9: Four wire Heat Pump without Auxiliary

**Multi-stage Heat Pump with Auxiliary Heat** for systems with up to 2 stages of compression and 2 stages of AUX heat.

**Warning:** If you have both O and B, connect only the O wire to the O terminal and DO NOT connect B to B terminal.

1. Connect O wire to the O terminal or the B wire to the B terminal. (Change-over Valve).
2. Connect the AUX 1 wire to the AUX 1 terminal (1st stage Auxiliary Heat).
3. Connect the AUX 2 wire to the AUX 2 terminal (2nd stage Auxiliary Heat).
4. Connect the Y and Y2 wires to the Y and Y2 terminals (Compressor).
5. Connect the R wire to RH terminal (Power).
6. Connect the G wire to the G terminal (Fan).
7. If available, connect the C wire to the C terminal.

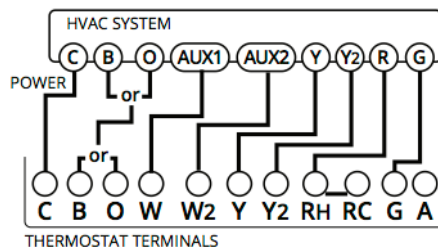


Fig. 10: Multi-Stage Heat Pump with Multi-Stage Auxiliary

**Zoned Hot Water Heat** for systems that use Solenoid or Motor valves.

**Warning:** Hydronic Systems

When controlling a hydronic heating system, configure the thermostat as HVAC Type = Radiant with Heat Type = Gas.

Use Thermostat only in Heat Mode.

The Thermostat must be powered by 24VAC. The third wire on your valve may be called 6, Y, or G (see the Wire Reference Table).

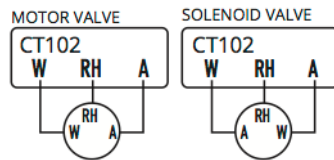


Fig. 11: Hot Water HVAC system

## Wire Reference Table

**Warning:** If there are both B and O wires (Trane pump products) DO NOT CONNECT B to B terminal. Instead, connect B to C terminal. If not a Trane product, tape off B.

Table 1: General Reference

Label	RTCOA	HVAC Function
R,V,VR	RH and RC	Single power for HEAT and COOL
RH,4	RH	Power for HEAT (RH not connected to RC)
RC	RC	Power for COOL (RH not connected to RC)
W	W	1st stage HEAT or 1st stage auxiliary heat
W2	W2	2nd stage HEAT or 2nd stage auxiliary heat
W3	W3	3rd stage HEAT or 2nd stage of 2 stage auxiliary heat
Y	Y	COOL control or 1st stage compression for heat pump
Y2	Y2	2nd stage COOL or compression for a heat pump
G,F	G	FAN control
C,X	C	24VAC power (to power thermostat)
H	H	External Humidifier
DH	DH	External De-Humidifier
EX	EX	External fresh air baffle
B	B	Heat pump changeover (cool to heat, powered in heat)
O	O	Heat pump changeover (heat to cool, powered in cool)
B and O	[WARNING]	
E	n/a	Emergency heat (do not connect, tape off)
L	n/a	System monitor (do not connect, tape off)
T	n/a	Outdoor sensor (do not connect, tape off)

Table 2: Manufacturer Specific Wiring

Manufacturer	Label	RTCOA	HVAC Function
Lenox Heat Pump	V,VR,R	RH	Power for HEAT
	M,Y	Y	COOL control
	Y,W,W2	W2	2nd stage HEAT
	F,G	G	Fan control
	R,O	O	Changeover (powered in cool)
	X,X2,C	C	24VAC power (to thermostat)
Trane (American Standard)	B	C	24VAC power (to thermostat)
	X2	n/a	Emergency heat (do not connect)



Table 3: Radiant HVAC Systems

System	Label	RTCOA	HVAC Function
Zoned Hot Water (2 Wire)	R	RH	
	W	W	
Motor Driven Valves (3 Wire)	R,5	RH	Power
	W,4	W	HEAT ON
	Y,G,6	A	HEAT OFF
Solenoid Valves (3 Wire)	R	RH	Power
	W	A	HEAT ON
	Y,G	W	HEAT OFF



### Product Overview

**Home Screen** is the default screen on the Thermostat.

Anytime the unit wakes from sleep, the screen lights up and displays the system's mode (top), the target temperature (center), and the current room temperature (bottom). Wait 10 seconds for the device to sleep, then press any button to wake it again.

When in Heat mode, the light bar at the bottom of the Thermostat glows red. When in Cool mode, it glows blue. When the unit is off, the light bar does not glow. When the system is actively heating or cooling, the colored glow flickers.

**Adjust Temperature** Press +/- to change the target temperature.

**Change Thermostat Mode** Press the side button once, then Press +/- to select mode.

**Fan Screen** enables you to change fan operation and set the fan timer.

**View Screen** Press the SIDE button twice.

**Outside Weather Screen** displays the outside temperature and outside humidity.

**View Screen** Press and Hold the side button until screen appears, then release.

**Change Screen** Press +/- to toggle between temperature and humidity.

**Menu Screen** enables you to adjust the Thermostat settings, view information about the Thermostat, and configure the Thermostat.

**View Screen** Press and Hold the side button for 5 seconds.

**Navigate Screen** Press +/- buttons to move the cursor on the screen.

**Select Item** Press the side button to make a selection.

**Go Back** Navigate to "Back" and press side button.

## Device Menu

The Device menu provides access to change temperature units, display wake-up, testing, and information.

**Units** display either Fahrenheit or Celsius temperature units.

The Thermostat can display room temperatures in a range from 28F to 99F (-2C to 37C) with increments of 0.5 (F or C).

**Display** affects the wake-up from sleep behavior of the Thermostat.

The Thermostat must be powered by C-Wire for this option. Button Tap is default mode when Thermostat is powered by AA batteries.

**Approach** Wake-up when person approaches Thermostat.

**Button Tap** Press +/- or side button to wake-up the display.

**Info** shows information about the Thermostat.

**Power Supply** the active source (batteries or 24VAC C-Wire).

**Battery Level** remaining battery power.

**HVAC Configuration** type of heating and cooling.

**Relays** the active wires being used by the system.

**Network** Z-Wave Network connection status.

**Software** versions for Thermostat (D) and Z-Wave (Z).

**Testing** runs heating or cooling for up to 30 minutes as a system test.

You can stop a test at any time by selecting Stop and pressing the side button. If Thermostat is configured for Heat Pump, the minimum time between tests is four minutes to avoid activating Compress Delay protection.

Do not test Cooling if the outside temp is below 65F.

**Time** duration of test in minutes and seconds.

**Active** wires the system with the heating system.

**Change** the temperature change caused during the test.

A successful test is:

- Positive temperature change if Heating.
- Negative temperature change if Cooling.
- Proper wires active.

An unsuccessful test suggests:

- Check the wire connections
- Verify HVAC system configuration

## Configure Menu

The Configure Menu provides access to set the HVAC system, comfort control settings, and network settings.

**Equipment** Be sure to turn the thermostat operating mode to OFF before changing HVAC setup

**Heating** menu configures heat type, heat fuel, and stages.

If Heat Pump type, additional menu options are available.

**Type** Forced Air, Heat Pump, Radiant

**Fuel** Natural Gas, Propane, Fuel Oil, Geothermal, and Electric For Heat Pump

**Stages** 1(single), 2(dual). If Heat Pump, additional stages available 1 + Auxiliary, 2 + Auxiliary, and 2 + 2 Auxiliary.

**O/B Wire** O activated for Cool, B activated for Heat.

**Cooling** menu configures cooling type and cooling stages

**Type** Air Conditioning, Heat Pump, or Evaporate.

**Stages** 1(single) or 2 (dual).

**Network** joins or unjoins the Thermostat to a Z-Wave Network.

Before starting this procedure, go to your Z-Wave controller and prepare it for new devices.

**Connect** joins the Z-Wave network.

**Disconnect** unjoins the Z-Wave network.

**Calibrate** offsets the temperature measurement.

Calibration range is -5.0 to +5.0 degrees.

**Cycling** sets an offset to the current room temperature before the heating or cooling system will turn on.

The Cycling can be from 0.5F to 4.0F. For example, if Cycling is set to 2.0F and the Thermostat is set to 70F target temperature, the heat cycle will start when the room temperature drops to 68F. Similarly, the cooling system will start when the room temperature increases to 72F. The HVAC runs until the room reaches the target temperature, and then shuts off.

**Staging** sets an offset from the room temperature at which the next stage in multi-stage systems will engage to bring the room temperature back to the target temperature.

The default is 2 degrees Fahrenheit, and the range is 2 degrees Fahrenheit to 6 degrees Fahrenheit.

**Reset** clears Z-Wave settings and restores Z-Wave settings to factory default.

Reset does not affect Thermostat settings.

Use this procedure only if the Z-Wave network primary controller is missing or inoperable.

The Thermostat automatically resets and reboots the Z-Wave radio. You will need to reconnect the Thermostat to your Z-Wave network.

## Thermostat Warnings

**Compressor Protection Warning** indicates compressor protection is active.

The Home screen shows an hour glass and the message “Please Wait”. The Thermostat has a minimum cycle time of four (4) minutes to protect your compressor from excessive wear from responding to thermostat changes. The compressor will restart after the four-minute delay.

**Low Battery Warning** indicates battery voltage is low.

The Thermostat displays this screen when the batteries are running low on charge and should be replaced. This screen will only display once per day the first time the screen wakes.

**Dismiss Warning** Press the side button.

**Eliminate Warning** Replace the batteries.

1. Turn the thermostat mode to OFF (from heat or cool).
2. Remove Thermostat from mounting plate.
3. Replace the batteries.
4. Replace Thermostat to mounting plate.
5. Adjust the thermostat mode as desired.

Your settings will be retained and the thermostat will automatically reconnect to the Z-Wave Network

**Network Disconnected Warning** indicates the thermostat has lost the connection to the Z-Wave network.

This screen will only display once per day the first time the screen wakes.

**Dismiss Warning** Press the SIDE button.

**Connect Network** Navigate to the Menu Screen > Configure > Network, and follow the procedure to include the Thermostat to the Z-Wave network.

**Firmware Updating Warning** indicates an active firmware upgrade.

Wait until the firmware update is complete before attempting to use the Thermostat.

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### Z-Wave Reference

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The Thermostat can work in the same network with any other certified Z-Wave device, regardless of manufacturer or vendor. See your specific Z-Wave controller User Manual for detailed instructions on operating your thermostat through the network.

**Include** in a Z-Wave Network.

SmartStart enabled products can be added into a Z-Wave network by scanning the Z-Wave QR Code present on the product with a controller providing SmartStart inclusion. No further action is required and the SmartStart product will be added automatically within 10 minutes of being switched on in the network vicinity.

The SmartStart QR Code is located on the back of the thermostat. The SmartStart QR Code is also located on the outside of the product packaging.

The thermostat is a Z-Wave Plus compliant thermostat. It has an onboard radio that can be added to an existing Z-Wave network. This device can be used on a network with products from different vendors.

Alternative to SmartStart, the thermostat can be added by:

1. Set your primary controller to **INCLUDE** mode to add the thermostat as a node on your network (see your specific controller's User Manual for detailed instructions).
2. The thermostat main screen shows a welcome message. Press the **SIDE** button to continue.
3. Press the **SIDE** button to initiate the inclusion process. This initiates the network connection process. If inclusion fails, the screen says "Failed". Press the **SIDE** button to try adding again.
4. When the thermostat has been successfully included to a Z-Wave network, the screen displays a confirmation. Press the **SIDE** button to continue. You can now configure the thermostat to work with your HVAC system.
5. Your primary controller should indicate that the thermostat was successfully added to its network (see your specific controller's User Manual for details).

**Exclude** from a Z-Wave Network.

The thermostat can be removed from the Z-Wave network process similar to the inclusion process. Set your primary controller to EXCLUDE.

**Z-Wave Repeater** functionality is enabled for all line powered devices in a Z-Wave network.

When power is first applied to this device it will broadcast a Hail message followed by a Node Information frame. This behavior is to maintain backwards compatibility with older controllers that work with this line of devices.

The Thermostat's node type is fixed when it is included to the Z-Wave network; if the C-Wire is not connected and is only battery-powered when including to the network, the Thermostat will remain a frequent listening routing slave (FLIRS) node until it is removed from the network.

When your thermostat is running on battery power, the Z-Wave radio will turn off to help conserve battery life. The Thermostat Z-Wave radio module supports Z-Wave beaming, which allows other devices in the network to wake up the Z-Wave module and accept commands and then go back to sleep.

When your thermostat is running on C-Wire power, the Z-Wave radio will stay on and actively help route messages within the Z-Wave network. The thermostat's node type is fixed when it is included to the Z-Wave network; if the C-Wire is present and powered when including to the network, the thermostat will remain an always-listening node until it is removed from the network

**Security 2** is supported by this device.

Table 1: Supported Command Classes

Category	Command Class	Security Level
Application	Basic	n/a
Application	Configuration	Authenticated
Application	Multilevel Sensor	Authenticated
Application	Thermostat Fan Mode	Authenticated
Application	Thermostat Fan State	Authenticated
Application	Thermostat Mode	Authenticated
Application	Thermostat Operating State	Authenticated
Application	Thermostat Setpoint	Authenticated
Management	Association	Authenticated
Management	Association Group Info	Authenticated
Management	Battery	Authenticated
Management	Device Reset Locally	Authenticated
Management	Firmware Update Meta Data	Authenticated
Management	Manufacturer Specific	Authenticated
Management	Version	Authenticated
Management	Z-Wave Plus Info	non-secure
Network	Powerlevel	Authenticated
Transport	Security S2	non-secure
Transport	Supervision	non-secure
Transport	Transport Service	non-secure

**Lifeline** is supported by this device.

The device only supports Association Group 1, which can hold up to 2 nodes.

If at least one node is added to association group one (1), the thermostat will send the following reports when the respective state has changed:

- Basic Report



- Battery Report
- Device Reset Locally
- Sensor Multilevel Report
- Thermostat Mode Report
- Thermostat Operating State Report
- Thermostat Setpoint Report
- Fan Mode Report
- Fan State Report
- Configuration Report

These can be accessed via an Association Group Info Command List Get for group 1 (Lifeline).

**Basic Command Class** is supported by this device.

The Thermostat supports this as a stateful flag. The flag does not affect the thermostat operation.

The Thermostat supports compliant mapping of the Z-Wave BASIC\_COMMAND\_CLASS to the Thermostat “Energy Saving” and “Comfort Mode” as follow:

- Basic Set (Value = 0x00) = Set Energy Saving Mode
- Basic Set (Value = 0xFF) = Set Comfort Mode

**Configuration Command Class** is supported by this device.

The Configuration Command Class allows product specific configuration parameters to be changed.

Table 2: Summary of Configuration Parameters

Parameter (8-bit)	Name
0x01	<i>Temperature Reporting Threshold</i>
0x02	<i>HVAC Settings</i>
0x03	<i>Utility Lock</i>
0x04	<i>Thermostat Power Source</i>
0x05	<i>Humidity Reporting Threshold</i>
0x06	<i>Auxiliary Heat</i>
0x07	<i>Thermostat Swing</i>
0x08	<i>Thermostat Differential</i>
0x09	<i>Thermostat Recovery Mode</i>
0x0A	<i>Temperature Reporting Filter</i>
0x0B	1
0x0C	1
0x0D	1
0x0E	1
0x0F	<i>Fan Timer</i>
0x10	1
0x11	<i>Temperature Calibration</i>
0x12	<i>Display Units</i>

### Temperature Reporting Threshold

<sup>1</sup> Not supported at this time to preserve backwards compatibility with v11.x.

The Temperature Reporting Threshold parameter specifies the threshold change in the ambient air temperature as detected by the thermostat to generate an unsolicited report when association reporting is enabled.

Table 3: Temperature Reporting Threshold

Name	Value
Parameter (8-bit)	0x01
Size (3-bit)	0x01
Configuration Values (8-bit)	<i>Valid Thresholds</i>

Configuration values are bit-encoded. Unsupported values will be ignored.

Table 4: Valid Thresholds

Value	Configuration
0x00	Disable Reporting
0x01	0.5 degrees Fahrenheit
0x02	<b>1.0 degrees Fahrenheit (DEFAULT)</b>
0x03	1.5 degrees Fahrenheit
0x04	2.0 degrees Fahrenheit

### HVAC Settings (Get Only)

The HVAC Settings parameter contains a read-only description of the HVAC settings of the thermostat.

Table 5: HVAC Settings

Name	Value
Parameter (8-bit)	0x02
Size (3-bit)	0x04
Configuration Values (32-bit)	<p><b>Byte N = Upper Nibble, Lower Nibble</b></p> <ul style="list-style-type: none"> <li>• Byte 1 = Cooling Type, Heating Type</li> <li>• Byte 2 = Heating Fuel, Heat/Aux Stages</li> <li>• Byte 3 = A Terminal, Heat Pump Stages</li> <li>• Byte 4 = O/B Terminal, Cooling Stages</li> </ul>

The Configuration Values are bit-encoded. Each nibble contains the configuration as programmed by the user on the thermostat.

Table 6: Configuration Value Value

Name	0000	0001	0010	0011	0100	0101
Cooling Type	None	AirCon	Heat-Pump	Evaporative	n/a	n/a
Heating Type	None	ForcedAir	Heat-Pump	Radiator	n/a	n/a
Heating Fuel	n/a	Gas	Electric	Oil	Geothermal	Propane
Heat/Aux Stages	n/a	1	2		n/a	n/a
A Terminal	n/a	Humidify	Dehumidify	EX	W3	n/a
Heat Pump Stages	None	1	2		n/a	n/a
O/B Terminal	n/a	O	B		n/a	n/a
Cooling Stages	None	1	2		n/a	n/a

### Utility Lock

The Utility Lock parameter enables or disables the utility lock. If the utility lock is enabled, the thermostat setpoint cannot be modified by the user on the thermostat physical user interface.

Table 7: Utility Lock

Name	Value
Parameter (8-bit)	0x03
Size (3-bit)	0x01
Configuration Values (8-bit)	<i>Lock State</i>

Configuration values are bit-encoded. Unsupported values will be ignored.

Table 8: Lock State

Value	Configuration
0x00	<b>Disabled lock (DEFAULT)</b>
0x01	n/a
0x02	n/a
0x03	Enabled lock

### Thermostat Power Source (Get Only)

The Thermostat Power Source parameter is a read-only status of the thermostat power source. The Power Source is either C-Wire or batteries. C-Wire is the power source if both C-Wire and batteries are present. The power source is fixed when the thermostat joins the Z-Wave network.

Table 9: Power Source

Name	Value
Parameter (8-bit)	0x04
Size (3-bit)	0x01
Configuration Values (8-bit)	<i>Source</i>

Configuration values are bit-encoded.

Table 10: Source

Value	Configuration
0x01	C-Wire
0x02	Batteries

### Humidity Reporting Threshold

The Humidity Reporting Threshold parameter specifies the threshold change in the relative humidity as detected by the thermostat to trigger an unsolicited report when association reporting is enabled.

Table 11: Humidity Reporting Threshold

Name	Value
Parameter (8-bit)	0x05
Size (3-bit)	0x01
Configuration Values (8-bit)	<i>Threshold</i>

Configuration values are bit-encoded.

Table 12: Threshold

Value	Configuration
0x00	Disabled Reporting
0x01	<b>3% Relative Humidity (DEFAULT)</b>
0x02	5% Relative Humidity
0x03	10% Relative Humidity

### Auxiliary Heat

The Auxiliary Heat parameter enables or disables Thermostat Mode called Auxiliary Heating in the thermostat while the thermostat mode is Heat.

Enabling Auxiliary Heat parameter will only use the auxiliary heating HVAC subsystem to maintain the room temperature using the thermostat heating setpoint. The heat pump will not be used to maintain the room temperature.

Auxiliary heating is only available if the thermostat is configured in heat pump mode and with at least one stage of auxiliary heating. This command should only be used on thermostats that support Auxiliary Heat thermostat mode.

Table 13: Auxiliary Heat

Name	Value
Parameter (8-bit)	0x06
Size (3-bit)	0x01
Configuration Values (8-bit)	<i>Auxiliary Heat</i>

Configuration values are bit-encoded.

Table 14: Auxiliary Heat

Value	Configuration
0x00	<b>Disabled auxiliary heat (DEFAULT)</b>
0x01	Enabled auxiliary heat

## Thermostat Swing

The Thermostat Swing Temperature parameter specifies the swing temperature on the thermostat. The swing temperature is applied to the setpoint to determine when the thermostat will turn on the HVAC system. If the thermostat is heating, the swing temperature is subtracted from the heat setpoint. If the thermostat is cooling, the swing temperature is added to the cool setpoint.

Table 15: Auxiliary Heat

Name	Value
Parameter (8-bit)	0x07
Size (3-bit)	0x01
Configuration Values (8-bit)	<i>Swing Temperature</i>

Configuration values are bit-encoded. Unsupported values will be ignored.

Table 16: Swing Temperature

Value	Configuration
0x00	not supported
0x01	0.5 degrees Fahrenheit
0x02	<b>1.0 degrees Fahrenheit (DEFAULT)</b>
0x03	1.5 degrees Fahrenheit
0x04	2.0 degrees Fahrenheit
0x05	2.5 degrees Fahrenheit
0x06	3.0 degrees Fahrenheit
0x07	3.5 degrees Fahrenheit
0x08	4.0 degrees Fahrenheit

## Thermostat Differential

The Thermostat Differential Temperature parameter specifies the differential temperature for multi-stage HVAC systems.

The *Configuration Set Command* is used to set the value of a configuration parameter.

Table 17: Set Command for Thermostat Differential Temperature

Name	Value
Parameter (8-bit)	0x08
Size (3-bit)	0x02
Configuration Values (16-bit)	<ul style="list-style-type: none"> <li>• Byte 1 = <i>Differential Mode</i></li> <li>• Byte 2 = <i>Differential Temperature</i></li> </ul>

The thermostat uses a separate differential temperature for HEAT mode and COOL mode.

Table 18: Differential Mode

Value	Configuration
0x00	<b>Heat Mode (DEFAULT)</b>
0x01	Cool Mode

Differential Temperature is the threshold when the thermostat will turn on additional stages.

Table 19: Differential Temperature

Value	Configuration
0x04	<b>2.0 degree Fahrenheit (DEFAULT)</b>
0x06	3.0 degree Fahrenheit
0x08	4.0 degree Fahrenheit
0x0A	5.0 degree Fahrenheit
0x0C	6.0 degree Fahrenheit

**Warning:** Default factory settings do not adjust the Cool Mode differential.

**Warning:** The differential temperature must be an integer value. Non-integer values, such as 1.5F (0x03), should not be used.

**Warning:** If the thermostat is not configured for multistage HVAC systems then these parameters have no effect.

This *Configuration Report Command* command is used to advertise the actual value of the advertised parameter.

Table 20: Report Command for Thermostat Differential Temperature

Name	Value
Parameter (8-bit)	0x08
Size (3-bit)	0x02
Configuration Values (16-bit)	<ul style="list-style-type: none"> <li>• Byte 1 = Heating <i>Differential Temperature</i></li> <li>• Byte 2 = Cooling <i>Differential Temperature</i></li> </ul>

**Warning:** Unlike the Set Command, the Configuration Report returns the Differential Temperature for both the Heat Mode and Cool Mode. The Configuration Report does not explicitly return the Differential Mode.

### Thermostat Recovery Mode

The Thermostat Recovery Mode parameter specifies the HVAC recovery mode type. The recovery mode determines when additional HVAC stages are turned off as the ambient temperature returns to the target temperature.

**Fast Mode** The thermostat will leave all stages on (assuming they were already on) until the ambient temperature reaches the target temperature.

**Economy Mode** The thermostat will turn off additional HVAC stages when the ambient temperature reaches the target temperature plus/minus the differential temperature.

Table 21: Thermostat Recovery Mode

Name	Value
Parameter (8-bit)	0x09
Size (3-bit)	0x01
Configuration Values (8-bit)	<i>Recovery Mode</i>

Configuration values are bit-encoded.

Table 22: Recovery Mode

Value	Configuration
0x01	Fast Mode
0x02	<b>Economy Mode (DEFAULT)</b>

### Temperature Reporting Filter

The Temperature Reporting Filter parameter specifies the upper and lower bounds of the ambient temperature reporting. The thermostat will not report ambient temperature changes if the ambient temperature is below the upper bound or above the lower bound. The thermostat will only send ambient temperature changes if the thermostat has been added to an association group and the temperature reporting threshold is non-zero.

The *Configuration Set Command* is used to set the value of a configuration parameter.

Table 23: Thermostat Recovery Mode Set Command

Name	Value
Parameter (8-bit)	0x0A
Default Value (1-bit)	If set, then Disabled using - Upper Bound = 0F - Lower Bound = 124F
Size (3-bit)	0x04
Configuration Values (32-bit)	<ul style="list-style-type: none"> <li>• Byte 1 = Lower Bound <i>Temperature Scale</i></li> <li>• Byte 2 = Lower Bound <i>Temperature Filter</i></li> <li>• Byte 3 = Upper Bound <i>Temperature Scale</i></li> <li>• Byte 4 = Upper Bound <i>Temperature Filter</i></li> </ul>

The Scale (2-bites) field indicates the temperature scale. The Scale is encoded in bit 4 and bit 5 of the byte. For example, binary 00000001 indicates Scale is Celsius, and binary 00001001 indicates Scale is Fahrenheit.

Additional bit-encoded information with Scale. In addition, upper three bits indicate the precision and are always 0x00. In addition, lower three bits indicate the size and are always 0x01

Table 24: Temperature Scale

Value	Configuration
0x00	Celsius
0x01	Fahrenheit

The Temperature Filter (8-bit) field thermostat will report ambient temperature changes for temperature values less than the lower bound and greater than the upper bound.

Table 25: Temperature Filter

Value	Configuration
0x00	<b>0 degree Fahrenheit (DEFAULT, upper bound)</b>
0xXX	X degree Fahrenheit
0x7C	<b>124 degrees Fahrenheit (DEFAULT, lower bound)</b>

The *Configuration Report Command* is used to advertise the actual value of the advertised parameter.

Table 26: Report Command for Thermostat Recovery Mode

Name	Value
Parameter (8-bit)	0x0A
Configuration Values (32-bit)	<ul style="list-style-type: none"> <li>• Byte 1 = Lower Bound <i>Temperature Filter</i></li> <li>• Byte 2 = Upper Bound <i>Temperature Filter</i></li> </ul>

### Fan Timer

This configuration is used to activate the fan with an automatic shut-off timer. Sending the thermostat a Get request for this parameter will cause the thermostat to respond with a Configuration Report containing the original time it was set to. When the Fan Timer value is changed through the Thermostat's UI, this parameter will be sent to the association group as an unsolicited message. The valid values for this parameter are listed below:

Table 27: Fan Timer

Name	Value
Parameter (8-bit)	0x0B
Size (3-bit)	0x01
Configuration Values (8-bit)	<i>Timer</i>

Configuration values are hexadecimal representations of decimal values.

Table 28: Timer

Value	Configuration
0x00	<b>Always On (DEFAULT)</b>
0x0F	15 minutes
0x1E	30 minutes
0x3C	60 minutes

### Temperature Calibration

Temperature Calibration parameter specifies the offset applied to the measured value of the thermostat. For example, an offset of +1 degree Fahrenheit to a measured 65 degree Fahrenheit would cause the thermostat to display and report 66 degree Fahrenheit.



Table 29: Temperature Calibration

Name	Value
Parameter (8-bit)	0x0D
Size (3-bit)	0x01
Configuration Values (8-bit)	<i>Offset</i>

Offset is a signed integer ranging from -6.0 degrees Fahrenheit to +6.0 degrees Fahrenheit.

Table 30: Offset

Value	Binary	Configuration
0xFA	11111010	-6.0 degree Fahrenheit
0xFB	11111011	-5.0 degree Fahrenheit
0xFC	11111100	-4.0 degree Fahrenheit
0xFD	11111101	-3.0 degree Fahrenheit
0xFE	11111110	-2.0 degree Fahrenheit
0xFF	11111111	-1.0 degree Fahrenheit
0x00	00000000	<b>+0.0 degree Fahrenheit (DEFAULT)</b>
0x01	00000001	+1.0 degree Fahrenheit
0x02	00000010	+2.0 degree Fahrenheit
0x03	00000011	+3.0 degree Fahrenheit
0x04	00000100	+4.0 degree Fahrenheit
0x05	00000101	+5.0 degree Fahrenheit
0x06	00000110	+6.0 degree Fahrenheit

**Warning:** The offset must be an integer value. Non-integer values, such as 1.5F (0x03), should not be used.

## Display Units

The Display Units parameter specifies the unit of measurement used by the device to display temperature.

Table 31: Display Units

Name	Value
Parameter (8-bit)	0x0E
Size (3-bit)	0x01
Configuration Values (8-bit)	<i>Display Units</i>

Configuration values are bit-encoded.

Table 32: Display Units

Value	Configuration
0x00	<b>Fahrenheit (DEFAULT)</b>
0x01	Celsius

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**FCC Warning**

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception (which can be determined by turning the equipment off and on), try to correct the interference by following these suggestions:

- Reorient or relocate the receiving antenna.
  - Increase the separation between the equipment and receiver.
  - Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
  - Consult the dealer or an experienced radio/TV technician for help.
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**Statement Of Use**

Compatible with all popular residential HVAC systems: 24VAC single stage and two stage conventional heating systems (gas, oil, electric), heat pumps with up to two stages of heat and up to two stages of auxiliary heat (electric or fossil), zoned forced air and zoned hot water (2 or 3 wire), millivolt systems (with a 12- 24V AC or DC source), one or two stage cooling, and hybrid systems. Do not use this thermostat with line voltage heating systems.

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