TECHNICAL SERVICE DEPARTMENT
Technical Service Bulletin
1-800-432-8373

How to Check Residential Electric Thermostats

To perform this test you will need a multimeter capable of reading voltage. You may also use a test lamp to measure voltage; however, test lamps do not discriminate between 120V and 208V and 240V. Some of these test procedures will not be accurate if a heating element is defective. It is recommended that you check the heating elements for open circuits or grounding before you check the continuity of the thermostats.

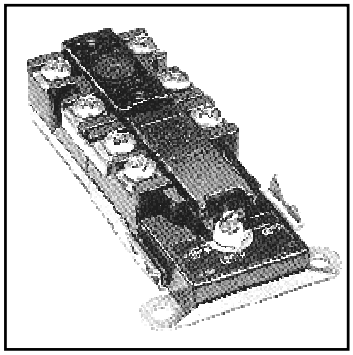
Check for power to the water heater:

1. Check manual switch, fuses and breakers.

2. Determine power to heater. Check with a multimeter or test lamp across terminals 1 and 3 (L1 black and L2 red). If power is being supplied, meter will register 240V or lamp will light. NOTE: If you are using a wide spectrum test lamp (50-400V) you may receive a false reading. If there is no power supply to the thermostat, the problem is not the heater; the problem is the power feed to the heater.

3. Determine power through the high limit switch. Place test prongs on terminals 2 and 4. If power is being supplied, meter will register 240V or lamp will light.

Check operation of upper thermostat:

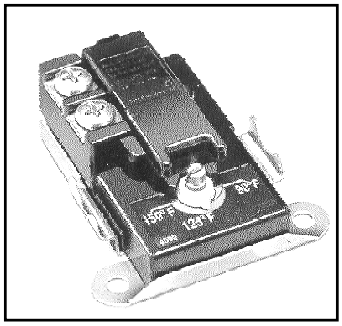


1. Turn the temperature dial on the upper thermostat to its highest setting. Turn the temperature dial on the lower thermostat to its lowest setting. This forces the upper thermostat to call for heat and the lower thermostat to turn off. Place the test prongs on terminal 1 (bottom of the bus bar) and the blue wire side of the upper heating element. This test checks for the presence of power between the thermostat and the heating element. If power is being supplied, the meter will register 240V or lamp will light.

2. Move the test prong from terminal 1 to terminal 2; the other test prong remains on the blue wire side of the upper heating element. This test checks the operation of the switch pole between the upper thermostat and upper element. If power is being supplied, the meter will register 240V or the lamp will light. If meter fails to register, the upper thermostat is defective and should be replaced. (This portion of the test will prove faulty if the heating elements is open or grounded.)

Check operation of the lower thermostat:

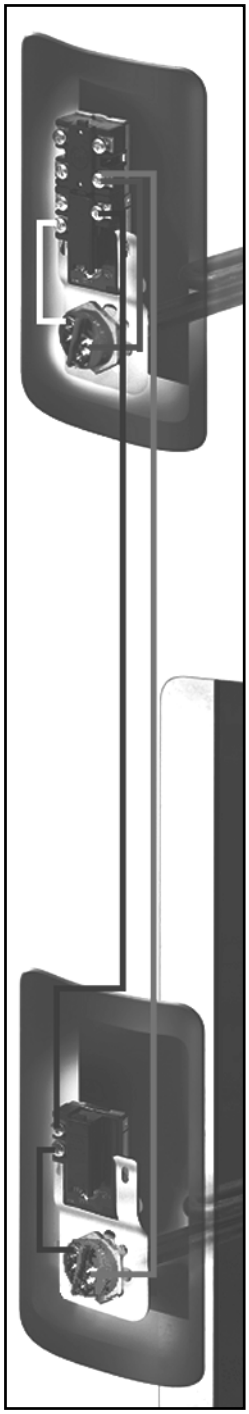
1. Turn the temperature dial on the upper thermostat to its lowest setting. Turn the temperature dial on the lower thermostat to its highest setting. This forces the upper thermostat to satisfy, redirect power to the lower thermostat and the lower thermostat to call for heat. Place the test prongs on terminal 1 of the lower thermostat the red wire side of the lower heating element. This test checks the operation of the switch pole between the upper and lower thermostat and checks for the presence of power between the lower thermostat and the heating element. If power is being supplied, the meter will register 240V or lamp will light. If meter fails to register, the upper thermostat has a defective switch pole and should be replaced.



2. Move the test prong from terminal 1 of the lower thermostat to terminal 2; the other test prong remains on the red wire side of the lower heating element. This test checks the operation of the switch pole on the lower

thermostat. If power is being supplied, the meter will register 240V or the lamp will light. If meter fails to register, the lower thermostat is defective and should be replaced.

Thermostat Sequence of Operations



Therm-O-Disc Thermostats -Non-Simultaneous Operation: (only one element can operate at a time)

Sequence of Operation (2-wire; 240V residential non-simultaneous):
Each heating element has 120 VAC potential going to one side of the element at all times. The upper and lower thermostat operation control the other 120 VAC flow to the other side of the heating elements. The heating elements require 240 VAC to heat the water.

1. Tank water is cold. Therefore upper thermostat contacts are closed (current is allowed to flow). Power (120VAC) from L1 is passed through the ECO and out the yellow wire to one side of the upper heating element. Power (120VAC) from L2 is passed through the ECO and out the blue wire to the other side of the upper heating element. The upper heating element now has 240 VAC and begins heating. Element heats until the upper thermostat is satisfied and opens (no current flow) at the temperature setting. Power is discontinued to the upper element because power is interrupted through the yellow wire. The water in the upper third to one-half of the tank is hot; while the bottom portion of the tank still contains cold water. As long as the upper thermostat is satisfied, it will redirect power to the lower thermostat.

2. Once the upper thermostat is satisfied, the contacts move and extend power out the black lead to the lower thermostat. The lower thermostat contacts are closed because of the cold water in the bottom of the tank. Power is extended to the lower element through the black lead. Power (120VAC) from L2 is passed through the ECO and out the red wire to the other side of the lower heating element. The lower heating element now has 240VAC and begins heating. Element heats until the lower thermostat is satisfied and opens (no current flow) at the temperature setting. Power is discontinued to the lower element because power is interrupted through the black wire. All the water in the tank is now hot.

3. As hot water is used, it is replaced by cold water entering the tank through the dip tube. The dip tube deposits the cold water into the bottom of the tank. The upper thermostat is still satisfied because the colder water has not reached it. While the upper thermostat is satisfied, the contacts are directing power to the lower thermostat.

4. The lower thermostat is the first thermostat to sense a change in temperature and the contacts close. Power is extended to the lower element through the black lead and the cycle starts again.

5. The lower thermostat will continue to heat until it is satisfied or the upper thermostat receives a demand for heat. This will take place when there is a high hot water demand, such as lengthy or multiple showers. When the upper thermostat receives a demand for heat, it opens (suspends power) to the lower thermostat and sends power to the upper heating element.