

# Install Guide CT20e

## Radio(( ))Thermostat

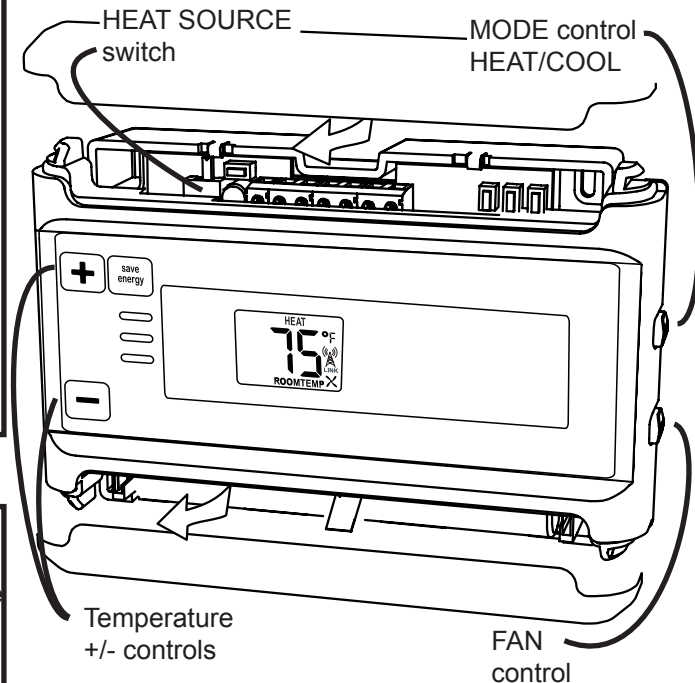
Radio Thermostat Company of America

### ! Caution

- Your thermostat is a precise instrument, handle it with care.
- Turn off electricity to the HVAC system before installing or servicing thermostat or any part of the system.
- Do not turn electricity back on until work is completed.
- Do not short (jumper) across electric terminals at the control on the furnace or air conditioner to test the system. This may damage the thermostat.
- All wiring must conform to local codes and ordinances.
- This thermostat is designed for use with 3AA batteries and/or 24 volt AC (C wire) or a 24VAC adapter) or millivolt gas systems. Each thermostat relay load should be limited to 1.0 amp; higher amperage may cause damage to the thermostat.

### ! Caution

To avoid electrical shock and to prevent damage to the furnace, air conditioner, and thermostat, disconnect the power supply before beginning work. This can be done at the circuit breaker.



ENGLISH

## TOOLS

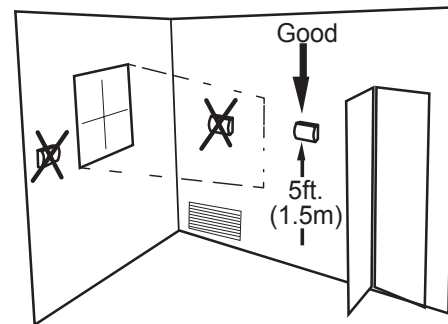
You will need a small Phillips screwdriver and a drill with 3/16-in. (4.8mm) bit for wall mounts.

## LOCATION

Replacement installations - mount the CT20e in place of the thermostat. A new location will require moving your wiring.

New installations and for re-locating the CT20e - follow the guidelines listed below:

- Locate the thermostat on an inside wall, about 5 ft. (1.5m) above the floor, and in a room that is used often.
- Do not install it where there are unusual heating conditions, such as: in direct sunlight; near a lamp, radio, television, radiator register, fireplace; near hot water pipes in a 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 thermostat life.
- Do not locate where air circulation is poor, such as: in a corner, an alcove; behind an open door.
- Do not install the CT20e until all construction and painting has been completed.
- This thermostat does not require leveling.



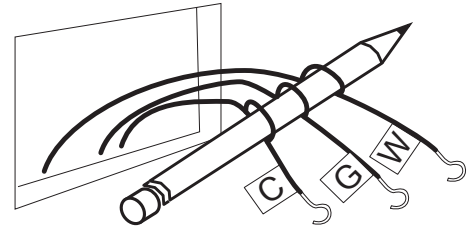
## REMOVE OLD UNIT

- ⚠ Switch OFF electricity to the furnace and air conditioner; then follow these steps.
- Remove cover from old thermostat. Most are snap-on types and simply pull off. Some have locking screws on the side or front. These must be loosened. DO NOT remove wires. Note the letters printed near the terminals. Attach labels (enclosed) to each wire for identification.

### ⚠ Caution

Read instructions carefully before removing any wiring from existing thermostat. Wires must be labeled before they are removed. **THERE IS NO STANDARD COLOR CODE.** When removing wires from their terminals, ignore the color of the wires and **LABEL THEM** by the lettered terminal where they were screwed.

- Label the wires one at a time. You must label all the wires before you proceed. With all wires labeled, remove them from the old unit.
- Make sure the wires do not fall back inside the wall. You can wind them around a pencil to keep them from falling.
- Loosen all screws on the old thermostat and remove it from the wall.

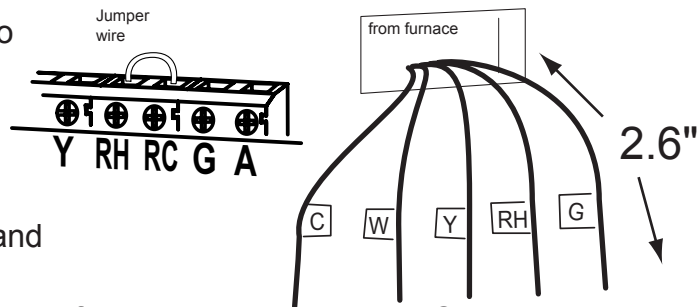


## What wires do you have?

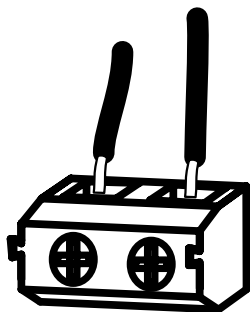
Make sure your wires are labeled. This may require you to find the 'other end' connection for each wire on your heating or air conditioning equipment and read the label there. Refer to the Wire Reference pages 14-16 for better understanding of wire labels from different HVAC system makers.

**⚠ IMPORTANT:** The CT20e runs on 3 AA alkaline batteries and/or the C wire if available. If you do not have a C wire you can run a new wire from the HVAC or use standard 24VAC wall transformer. 24VAC is required when using a radio module.

**⚠ IMPORTANT:** If you have both RH and RC you need to remove the jumper wire between these 2 terminals.



## Prepare wires



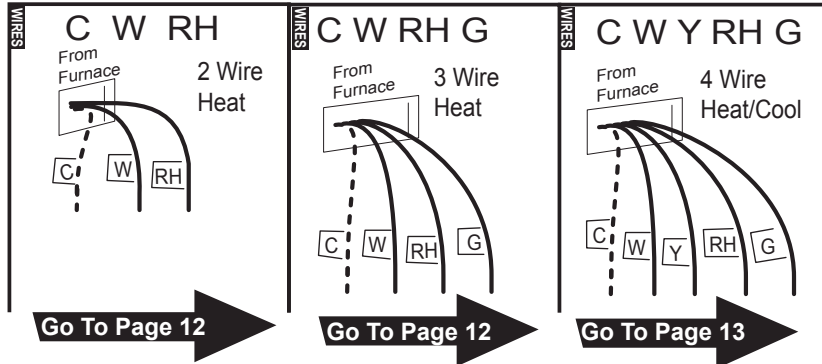
Wire Terminals

Please follow these guidelines for safe and secure wire connections:

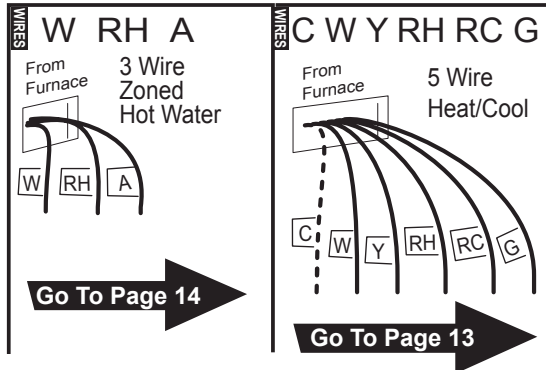
- You will need at least 2.6" of wire for each of your connections to the CT20e.
- If you do not have enough wire, splice additional wire to allow enough slack.
- Fan out wires below the hole as shown.
- Remove insulation 1/8" from the tip of each wire.
- Take care not to damage the labels for each wire in handling.
- Fan wires out as illustrated with CT20e below the wall opening.

## Find the set-by-step diagram for your system

- Select the reference page with your wiring diagram and jumper set-up information below.



- If your combination of wires is not above you can use the wiring table on pages 16 to determine your connections, contact technical support for help.



As in the example: fan out the wires so that the C wire is above the C terminal the W above the W. This allows the CT20e to fit snug to the wall.

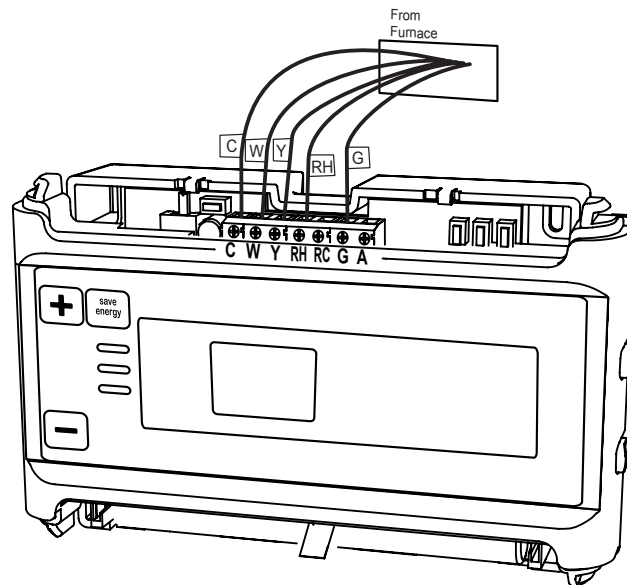
## **! Caution**

Do not allow wires to touch each other or parts on thermostat.

- Wires will position behind the CT20e and up over the terminal area.
- Do not bunch wires behind CT20e. Feed any slack back into the wall opening.

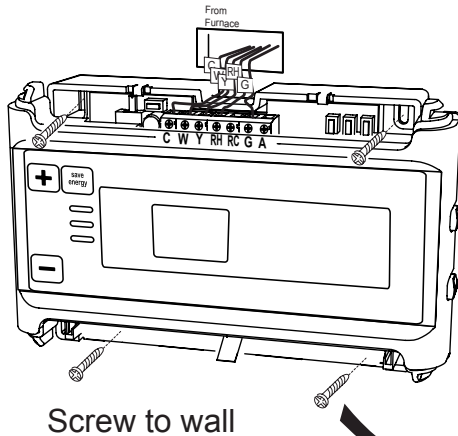
## **Connect your wires**

- Connect labeled wires only to a terminal with the same letter label.
- Insert the wire in the terminal well and tighten the screw securely.
- If a 24VAC transformer [Radio Shack PN273-1690] is used, connect to the C and RH terminals (no polarity).

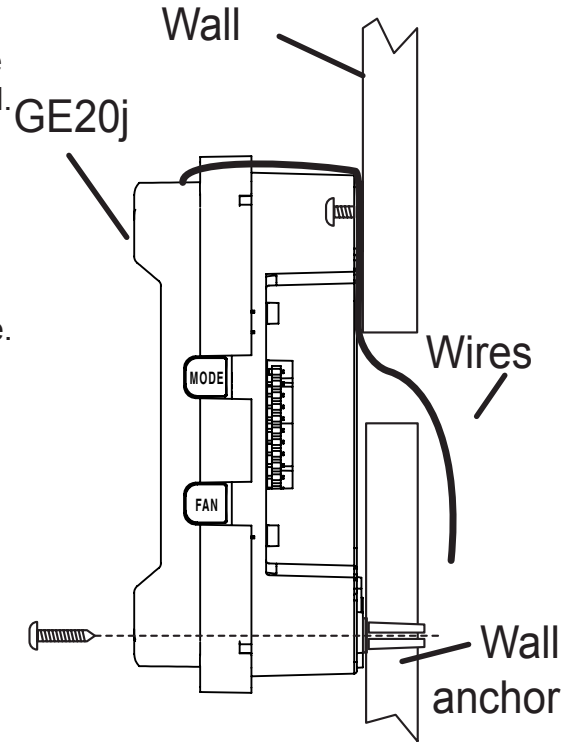
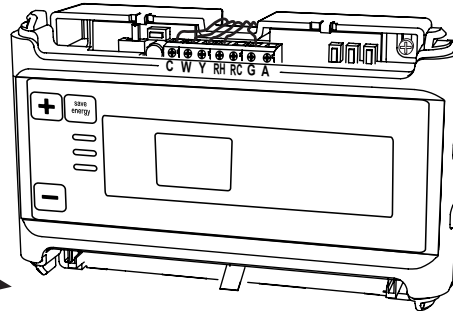


## Mount the CT20e to wall

1. Hold the CT20e against the wall, with the wires coming over the top above terminal block. The CT20e will cover the hole in the wall.
2. Position CT20e for best appearance.
3. Attach the CT20e to the wall with the screws provided.
4. If you are mounting the CT20e to sheet rock or if you are using the old mounting holes, use the plastic anchors provided.
5. Mark first and drill a 3/16-in.(4.8mm) hole for the insert at each screw location, then mount the CT20e.

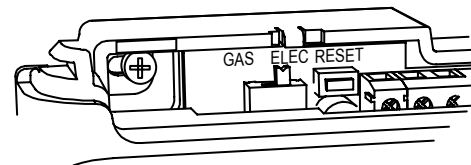


place wires like this



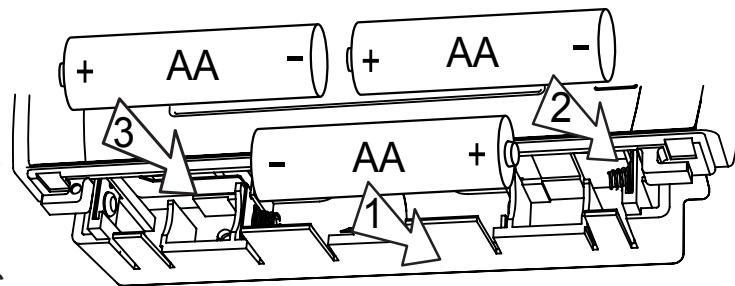
## Heat Source Selection

- Put the **HEAT SOURCE** switch in the **GAS** position if you have or Gas or oil heat. Put the **HEAT SOURCE** in the **ELEC** position if you have electric heat.
- When finished push RESET.



## Install 3 AA Batteries

- The CT20e requires 3 AA batteries to operate .
- Install 3 AA batteries following the marked polarity in the battery compartment. Put the lower battery negative end first against the spring.



With all the wires connected it is time to turn the AC power back on. Do this at the breaker you used to switch it off. The CT20e will power-up in the control OFF mode. Be sure the HEAT source switch is in the proper position for your heat type; GAS for gas or oil heat, or ELEC for electric heat.

- Press the RESET button (under top cover) to set heat type and clear memory. (REQUIRED)
- Replace top and bottom covers on unit.

## **⚠ IMPORTANT: Special Battery Warning**

Always replace the batteries as soon as the “Lo - BaT” flashes. The thermostat is a battery powered device, you must be responsible to replace batteries before they run out. Failure to replace batteries can result in overheating or excessive cooling of your house.

- Even if the low battery indicator does not flash, you should always replace the batteries at least once a year. 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.
- Always use new alkaline batteries.
- 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 overheating or excessive cooling.
- If the thermostat batteries fail with the cool OFF, this can result in NO COOL and could cause possible damage or excessive temperatures. If the thermostat batteries fail with the cool ON, this can result in continuous cooling and possible damage.
- If the thermostat batteries fail with the heat ON, this can result in an over heat and possible damage. If the thermostat batteries fail with the heat OFF, this can result in NO HEAT and possible frozen or broken pipes and water damage.

## Test Installation

Follow these procedures to verify you have correctly installed the CT20e.

### **TO CHECK FAN** (If you connected the G wire):

Push the fan button; the fan icon will be on screen.

Verify that air is blowing from the system.

Push the fan button again to shut off manual fan.

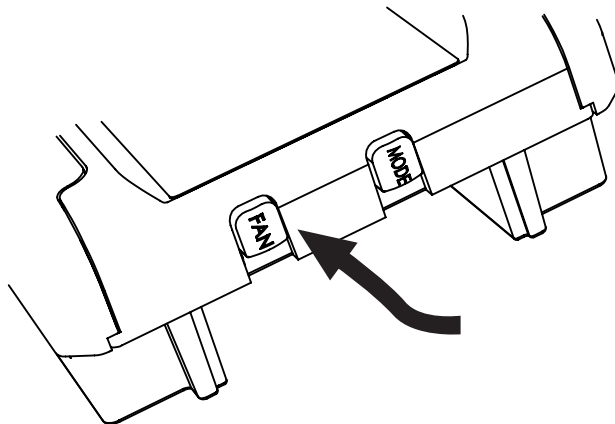
### **TO CHECK HEAT**

Press the mode button and select heat.

Press the **+** button to raise the target temp to 90°F; allow the system 2 minutes to respond.

Verify that heat is blowing from the system.

Return mode to OFF



### **TO CHECK COOL** mode (do not operate AC if outside temp is below 65°F):

Press the mode button and select **COOL**.

Press the **-** button to lower the cool target temperature to 50°F.

Allow the system 5 minutes to respond.

Verify that cool air is blowing from the system.

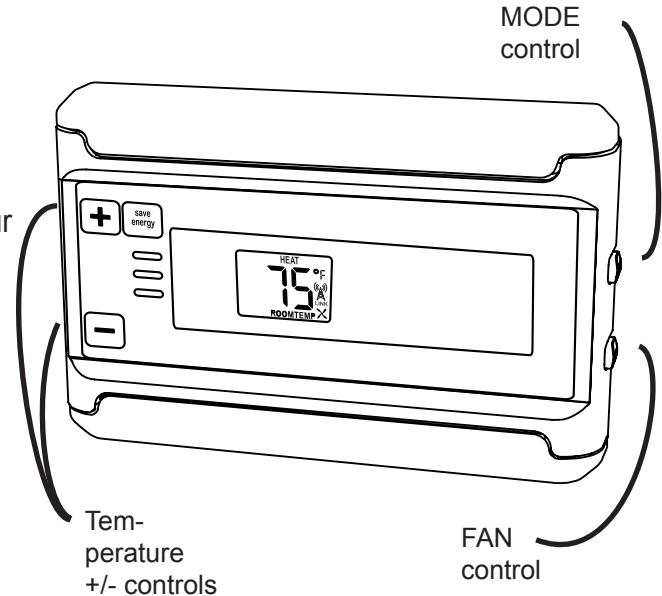
Return mode to OFF

**Congratulations, you have successfully installed your unit. Please proceed to the OPERATING Guide to initialize the CT20e.**

**⚠ IMPORTANT:** After you have labeled and connected your wires, and followed the correct HVAC set-up, if these check procedures do not operate your system, contact technical

support. This thermostat can be used with 3AA batteries, 24VAC (C wire), 24VAC adapter and millivolt heating and all cooling systems. It cannot be used with line voltage systems. This thermostat is digital and your desired heat or cool temperatures can easily be set on the large touch screen with the +/- buttons. A minimum 4 minute off time protects the cooling compressor from damage.

This thermostat runs on 3AA batteries. It can also run on the HVAC systems 24VAC (C wire) or external 24VAC transformer connected to the C and RH terminals. 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.



## Set-by-step wiring diagrams

### **C W RH** 2 wire heat GAS MILLIVOLT or 24VAC system

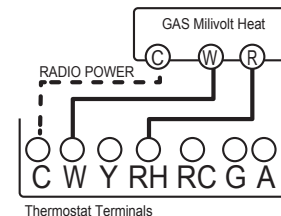
STEP 1 - Connect the R (or RH) wire to the RH terminal. This connects the Heat Power.

STEP 2 - Connect the W wire to the W terminal. This connects the heat.

STEP 3 - Set heat type to GAS for gas or oil, to ELEC for electric

Your Heater is now connected to the CT20e.

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### **C W RH G** 3 Wire Heat

STEP 1 - Connect the R (or RH) wire to the RH terminal. This connects the Heat Power .

STEP 2 - Connect the W wire to the W terminal. This connects the heat.

STEP 3 - Connect the G wire to the G terminal on the thermostat. This connects the Fan.

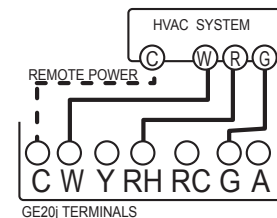
STEP 4 - Set heat type

If you have gas or oil heat set the HEAT TYPE to GAS

If you have electric heat, set the HEAT TYPE to ELEC

Your system is now connected to the CT20e.

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**WIRING** **C W Y RH G** **4 Wire Heat/Cool**

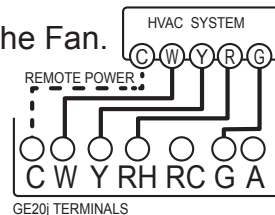
- STEP 1 - Connect the W wire to the W terminal. This connects the heat.
- STEP 2 - Connect the Y wire to the Y terminal. This connects the cooling compressor.
- STEP 3 - Connect the RH or R wire to the RH terminal. This connects the Power.
- STEP 4 - Connect the G wire to the G terminal on the Thermostat. This connects the Fan.
- STEP 5 - Set heat type switch

If you have gas or oil heat set the HEAT TYPE to GAS.

If you have electric heat, set the HEAT TYPE switch to ELEC

Your HVAC system is now connected to the CT20e.

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**WIRING** **C W Y RH RC G** **5 Wire Heat/Cool**

- STEP 1 - Connect the W wire to the W terminal. This connects the heat.
- STEP 2 - Connect the Y wire to the Y terminal. This connects to the Cool compressor.
- STEP 3 - Connect the RH wire to the RH and the RC wire to the RC terminals. This connects Power.
- STEP 4 - Connect the G wire to the G terminal. This connects the Fan.
- STEP 5 - Set heat type switch:

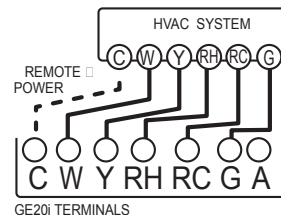
If you have gas or oil heat set the HEAT TYPE to GAS.

If you have electric heat, set the HEAT TYPE to ELEC.

STEP 6 - Disconnect the jumper between RH and RC terminals

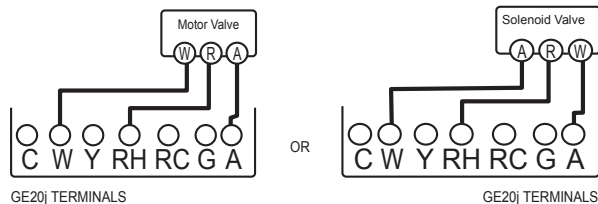
Your HVAC system is now connected to the CT20e.

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### W RH [A?] 3 Wire Zoned Hot Water

For Solenoid valve or Motor valve connect the wires based diagrams below to the correct terminal on the CT20e. USE ONLY IN HEAT MODE.



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## WIRE REFERENCE CHART

### Your Wires

R or V or VR

RH or 4

RC

W

W2

W3

?

Y

Y2

G or F

C or X

connection

### CT20e

RH and RC Single power for HEAT and COOL

RH Power for HEAT (RH not connected to RC jumper clip removed)

RC Power for COOL (RH not connected to RC jumper clip removed )

W Heat control

W2 2nd stage HEAT or heat pump auxiliary heat

W3 3rd stage HEAT or 2nd stage of 2 stage auxiliary heat

A 3rd wire for zoned hot water heat (see zoned systems pg14)

Y COOL control or 1st stage compression for heat pump.

Y2 2nd stage COOL control or 2nd stage compression for a heat pump

G FAN control

C Common 24VAC power (to power thermostat ) NOTE: TRANE uses B for this

<b>E</b>	n/a Emergency heat (do not connect, tape off)
<b>L</b>	n/a System monitor (do not connect, tape off)
<b>T</b>	n/a Outdoor sensor (do not connect, tape off)
<b>H</b>	External Humidifier
<b>DH</b>	External De-Humidifier
<b>EX</b>	External fresh air baffle
<b>B or</b>	<b>B</b> Heat pump changeover (cool to heat, powered in heat)
<b>O</b>	<b>O</b> Heat pump changeover (heat to cool, powered in cool)
<b>B and O</b>	<b>⚠ IMPORTANT:</b> If there are both B and O wires (Trane pump products) <b>DO NOT CONNECT B to B terminal, connect B to C terminal.</b> If not a Trane product tape off B.

#### **Lennox Heat Pump**

V or VR or R	RH Power for HEAT
M or Y	Y
Y or W or W2	W2
F or G	G
R or O	OX or X2 or C

#### **Trane Products [American Standard]**

<b>B</b>	<b>C</b>
W or W1 or X2	W2

**Your Wires                      Radio Thermostat Terminal****2 wire Zoned Hot Water**

R                                      RH

W                                      W

**3 Wire Zoned Hot Water****Motor Driven Valves**

R or 5                                      RH (power)

W or 4                                      W (heat ON)

Y or G or 6 (the 3rd wire) A (heat OFF)

**3 Wire Zoned Hot Water****Solenoid Valves****Must be used only in HEAT MODE**

R                                      RH (power)

W                                      A (heat ON)

Y or G (the 3rd wire) W (heat OFF)