Install Guide CT110

Radio Thermostat

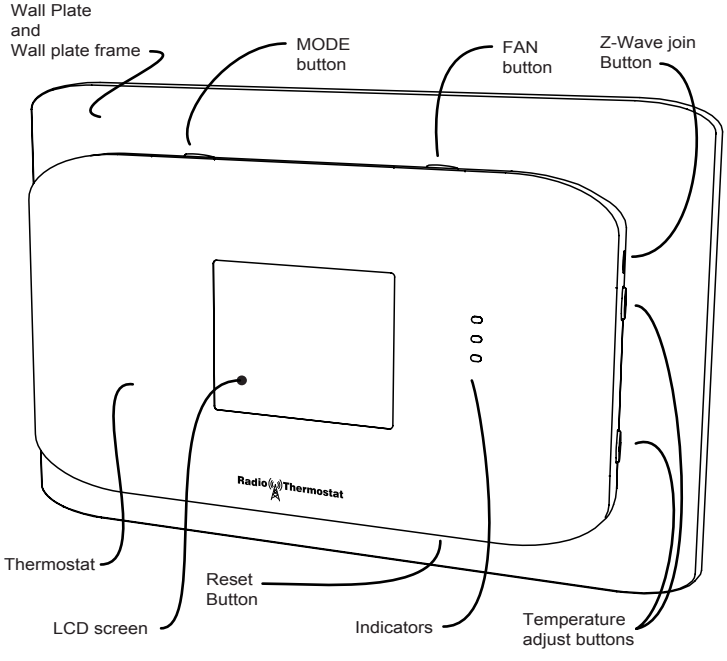
Radio Thermostat Company of America

⚠ Caution

• **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 24 volt AC HVAC and millivolt gas systems. The thermostat is powered by 4AA alkaline batteries and/or 24 volt AC C wire (or a 12-24 AC or DC source). Each thermostat relay load should be limited to 1.0 amp; higher amperage may cause damage to the thermostat.
• Your thermostat is a precise instrument, handle it with care.

⚠ 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.



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ENGLISH

INSTALLATION

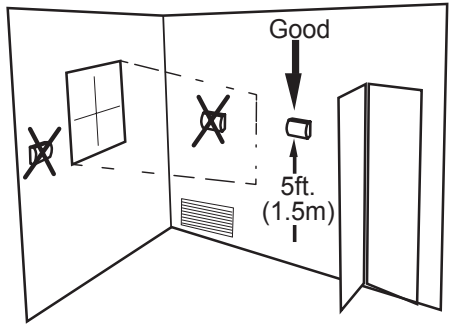
TOOLS

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 CT110 in place of the old thermostat.
A new location will require moving your wiring.
For new installations and relocating the CT110 - 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 CT110 until all construction and painting has been completed.
- This thermostat does not require leveling.



REMOVE OLD UNIT

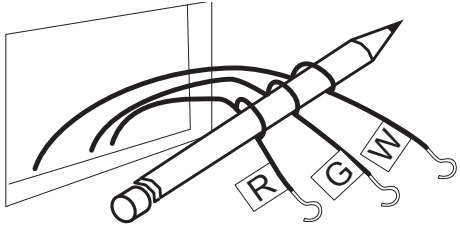
⚠ **Switch OFF electricity to the HEATING and COOLING systems**.
Then follow these steps:

• 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

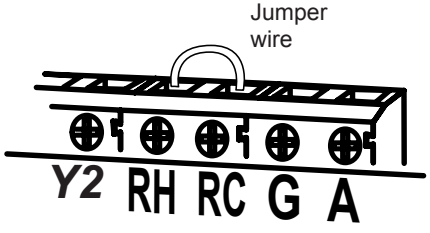
Read instructions carefully before removing any wiring from existing thermostat. Wires must be labeled before they are removed. THERE IS NO STANDARD COLOR CODE. When removing wires from their terminals, ignore the color of the wires and LABEL THEM by the lettered terminal where they were screwed.

• 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 page at end of install section for better understanding of wire labels from different HVAC system makers.



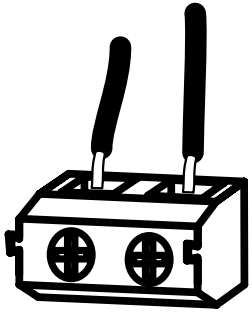
⚠ **IMPORTANT:** The CT110 runs on 4 AA alkaline batteries and/or the C wire if available. If you do not have a C wire you can run a new wire from the HVAC or use a standard 12-24V [AC or DC] wall transformer. A constant power source is required when using a radio module.

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

Prepare Wires

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 CT110.
- If you do not have enough wire, splice additional wire to allow enough slack.
- Terminals accept wires from 16-22awg.
- Fan out wires below the hole as shown.
- Remove insulation 1/8" from the tip of each wire.
- When handling, take care not to damage the labels for each wire.

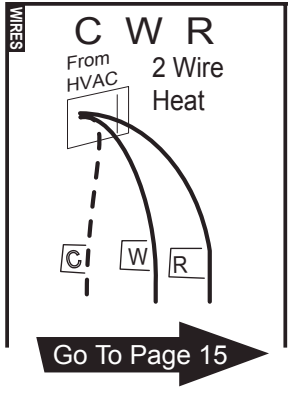


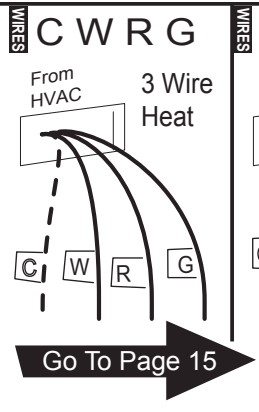
Wire Terminals

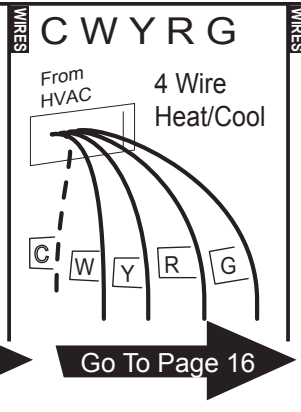
⚠ Caution

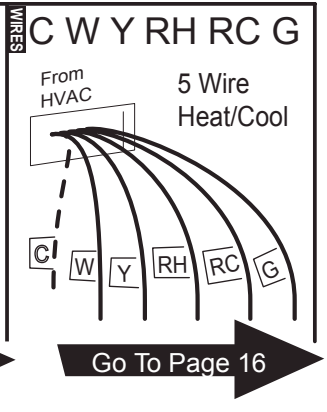
Do not allow wires to touch each other or parts on thermostat.

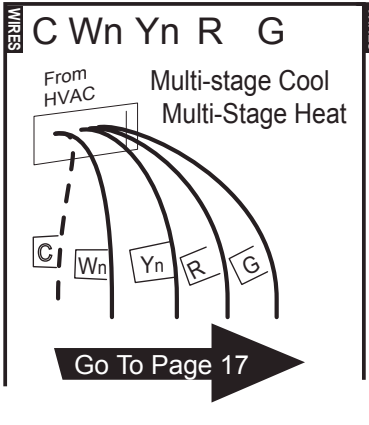
Find the step-by-step diagram for your system

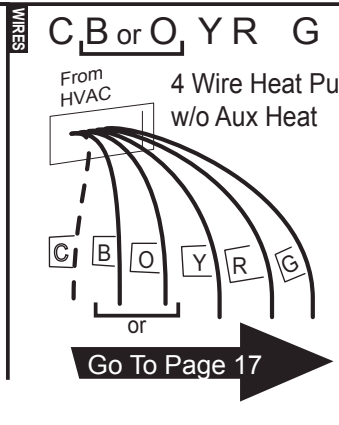


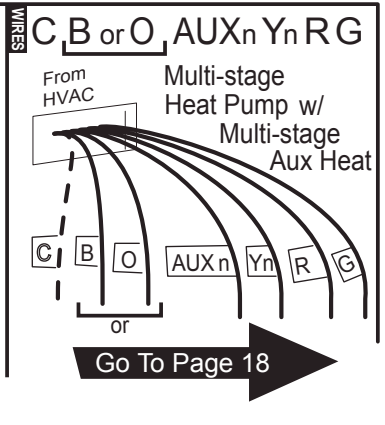












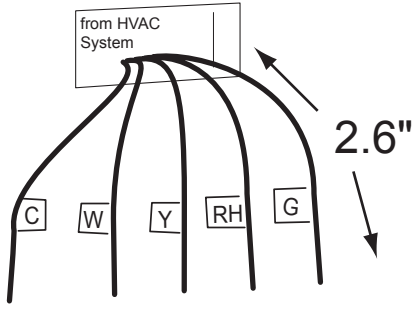
• Select the reference page with your wiring diagram and set-up information below.

• The C-wire is optional but preferred. Without a C-Wire the CT110 will operate on batteries only for about one year.

• Hot water systems diagrams are on pg20.

• If your combination of wires is not above you can use the wiring table at the end if the install section to determine your connections, contact customer support for help.

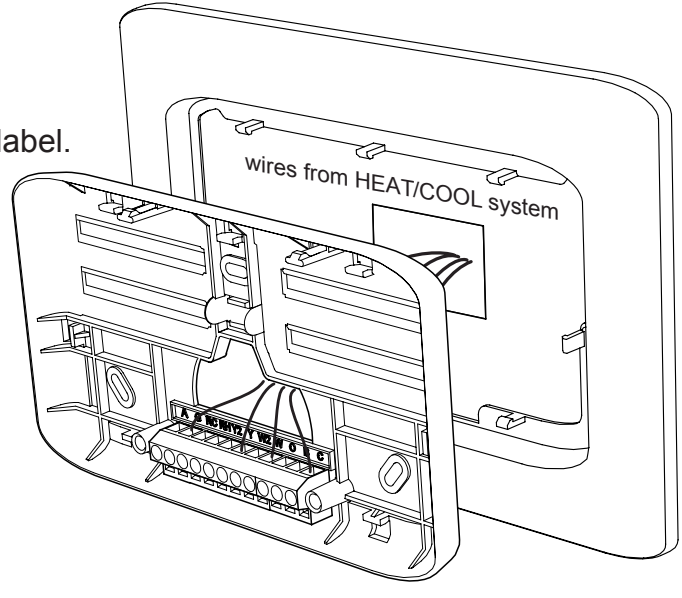
• “Fan out” wires as illustrated with CT110 below the wall opening. As in the example: fan out the wires so that the C wire is above the C terminal, the W above the W. This allows the CT110 to fit snug to the wall.
• Position the wires through the wall plate to the terminal area.
• Do not bunch wires behind the wall plate. Feed any slack back into the wall opening.
• The Wall Plate Frame is optional, but you must have it in place when you thread your wires into the wall plate.



Connect Your Wires

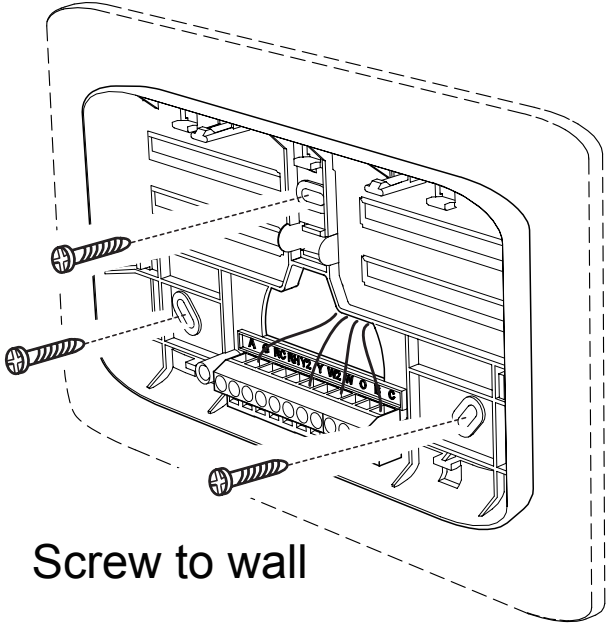
• Connect labeled wires only to a terminal with the same letter label.
• Insert the wire in the terminal well and tighten the screw securely.
NOTE: You can mount the wall plate to the wall first, then connect the wires, and mount the CT110.

• The CT110 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).



Mount the Wall plate to wall

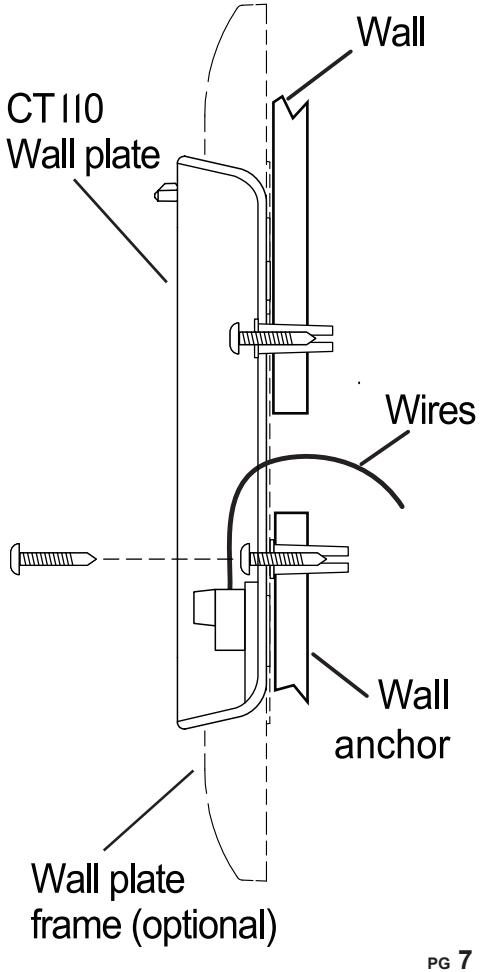
NOTE: If you are mounting to sheet rock or if you are using the old mounting holes, use the plastic anchors provided. Mark first and drill a 3/16-in.(4.8mm) hole for the insert at each screw location, then mount the unit.



1. Hold the CT110 wall plate against the wall, with the wires coming through the hole in the wall plate.

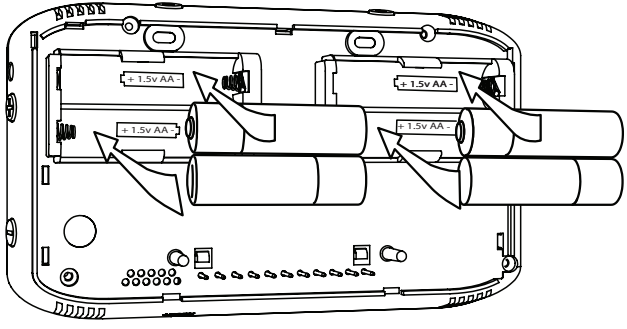
2. Position wall plate for best appearance.

3. Attach the wall plate to the wall with the screws provided.



Install 4 AA Batteries

• Install 4 AA alkaline batteries [required] following the marked polarity in the battery compartments. Put the battery in negative end first against the spring, then push the positive end in.



The CT110 will power-up in the OFF mode. Your CT110 is not configured to operate your HVAC system yet. You must now configure your thermostat for your HVAC system before you mount it to the wall plate.

⚠ Caution

Special Thermostat Battery Cautions

Always replace the batteries as soon as the low battery indicator displays. 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 display does not display, 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 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.bottom.

BATTERY WARNING
Do Not Use Re-chargeable Batteries
Do Not Mix Old And New Batteries.
Do Not Mix different battery types
ie. Alkaline, Standard (Carbon - Zinc), etc.
DO NOT DISPOSE OF BATTERIES IN FIRE. BATTERIES MAY EXPLODE OR LEAK.

HVAC Setup on Screen

⚠ **IMPORTANT:** Make sure the CT110 is powered up and the mode is set to OFF. You must know what your heat source is at this time: either Gas/oil heat or Electric heat (or AUX type for heat pumps.)

• Press the **+** and the **-** buttons at the same time, for 10 seconds.
This will put you in the HVAC SET UP screen.
• Use +/- buttons to select HVAC SET UP code on screen. You must select the correct HEAT type for your system. In the upper left, the CT110 will display **GAS** for gas heat and **ELEC** for Electric heat for each code. For HEAT PUMP systems CT110 will display **GAS** for gas auxiliary and **ELEC** for Electric auxiliary for each code (if you have AUX heat).

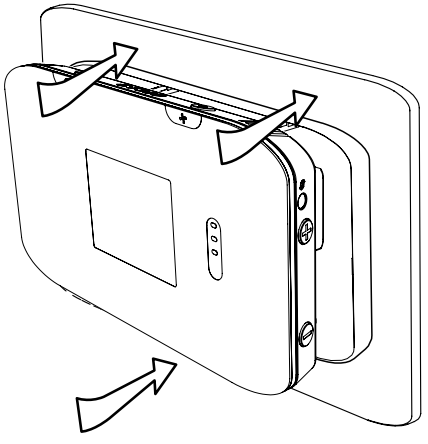
The LCD display will show your selection. During setup, 2nd stage will blink when both heat and cool have 2nd stages.

If you have a Normal HVAC system...
1 stage HEAT, 1 stage COOL select 1
2 stage HEAT, 1 stage COOL select 2
1 stage HEAT, 2 stage COOL select 3
2 stage HEAT, 2 stage COOL select 4

If you have a HEAT PUMP HVAC system...
HEAT PUMP with no AUX heat select A
2 stage HEAT PUMP with no AUX select b
HEAT PUMP with AUX heat select C
HEAT PUMP with 2 stage AUX heat select d
2 stage HEAT PUMP with AUX heat select E
2 stage HEAT PUMP with 2 stage AUX heat select F

Now double check that you have to select the correct HEAT TYPE for your system. **GAS** is for Gas or Oil heat, **ELEC** is for electric heat.

Snap CT110 to Wall plate



Snap the CT110 onto the wall plate. Take care to align with mounting posts at top and the contact pins at the bottom. With CT110 on the wall plate it is time to turn the AC power back on. Do this at the breaker you used to switch it off.

Test Installation

Follow these procedures to verify you have correctly installed the CT110.

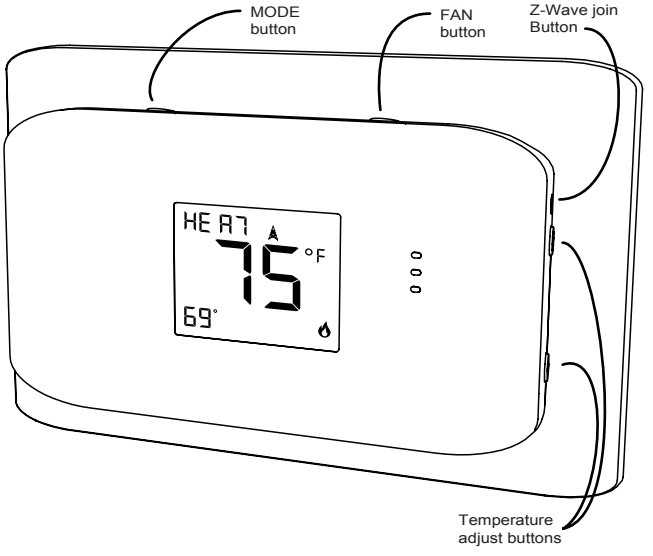
TO CHECK FAN (If you connected the G wire) - Press the fan button to turn the fan **ON.** Verify that air is blowing from the system. Touch the fan icon again to return to **AUTO** setting.

TO CHECK HEAT - Set the mode to **HEAT** by pressing the MODE button until **HEAT** is displayed. Press the **+** button and raise the target temp to change target temperature to about 5°F above room temperature; allow the system 2 minutes to respond. Verify that heat is blowing from the system. Return the Target Temperature to a normal setting. Return mode to **OFF** by pressing the mode button.
If you have a heat pump, leave in off for 4 minutes before checking COOL.

TO CHECK COOL (do not operate AC if the outside temp is below 65°F) - Set the mode to **COOL** by pressing the MODE button until **COOL** is displayed. Press **-** button and lower cool Target Temperature to change target temperature to about 5°F below room temperature. Allow the system 5 minutes to respond. Verify that cool air is blowing from the system. Return mode to **OFF** by pressing the mode button.

Communicating Thermostat

The CT110 has a built in Z-Wave radio to connect you with a home automation system. This can give you access to your home's HVAC system even when you are away. It can also give you access to web-based efficient energy management sites that can help you save money and protect the environment. Refer to specific instructions that came with your Z-Wave Hub on how to join a device to your Z-Wave network.



Joining a Z-wave network...

1. Press and hold the Z-wave join button ( ) on the CT110 unitl you hear a beep and the radio icon will blink on the CT110.
2. Follow your Hub's directions to join the device to your network.
3. Check to see if the CT110 has joined your network.

Congratulations, you have successfully installed your unit.
Please proceed to the OPERATING Guide to initialize the CT110.

⚠ **IMPORTANT:** If you have labeled and connected your wires and followed the correct HVAC setup, and your system still does not operate, contact technical support.

STATEMENT OF USE: This thermostat can be used with 24VAC heating and cooling systems and also millivolt heating. It is powered by 4AA batteries, 24VAC (C wire), or 24VAC adapter. It cannot be used with line voltage HVAC systems. This thermostat is digital and your desired heat or cool temperatures can easily be set with the +/- buttons on the right side. In COOL and heat pump operation, an automatic 4 minute off-time protects the compressor from damage.

This thermostat runs on 4AA batteries. The CT110 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.

Step-by-step wiring diagrams

WIRES © 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 - Optional - Connect the C wire to the C terminal.
Your heater is now connected to the CT110.

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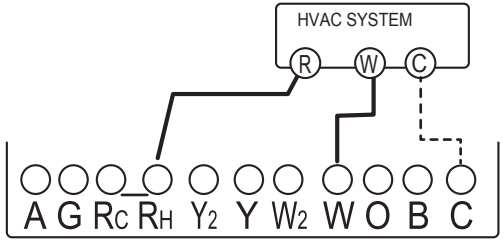

THERMOSTAT TERMINAL

WIRES © 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 - Optional - Connect the C wire to the C terminal.
Your system is now connected to the CT110.

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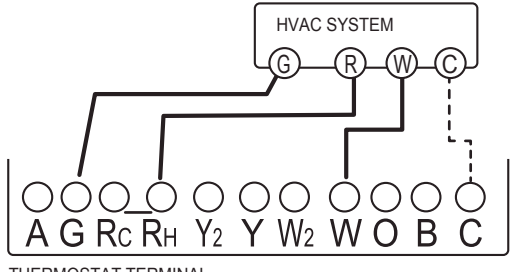

THERMOSTAT TERMINAL

4WIRES © 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 - Optional - Connect the C wire to the C terminal.
Your HVAC system is now connected to the CT110.

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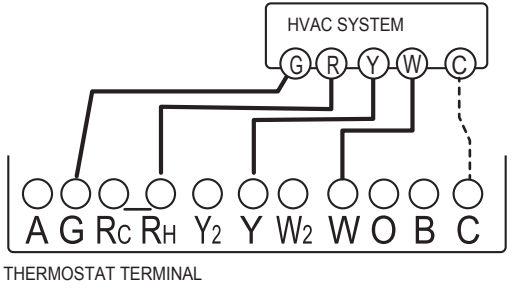

5WIRES © W Y RH RC G 5 Wire HEAT/Cool

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 cooling compressor.
STEP 3 - Disconnect the Rc and Rh terminals by removing Rc-Rh jumper wire.
STEP 4 - Connect the RH wire to the RH and the RC wire to the RC terminals. This connects power.
STEP 5 - Connect the G wire to the G terminal. This connects the fan.
STEP 6 - Optional - Connect the C wire from the HEAT to the C terminal.
Your HVAC system is now connected to the CT110.

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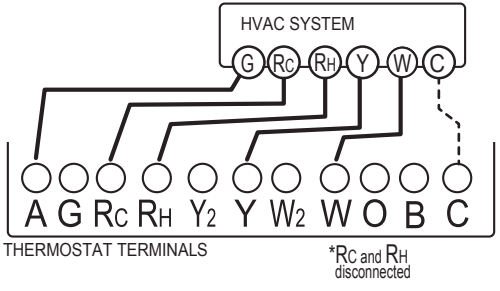

WIRES **C W$_n$ Y$_n$ RH G** **Multi-stage Heat and Multi-stage Cool**

The CT110 can handle up to 2 stages of HEAT and 2 stages of COOL.
STEP 1 - Connect the W, W2 wires to the W terminal.
This connects the stages of HEAT.
STEP 2 - Connect the Y and Y2 wires to the Y terminal.
This connects the stages of COOL.
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.
This connects the fan.
STEP 5 - Optional - Connect the C wire to the C terminal.
Your HVAC system is now connected to the CT110.

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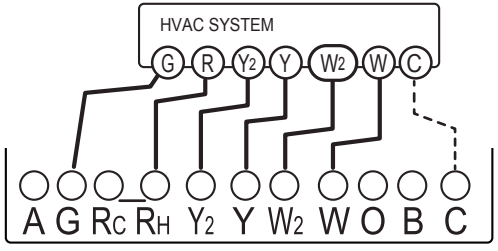

THERMOSTAT TERMINAL

WIRES **C B** or **O Y R G** **4 Wire Heat Pump (heat/cool) without Auxiliary Heat**

STEP 1 - Connect O wire to the O terminal or B wire to the B. This connects the change-over valve.
If you have both O and B - connect only the O wire to the O terminal and DO NOT connect B to B terminal (see wire reference under Trane for B wire terminal).
STEP 2 - Connect the Y wire to Y terminal. This connects the compressor.
STEP 3 - Connect the R wire to RH. This connects the power.
STEP 4 - Connect the G wire to the G. This connects the fan.
STEP 5 - Optional - Connect the C wire to the C terminal.
Your HVAC system is now connected to the CT110.

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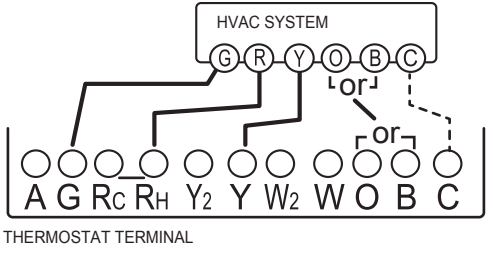

THERMOSTAT TERMINAL

WIRES **C O** or **B AUX**n **Y**n **RH G**

Multi-stage Heat Pump with Multi-stage Aux Heat

The CT110 can handle up to 2 stages of Pump compression and 2 stages of AUX heat.

STEP 1 - Connect O wire to the O terminal **or** B wire to the B. This connects the change-over valve.

If you have both O and B - connect only the O wire to the O terminal and DO NOT connect B to B terminal (see wire reference under Trane for B wire terminal).

STEP 2 - Connect the AUX 1, AUX 2, to the AUX 1 and 2 respectively. This connects the auxiliary heat.

STEP 3 - Connect the Y and Y2 wires to the Y terminals respectively. This connects the compressor.

STEP 4 - Connect the R wire to RH terminal. This connects the power.

STEP 5 - Connect the G wire to G terminal. This connects the fan.

STEP 6 - Optional - Connect the C wire to the C terminal.

Your HVAC system is now connected to the CT110.

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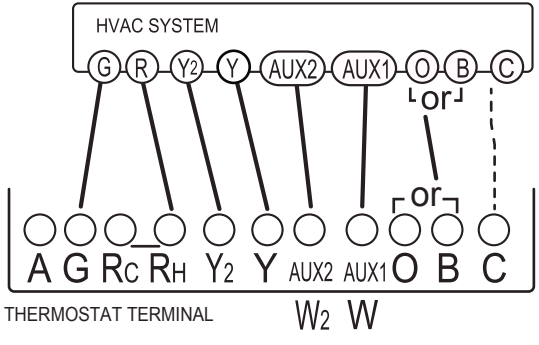


Wire Reference Table

Possible Wires	*What They Control*
R or V or VR	**RH** and **RC** Single power for HEAT and COOL
RH or 4	**RH** Power for HEAT (RH not connected to RC jumper removed)
RC	**RC** Power for COOL (RH not connected to RC jumper removed)
W / AUX	**W** Heat control or heat pump auxiliary heat
W2 / AUX2	**W2** 2nd stage HEAT or 2nd stage of 2 stage auxiliary heat
W3 / AUX3	**W3** 3rd stage HEAT or 3rd stage of 3 stage auxiliary heat
Y	**Y** COOL control or 1st stage compression for heat pump
Y2	**Y2** 2nd stage COOL control or 2nd stage compression for a heat pump
G or F	**G** FAN control
C or X	**C** 24VAC power (to power thermostat) NOTE: TRANE uses B for this connection
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	⚠ **IMPORTANT: If there are both B and O wires (Trane pump products) DO NOT CONNECT B to B terminal, connect B to C terminal. If not a Trane product tape off B.**
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)

Wire Reference cont.

Possible Wires	*What They Control*
Lennox Heat Pump	
V or VR or R	**RH** Power for HEAT
M or Y	**Y** COOL control
Y or W or W2	**W2** 2nd stage HEAT or 2nd stage heat pump auxiliary heat
F or G	**G** Fan control
R or O	**O**
X or X2 or C	**C**

Trane Products [American Standard]	
B	**C** 24VAC power (to power thermostat)
W or W1	**W** 1st stage normal HEAT or 1st stage heat pump auxiliary heat
X2	Emergency heat (do not connect, tape off)

Zoned Hot Water Heat -

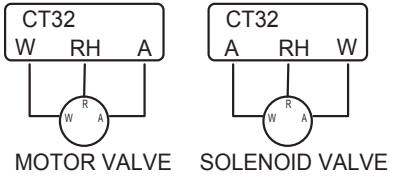
For Solenoid valve or Motor valve connect the wires based on diagrams below to the correct terminal on the CT110. The third wire on your valve may be called 6, Y, or G.

Your Wires...

2 wire	**Thermostat Terminal**
R	**RH**
W	**W**

3 Wire	
Solenoid Valves	
R	**RH** (power)
W	**A** (heat ON)
Y or G (the 3rd wire)	**W** (heat OFF)

FOR 3 WIRE HOT WATER



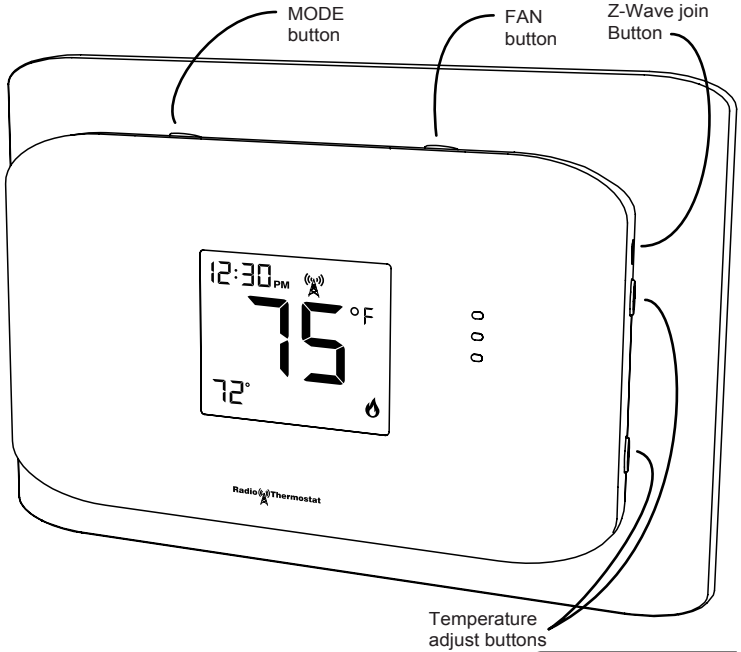
Operation Guide CT110

Radio Thermostat

Radio Thermostat Company of America

The CT110 communicating thermostat operates via a high-quality, easy-to-use radio interface. After you have joined to your Z-Wave network you can control it from phone apps or the web.

Without a radio connection you can locally set or adjust your CT110, simply press the buttons on the side of the unit. The screen will automatically light up and you will hear a “beep.” There are five buttons on the unit - +, -, FAN, MODE, and RESET.



Statement of use: 100% Compatible with all popular residential HVAC systems; 24VAC single, two stage conventional heating systems (gas/oil/electric), heat pumps with up to two stages of heat and two stage auxiliary heat(electric or fossil), zoned forced air and zoned hot water (2 or 3 wire), millivolt systems (with a 12-24 AC or DC source), one or two stage cooling, and hybrid systems.

1308-002-001

ENGLISH

OPERATION

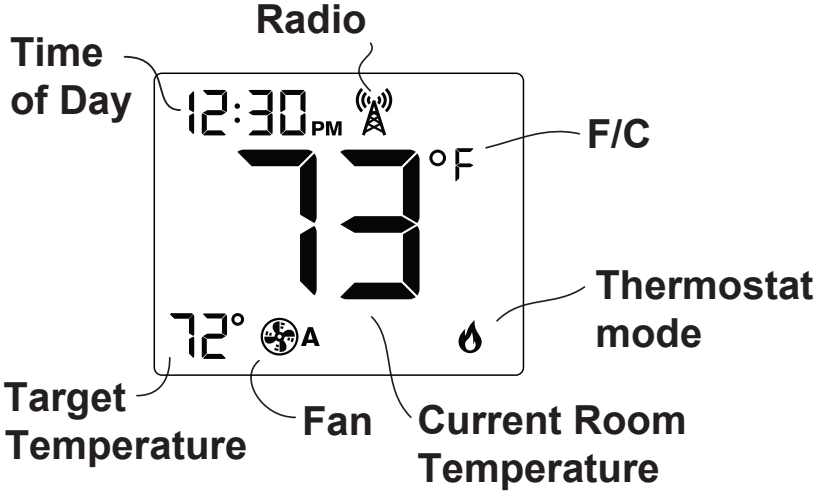
HOME Screen

Before you operate the CT110 please get familiar with these basic control screens. All the CT110 functions are accessed through these screens: HOME, and CONFIG. The CT110 radio control technology allows you to configure your thermostat.

The **HOME** screen is displayed when the unit is operating.

To set a Mode:
Press the mode button (on the top). The CT110 will step through the modes HEAT, OFF, COOL, OFF, AUTO, OFF in order.

To Change the current temperature target use the +/- buttons on the right side of the CT110.



Initial settings

TIME of DAY - This can be adjusted in the settings area of the web interface and displays in 12:00 or 24:00 format.

SWING - This can be set in the settings area of the web interface.
SWING controls how frequently your HVAC comes on. This feature allows you to set the desired variance in temperature between the CT110 setting and the room temperature required before the heating or cooling system will turn on—Swing range: 0.5 to 2.0°F (.25 to 1°C). For example, if SWING is set to 2.0°F and the CT110 is set to 70°F Target Temperature, the heat cycle will start when room temperature drops to 68°F. Similarly, the cooling system will start when the room temperature increases to 72°F. The HVAC then runs and will shut off at the Target Temperature. You can set the SWING from 0.5° to 4.0°F (.5 to 2°C). The HVAC will run more frequently at .5°F and less at 4°F. Default is 1°F.

Differential - This can be set in the settings area of the web interface. (Used for multiple stage systems only, not displayed for single stage) The differential is the number of degrees between the room temperature and the Target Temperature at which the 2nd stage will be used. Default is 2°F , range is 2°F to 6°F (1°- 3°C). Recommend 2°F for very cold climates and the 4°F for warm climates and 6°F for hot climates.

Physical Buttons

TEMPERATURE - Touch the +/- buttons to select your desired Target Temperature. If you create a program on the web, this temporary change in target will revert to the programmed target at the next time slot.

mode button - The mode button sets the CT110 to HEAT, COOL, or OFF modes. Press it once to step through OFF to the next mode: HEAT -> OFF-> COOL -> OFF , etc. AUTO mode is only accessible from the web interface - AUTO mode will automatically switch the CT110 from HEAT to COOL depending on the temperature trend in your house.

(fan) button - The fan button toggles the fan from AUTO to ON modes. The control is normally in the auto mode shown by this icon, A . This means that the fan operates automatically with the HVAC system and the thermostat. When the fan button is pressed the fan goes on and the icon will blink; the fan will run continuously in this manual override until switched back to auto by pressing the FAN button again. These functions can also be accessed from the web interface.
[NOTE: Fan **ON** function is available in the OFF mode to allow simple ventilating.]

Z-Wave join Button - Use to connect to a network. See Install section for details.

RESET button - The RESET button re-boots the CT110 processor. It does not effect the target temperatures that have been stored in permanent memory. You must use a paperclip to press RESET switch inside the CT110.

Remote Access Features

°F **or** °C **set -** Toggle this to switch the temperature display scale from °F to °C .

LOCK - From the settings screen of the web interface, click the icon and select lock. In lock, no changes can be made at the thermostat. Once locked, the CT110 will not respond to any local controls and the icon will be displayed.

To UNLOCK - Deselect **FULL** lock on the web interface.

Compressor Delay - The CT110 has a minimum cycle time of 4 minutes to protect your compressor in cool and in heat pump (if you have one). During this time and the compressor will not come on until the 4 minute delay is over.“Cd” is displayed during a delay.

EMER (when configured for HEAT PUMP) If you set your CT110 for HEAT PUMP with auxiliary heat, EMER function is available on the web interface. If you click **EMER**, your HEAT PUMP is disabled and auxiliary heat is your sole source of heat. This manual override stays active until you toggle EMER off. Auxiliary heat is more expensive than the heat pump so use EMER only if the heat pump cannot keep up or is defective.

HOLD - Accessed from the web interface, this will hold the current Target temperature indefinitely.

until **HOLD** is turned off.

SAVE ENERGY - Accessed from the web interface, this function sets the target temperature to teh lowest consuming point in the current program, or a simple 4 deg offset if no program is present.

Display Icons

Message and Time - This shows the time and various messages during operation.

Settings - This is displayed when setting the HVAC configuration during installation.

Fan - This shows if the fan is ON (blinking) or in AUTO.

HEAT PUMP - This is displayed of your system is configured for HEAT Pump Operation. In a multi-stage Heat pump the number 2 is displayed when the second stage is operational.

COOL - This is displayed when the CT110 is in Cool mode. Blinking when active.

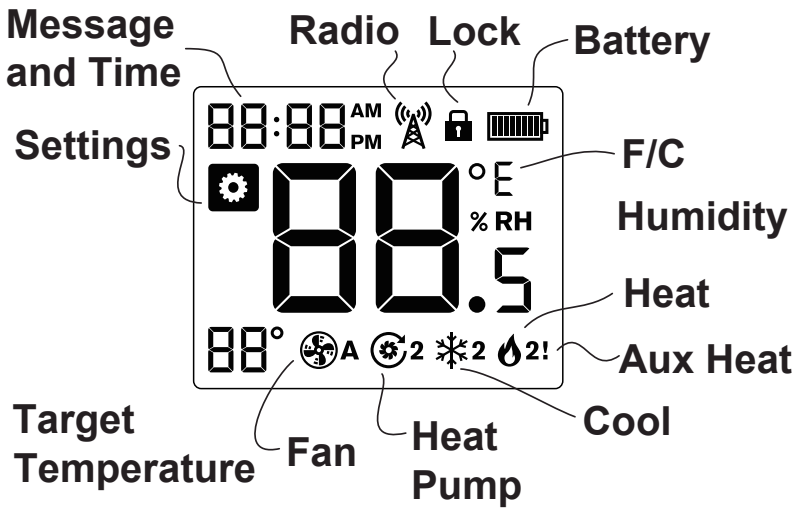
HEAT - This is displayed when the CT110 is configured for conventional heat. In a multi-stage Heating system the number 2 is displayed when the second stage is operational. Blinking when

active.

Battery Status - This is displayed when the battery power is low. It is very important to replace batteries as soon as this is displayed.

LOCK - This is displayed when the CT110 is in Lock. The unit must be unlocked from the web interface.

Radio - This is displayed when the CT110 is connected to a network. The radiators blink when transmitting or receiving.



Heat Pump EMER - This is displayed by the **!** mark next to the HEAT icon. Blinking when active.