

Humidity Control Board

Model # QT4300 - For 24 VAC Control Circuits only, Maximum 5 Amps
Patent Pending

Locating the Humidity Control Board and Dehumidistat

The Humidity Control Board can be located anywhere along the existing thermostat wire run. It is spliced into this control circuit anywhere between the existing thermostat and the air handler. **Before deciding the location of the dehumidistat and Humidity Control Board, read the installations instructions completely. If additional control circuit wiring must be run, this might impact the location of both the dehumidistat and Humidity Control Board.**

The normal wiring of an air conditioning and heating thermostat uses, at minimum, a multi-conductor thermostat wire (containing the R, C, G, Y, and one or more W conductors) which runs from the thermostat to the indoor air handler. (Additional thermostat wiring information is present in the section titled Thermostat Wiring Fundamentals. If a room dehumidistat is to be located on a wall in the room, then one possible location of the dehumidistat and the Humidity Control Board is adjacent to the thermostat, since all the necessary control wires are available at the thermostat. The Humidity Control Board can be located, inside the wall, behind the thermostat or dehumidistat. Alternatively, if a return air duct dehumidistat is to be installed, or the room thermostat is to be located near the return air duct, then another possible location for the Humidity Control Board is at the indoor air handler, because the return air duct dehumidistat is located in this area too.

Installation Instructions

STEP 1. Before connecting the Humidity Control Board wires into the thermostat wiring circuit you must verify the circuit.

1A: Verify the Circuits (at the Location where the Humidity Control Board will be installed)

- a) Making R to G should start the Blower.
- b) Making R to Y should start the compressor and outdoor fan
- c) Making R to W (the wire you will place on the W terminals of the Reheat Control Board) should start the electric heat (if it also starts the blower this is OK) and this electric heat must be located in the air flow path **downstream** of the evaporator coil.

***FURNACE NOTE:** A thermostat may have a single R terminal or it may have both Rh (heating) and Rc (cooling) terminals. When both Rh and Rc terminals exist they may be jumpered together and operate with a single R control wire. Both of these cases are fine. However, some furnace heating systems may have a separate transformer to power the furnace heating circuit, so that both Rh and Rc circuits exist, where the Rc refers to the contact that closes Rc to G and Rc to Y during cooling, while the Rh to W contact is closed during furnace heating. (The Rh and Rc are NOT jumpered together at the thermostat in this case.) In this case, the Rh and W circuits are not used in the Humidity Control Board, while the Rc circuit is used by the Humidity Control Board.*

*An electric heat strip downstream of the evaporator is necessary and it must be wired so that making Rc to the electric heat contactor control wire activates this heat. This control wire must be connected to the **Output to the Unit (TB3)** terminal of the Reheat Control Board. If the thermostat does not use this control wire then there is no need to wire it from the Humidity Control Board to the Thermostat, but it must be connected to the **Output to the Unit (TB3)** terminal of the Humidity Control Board.*

*For the Humidity Control Board to operate properly, making the wire connected to the R and W terminals of terminal block labeled **Output to the Unit (TB3)** must activate the electric heat that is downstream of the evaporator. If no such electric heat exists you must install a standard AC duct mounted electric heat strip (downstream of the evaporator), wired so that making R to W terminals of terminal block labeled **Output to the Unit (TB3)** activates this heat strip.*

*If the electric heat is being added, the W control wire does not need to be run to the thermostat, it is only necessary to connect the W wire from the Electric Heat Contactor to the W screw terminal on Terminal Block TB3 (labeled **OUTPUT TO UNIT**) of the Humidity Control Board. Sufficient electric heat should be added so that the air exiting the unit in Step 3c is warmer but only slightly warmer (ideally no more than 10°F warmer) than the incoming air. For this case, it may be easier to use a duct-mounted dehumidistat located in the return air duct and mount the Humidity Control Board on the air handler, thereby simplifying the control wire run to the new electric heat.*

***ELECTRIC HEAT CAPACITY:** When several heater settings or stages are possible, the electric heat that is activated should be sized so that the air exiting the unit in Step 3c is somewhere between 10°F cooler and 10°F warmer than the room air (incoming air) temperature.*

- d) Measure the voltage across R and C. It must be at least 21 VAC and no more than 26 VAC (see instructions below if there is no C wire available)

***NOTE:** The common C wire is the other pole of the transformer (24 VAC is supplied to the thermostat across R and C.) R and C are used to power features of the thermostat like the clock. Some thermostats do not require power or they use a battery and the C conductor is not used.*

If the C common wire is not available in the existing thermostat wiring then it must be run from the air handler, and connected to the C screw terminal on Terminal Block TB3 (labeled OUTPUT TO UNIT) of the Humidity Control Board. This wire does not have to be run to the thermostat. Verify you have 24 VAC across R and C at the Humidity Control Board. The 24 VAC is necessary to power the Humidity Control Board. When a C conductor must be run to the Humidity Control Board, a good location for the Humidity Control Board is to screw mount it to the air handler, thereby simplifying the C conductor wire run to the Humidity Control Board.

1B: Connect the C, R, G, Y, and W wires through the Humidity Control Board.

- The wires **FROM** the thermostat must be connected to the screw terminals on block TB2, labeled **INPUT FROM THERM**
- The wires **BETWEEN** the Humidity Control Board and the air handler must be connected to the screw terminals on block TB3, labeled **OUTPUT TO UNIT**.
- All other conductors in the thermostat wire are not used by the Humidity Control Board and should be left connected. They can be routed along the top of the control board inside the case.

***NOTE:** Suggested locations for the Humidity Control Board are the exterior of the air handler, or behind the wall-mounted dehumidistat and next to the thermostat (if both R and C conductors are available at the thermostat).*

***NOTE:** For proper dehumidification, the air must first be cooled and dehumidified by the evaporator and then reheated by the electric heat. That is, the electric heat must be located downstream of the evaporator, so the return air is first cooled and dehumidified then reheated by the electric heat.*

Step 2: Connect a dehumidistat (also known as a dehumidifier controller), which **makes (closes) on a rise in humidity** to the H1 and H2 terminals on the TB1 terminal block of the Humidity Controller Board. More than one dehumidifier controller (dehumidistat) can be used. If more than one dehumidistat is used, they can be wired in either series or parallel. Wiring in parallel will allow any dehumidistat to initiate dehumidification, while wiring in series will require all dehumidistats in the circuit to be closed before humidification is initiated.

Step 3: Test the System.

- Set the Thermostat Selector to “COOL”, Fan to “AUTO”, and the temperature to a low setting to initiate cooling and verify that the AC unit operates properly.
- Turn the Dehumidifier Controller (dehumidistat) to OFF (or to the highest humidity setting). Change the thermostat setting to a very high temperature (above room temperature). The entire unit should shut off. You may have to wait for a time-delay to take effect.
- Without changing the thermostat setting (from Step 3b), turn the Dehumidifier Controller to a very low humidity setting: The AC blower and compressor should start as well as the electric heat. There may be a time-delay before the compressor or electric heat starts, if the unit uses one. Once the unit is operating completely (blower on, compressor on, heat on), verify that the supply air exiting the unit **is within 10 °F cooler or warmer** as the incoming (return) air. If the supply air is more than 10°F cooler, you may have to add additional electrical heat to the system to avoid user complaints of being too cold. If two stages of electric heat are available, so that W can activate either or both stages, you may want to adjust which stage is being used by the Humidity Control Board, so that the air exiting the air handler is warmer but only slightly warmer (ideally no more than 10°F warmer) than the incoming air.
- Set the Dehumidifier Controller to a Relative Humidity of less than 55%. We recommend 50%.

Theory of Operation

The Humidity Control Board will lower the humidity in the building, by using reheat, only when the air conditioner is not already operating, since the action of the air conditioner already lowers the humidity. To conserve energy, the Humidity Control Board does not activate the reheat coils until the building is at the proper temperature.

The Humidity Control Board activates both the compressor and the downstream electric heat simultaneously. This only occurs when the thermostat is not calling for cooling (the building is at the proper temperature) but the humidity is above the set point (dehumidistat is calling for a reduction in humidity).

The circuitry of the Humidity Control Board determines this information without requiring any additional wires to be field installed between the thermostat and the air conditioning or heat pump system. This is done by using the fan control circuit R-G. Therefore setting the Fan control to ON instead of AUTO will operate the fan continuously, and halt the humidity control action of the Humidity Control Board. Setting the dehumidistat to the OFF or Maximum Humidity setting will also halt the control action of the Humidity Control Board.

Specifically the logic is as follows:

If the thermostat has activated the blower, determined by the G circuit being activated, then the system operates as normal. No reheat is provided regardless of the dehumidistat setting.

If the thermostat has turned the blower off and the compressor off, as determined by the G circuit being open, and the dehumidistat switch is Open (calling for no reduction in humidity) then the system remains off.

If the dehumidistat switch is Closed (calling for a reduction in humidity) and the thermostat is NOT activating the blower and compressor, then the Humidity Control Board will simultaneously:

- a) activate the blower (by activating the G circuit, connect R to G),
- b) activate the compressor unit (by activating the Y circuit, connect R to Y (actually both the compressor and condenser fan are activated) and,
- c) activate the electric heat downstream of the evaporator coil (by activating the Wx circuit, connect R to Wx - where the x refers to the particular heating circuit that activates the electric heat strip downstream of the evaporator.)

The actual circuit diagram for the Humidity Control Board is shown in Figure 1. Control is achieved with three single-pole double-throw relays and one single-pole normally closed relay and at least one dehumidistat connected across terminals H1 and H2. One or more separate commercially available dehumidistats (which close the circuit on a rise in humidity) can be connected to the H1 and H2 terminals of the Humidity Control Board. If multiple dehumidistats are used, they can be connected in parallel to the H1 and H2 terminals so that any humidity sensor can initiate dehumidification or they can be connected in series so that all the sensors must be recording elevated humidity before the dehumidification is initiated. Dehumidistats that are located inside the return air duct or inside a room can be used interchangeably.

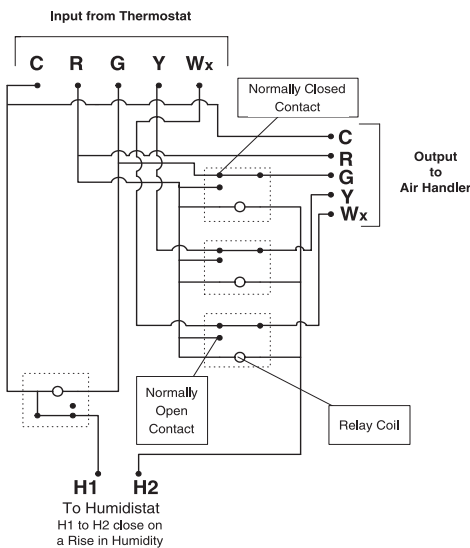


Figure 1. Circuit Wiring for the Humidity Control Board (Model QT4300)

Thermostat Wiring Fundamentals

Prior to installing the Humidity Control Board, a review of the thermostat control circuits will help to avoid installation problems.

A very simple thermostat control circuit is shown in Figure 2.

For a **standard heating-cooling thermostat**, on a call for cooling, the thermostat will make R-Y and R-G. (Connecting R to G activates the blower contactor as shown in Figure 2 and connecting R to Y activates the compressor.) On a call for heating, the thermostat will make the R-W circuit activating the heating circuit. In some cases, the thermostat does not activate the fan during heating; this is done by a temperature sensor in a forced-air heating system, by an additional set of contacts on the reversing valve relay in some heat pump configurations, or by an additional set of contacts on the heater relay in some air conditioners with electric heat.

Typically, the thermostat will also have a C terminal to provide 24 VAC to the thermostat for clock and other purposes, as well as a B terminal and O terminal, which may or may not be used.

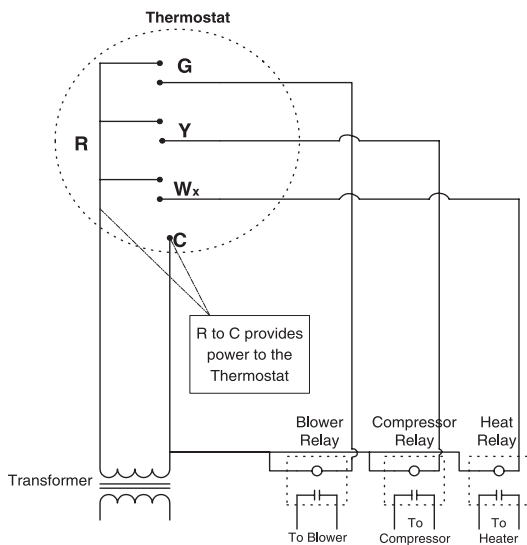


Figure 2. A Simple Thermostat Control Circuit

The thermostat can also make an R-B connection when the System Selector is set to “HEAT” (as shown in Figure 3) and/or it will make the R-O terminal when the system is set to Cool (as shown in Figure 4). Either or both of the B and O terminals can be used to energize dampers in heating or cooling modes but in actual practice are rarely used on thermostats that are not controlling a heat pump.

With the rising popularity of heat pumps, some thermostats have been designed especially for heat pumps. **Heat pump thermostats** are different from standard heating-cooling thermostats in that on heating the heat pump thermostat makes R-Y and R-G, compared to a standard

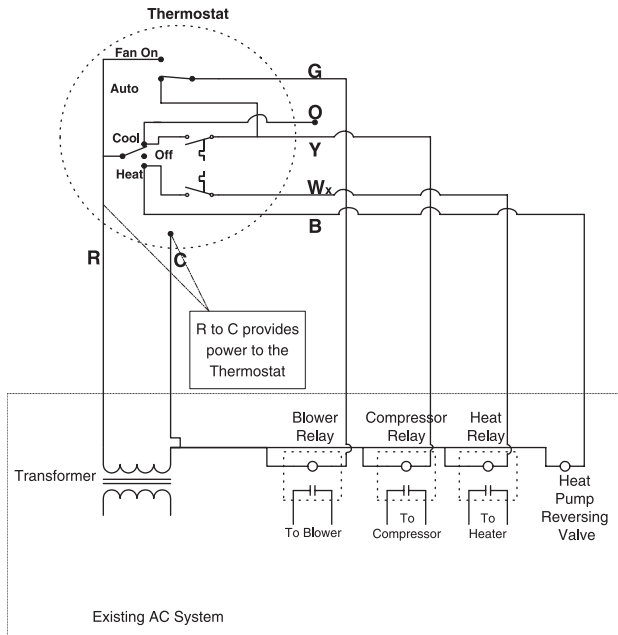


Figure 3. Thermostat that Activates the Reversing Valve on Heating (makes R-B)

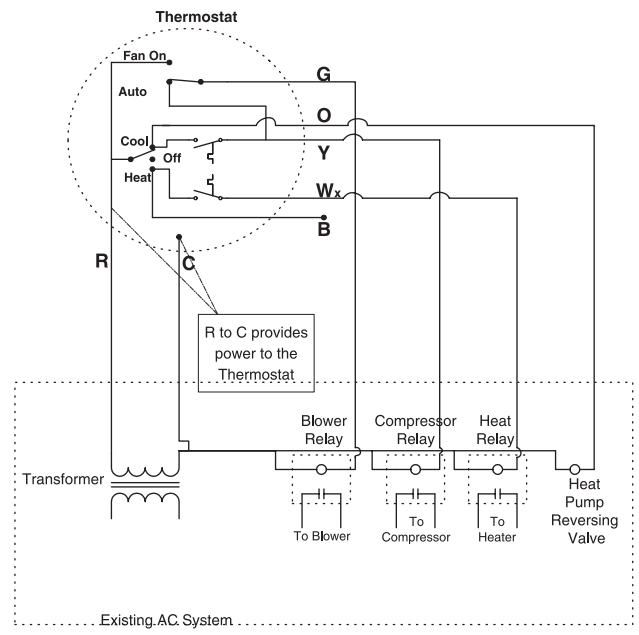


Figure 4. Thermostat that Activates the Reversing Valve on Cooling (makes R-O)

thermostat that makes R-W and uses a separate furnace switch or compressor relay to activate the blower. As shown in Figures 5 and 6, the heat pump thermostat also has a second stage of heating, the back up or emergency heating, that is activated by making the R-W₂ circuit. There is no W₁ terminal on this type of heat pump thermostat. Either the B or O terminal is used to activate the heat pump reversing valve, depending on whether it is activated on heating (Figure 5) or cooling (Figure 6). The Humidity Control Board will use the W₂ circuit to activate the electric heat. That is, the W₂ circuit is connected through the Humidity Control Board at the W terminals.

An **Electric Heat Thermostat** typically makes R-G at the same time it makes R-W, instead of using an extra set of contacts on the heating relay to activate the blower. This will not affect the operation of the Humidity Control Board.

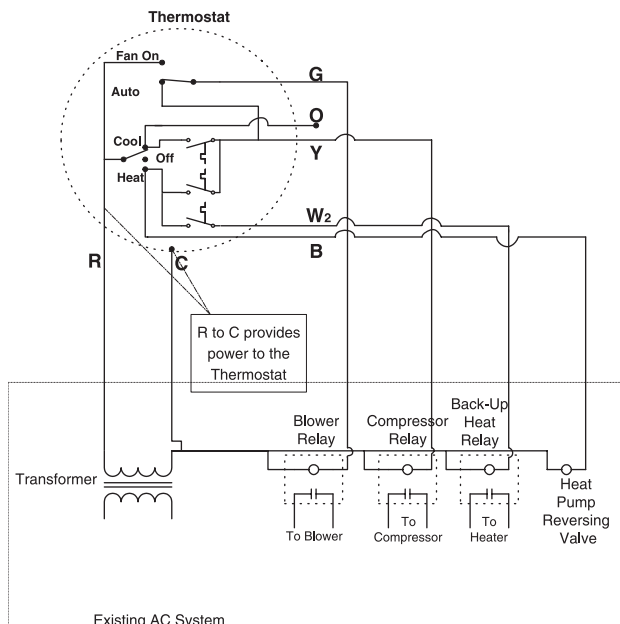


Figure 5. Heat Pump Thermostat that Activates the Reversing Valve on Cooling

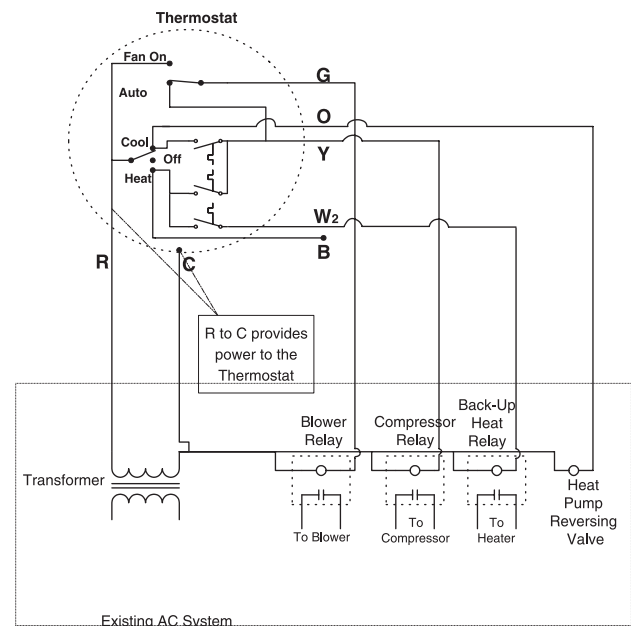


Figure 6. Heat Pump Thermostat that Activates the Reversing Valve on Heating