



Universal Commercial Gas Diagnostics Checks

How to check 24 Volt Transformer

The 24 volt (AC) transformer supplies the power to operate the ignition control module, the damper motor and the gas control valve. *Assuming the presence of 120VAC power and the thermostat operates –*

1. Turn thermostat to highest setting to demand heat.
2. Place the multimeter probe on the gray wire terminal of the grounding buss. Place the other probe on the yellow wire leading from the transformer to the thermostat. Multimeter should read 24 volts (VAC). If not, replace the transformer.
3. Return thermostat to a safe temperature setting.

How to check an Immersion Mounted Thermostat

The thermostat performs a number of tasks. Mainly it senses the water temperature in the heater by the use of a capillary bulb mounted in the tank, near the bottom of the heater. This capillary is fluid filled and with the cold and hot water passing through the heater the capillary fluid expands and contracts at a very precise rate. This operates a bellows that opens and closes the thermostat switch mechanism, making and breaking the control circuit to the damper assembly.

The L8100B thermostat used on the tall models, has a second capillary bulb that is immersed in the upper portion of the tank. This capillary is also fluid filled and connects to the same bellows as the lower capillary. The upper capillary is responsive to temperatures due to stacking or overheating and can also open the thermostat switch mechanism. The lower immersion bulb contains an ECO (Energy Cut Off) switch. This switch will react in hotter water (2000) and open the circuit to the pilot valve operator. On the face of the thermostat is a rotary dial with temperature markings of 1000 through 1800F. Initially, when the dial is rotated clockwise, as far as it can easily turn, it will bring the thermostat to the off position and be in the area below 900. By rotating the dial plate counterclockwise, the thermostat temperature setting increases. As the dial rotates a click can be heard. This indicates the relative temperature of the thermostat sensing bulb.

With the cover removed from the thermostat you will see 4 screws for electrical connections. The upper 2 vertical screws are for the thermostat portion of the circuit. The lower 2 horizontal screws are for the energy cut off (ECO) portion of the circuit. By rotating the dial past the click point, you will be opening and closing the upper vertical contact connections portion of the thermostat circuit.

Check operation of the immersion mounted thermostat

1. Turn the temperature dial on the immersion thermostat to its highest setting. This forces the thermostat to call for heat. Place the test prongs of a multimeter on the yellow wire and the gray (ground) wire terminal of the transformer. This test checks for the presence of voltage between the thermostat and the transformer. If voltage is being supplied, the meter will register 24V or lamp will light.
2. Move the test prong to the blue wire; the other test prong remains on the gray (ground) wire terminal of the transformer. This test checks the operation of the switch pole inside the immersion thermostat. If voltage is being supplied, the meter will register 24V or the lamp will light. If the meter fails to register, cool the water inside the tank and recheck. If the meter fails to register a second time, the thermostat is defective and should be replaced.
3. Turn the temperature dial on the immersion thermostat to its lowest setting. This forces the thermostat to satisfy. Repeat step 2 and check for voltage on the blue wire. You should not read 24V. If the multimeter registers 24V, the thermostat is stuck closed and should be replaced.



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Check calibration of the immersion mounted thermostat

Turn the temperature dial on the thermostat to a known setting. This forces the thermostat to call for heat. Wait for the heater to fully recover. Draw a small quantity of hot water from the T&P valve and measure the temperature of the water. The water temperature should be the same temperature as the thermostat setting (+/- 5 degrees).

How to check the Damper Assembly

As of January 1994, Rheem commercial gas tank type water heaters with more than 98,000 BTU input must be equipped with dampers. This is due to government energy efficiency standards for standby heat loss. The main purpose of the damper is to prevent stand-by heat loss through the flue tubes when the main burner is not ignited. The secondary purpose of the flue damper is to allow combustion gases to escape when the main burner is operating.

The damper is one of the safety devices designed into the commercial gas water heater. The damper motor rotates in one direction and opens or closes the damper blade. As well as conserving stand-by heat loss, the damper prevents the main burner from lighting if the damper plate is not open. If the heater will not light, take a look at a few simple things. Check to make sure the heater is plugged in to a 120VAC source and the switch is turned ON. Ensure the wires to the damper are securely connected. The connecting plug only goes one way. Check the damper arm is operational and not jammed or stuck in the closed position. Check the small butterfly bracket between the damper motor and the damper arm. It should not be broken or bent.

Assuming the presence of 120VAC power to the heater, switch is ON and transformer is working -

1. Remove the access panel from the damper motor.
2. Measure for 24 volts between the 24V and the COMM terminals of the damper. This connection drives the damper closed when the thermostat is satisfied.
3. Adjust thermostat to demand heat.
4. Measure for 24 volts between the TH and COMM terminals of the damper. This connection drives the damper open when the thermostat calls for heat.
5. Measure for 24 volts at the IGN terminal of the damper. This terminal relays 24 volts to the ignition control module. It is the only source of 24 volt power to the control module.
6. If the damper fails any one of the above tests, the damper assembly is damaged and must be replaced.

Temporary Solution for Non Operating Damper Assemblies

1. Turn off power to the heater.
2. Remove damper motor cover and locate the slide switch.
3. Move the slide switch from NORMAL to SERVICE.
4. Using a flat tip screwdriver, rotate the slotted metal knob COUNTERCLOCKWISE until the damper blade is in the open (fully vertical) position.
5. Replace the damper motor cover and turn power on to the heater.
6. The heater should now attempt to light the main burner. Adjust thermostat if necessary to demand heat.
7. Order new damper assembly.

Honeywell M896 Damper Motor Manufactured effective 12-97

Rheem's Universal™ commercial gas heaters manufactured after Dec 97 will have an improved Honeywell damper motor (model M896). This damper motor contains two green LED display lights to aid in the diagnostics of the heater. It also has a SERVICE switch that allows the main burner to light during service inspections and



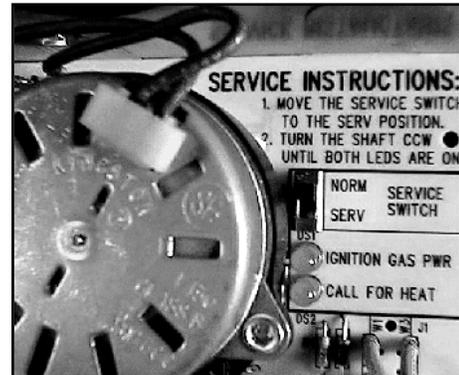
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troubleshooting. If there is a power failure the damper remains exactly where it is, at the moment of failure (open, closed, or somewhere in between). When power is restored, the damper opens if the thermostat calls for heat or closes if the thermostat is not calling for heat.

The CALL FOR HEAT LED glows when the thermostat is demanding heat. This verifies that 24V power is being passed from the thermostat to the damper motor. The damper motor drives the damper blade to the open position.

The IGNITION GAS PWR LED glows when 24V power is being passed from the damper motor to the ignition control module. You can verify this by measuring for 24 volts at the 24V terminal of the ignition control module. You should also be able to hear sparking from the pilot electrode.

All other aspects of checking the damper assembly, damper blades, butterfly arms and damper motor remain the same.



Checking the Ignition Control Module

The diagnosis of a faulty ignition control module is a process of elimination. To properly isolate the control module, all other components of the commercial gas water heater must be functioning. Insure there is adequate gas pressure and then perform the check below:

1. Recycle the heater by turning the ON/OFF switch to OFF; wait one minute and turn the heater to ON. Adjust thermostat to its highest setting to demand heat.
2. Using a multimeter, place one probe on the 24V terminal (red wire) of the ignition control module and the other probe on the 24V (GND) (gray wire) terminal. Measure 24 volts.
 - a. If the multimeter registers 24V, then the thermostat, transformer, and damper assembly are all functioning normally.
 - b. If the multimeter does not register 24V, then check each component using the How to Check..... sections of this document.
3. Next, perform the How to Check Gas Control Valve procedure.
4. Replace the ignition control module if faulty.

How to check Ignition Cable and Spark Ignitor

This procedure will expose you to 10,000 volts of electrical energy. When performing these steps do not touch bare or exposed wiring. Make sure the heater is turned off when servicing or inspecting the spark ignition system.

The pilot and electrode assembly contains a metal rod that has a ceramic insulator covering. The lower end of the electrode connects to the high voltage ignition cable. Over the upper end of the electrode is a ground strap that provides for igniting and sensing the pilot flame.

1. Make sure the ignition cable does not run in contact with any metal surfaces; is no more than 36 inches long; and connections to the ignition control module and ignitor are clean and tight.
2. Check ignition system grounding. A poor or erratic ground often causes nuisance shutdowns.
 - a. Check for good metal to metal contact between the pilot burner bracket and the main burner.
 - b. Check the ground lead from the GND (BURNER) terminal on the ignition module to the pilot burner.



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c. Check the ceramic flame rod insulator for signs of cracked or exposure to extreme heat. This can cause a short to ground and will prevent the pilot electrode assembly from sparking. Clean the flame rod with emery cloth if dirty.

d. Check and reset electrode for proper gap of 1/8 inch to 5/32 inches.

3. Check spark ignition circuit. You will need a short jumper wire made from ignition cable or other heavily insulated wire.

a. Close the gas valve manually.

b. Disconnect the ignition cable at the SPARK terminal of the control module. Move the ignition cable out of your way.

c. Energize the module by turning heater on or adjusting the thermostat to demand heat.

d. Immediately place one end of the jumper firmly on the 24V (GND) terminal on the control module.

Move the free end of the jumper slowly toward the SPARK terminal of the control module until a spark is established.

e. Pull the jumper slowly away from the SPARK terminal and note the length of the spark gap. If the arc is 1/8 inch or more, then the voltage output is okay. If the spark is less than 1/8 inch or there is no spark, then replace the control module.

f. Remove the jumper, turn heater off, reinstall the ignition cable and turn heater back on.

How to check Gas Pressure - Honeywell VR8304

This procedure assumes a maximum supply gas pressure of 10.5" water column for natural gas and 13.0" w.c. for L.P. gas.

1. Turn gas cock knob to OFF.

2. Remove gas pressure check plug using a 3/16" hex key wrench.

3. Connect manometer to 'Press Tap'.

4. Turn gas cock knob to ON. Allow main burner to light.

5. Gauge should read 4" for natural gas or 10" for L.P. gas. If OK, turn gas cock knob OFF, remove gauge and replace 'Press Tap' plug.

How to check Gas Control Valve - Honeywell VR8304

The VR8304 gas control provides ON-OFF manual control of the gas flow. In the OFF position, the pilot and main burner gas flow is prevented. In the ON position, pilot and main burner gas flow is under control of the Honeywell 8600M electronic control module.

If main burner and or pilot will not light:

1. Check the gas control knob is in the ON position.

2. Verify the presence of a spark at the electrode assembly. You may need to recycle the heater by turning the ON/OFF switch to OFF, waiting one minute and turning the switch back to ON. Also check the wiring harness connections are clean and tight.

3. Adjust the thermostat to its highest setting to demand heat.

4. Using a multimeter check for 24 volts at the gas control:

a. If pilot lights, measure across the MV/PV and MV terminals (blue & white wires). If multimeter does not register 24 volts, replace the ignition control module. If the multimeter registers 24 volts replace the gas control valve.

b. If pilot DOES NOT light, measure across the MV/PV and PV terminals (brown and white). If multimeter does not register 24 volts, replace the ignition control module. If the multimeter registers 24 volts replace the gas control valve.