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Atwood Water Heater Troubleshooting - Pilot

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<http://waterheatertimer.org/Atwood-water-heater-resources.html>

Atwood 6 and 10 gallon Pilot Water Heaters

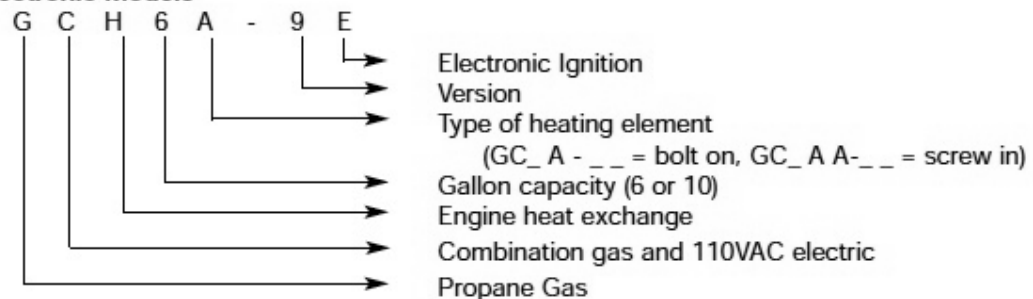


Atwood water heaters are designed and approved for use only in recreation vehicles (travel trailers, 5th wheels, motor homes, etc.). They are offered in two sizes: 6 and 10 gallon capacities.

TYPE OF GAS IGNITION - This unit is ignited outside of the trailer by a match, piezo ignitor or other ignition device. The water temperature is adjustable at the thermostat control.

EXPLANATION OF MODEL NUMBER:

Electronic Models



NOTE: When replacing the element on a combination gas/110 VAC unit, always check the back of

the heater for the type of element it has. It will either be a bolt-on or screw-in element. They are no interchangeable.

FEATURES

- All units operate on propane gas.
- A heat exchange option is available for motor homes. The water heater tank must have factory equipped heat exchange tubes welded on it already. They cannot be added later. A new water heater tank with this option is the only way to obtain this feature.
- Skin mounting allows the water heater to be hooked up with plumbing and electrical before the sidewall is erected.
- The tank has a clad aluminum lining that protects against corrosion and does not need to be replaced on a yearly or more frequent basis like anode rods do. A more detailed explanation of cladding is found in the back of this manual.
- 95% of all servicing can be done on the outside of the water heater. 110 VAC heating components are the exception since they are located on the back of the water heater inside the trailer.
- A flush flange is available for all models. This makes the access door flush with the trailer sidewall.
- There are multiple protection features in the form of a pressure-temperature relief valve, a limit switch in the gas thermostat and an externally sealed combustion chamber.
- On combination water heaters, the gas mode and the 110 VAC heating mode can be operated at the same time since each mode has its own thermostat.
- Both the six and ten gallon units have the lightest weight in the industry.
- On all trailers purchased after June 1, 1997 Atwood Limited Warranty is for a period of two years. This includes all reasonable labor charges.
- We have 650+ Service Centers throughout the United States.

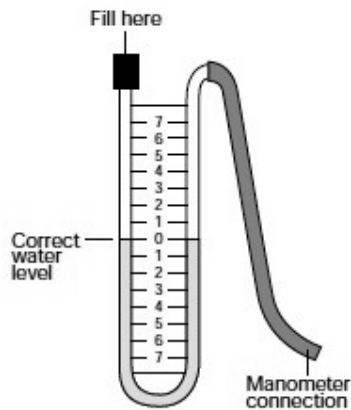
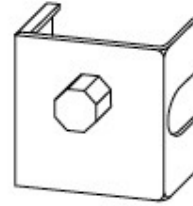
Recommended Tools and Equipment

U-Tube Manometer - This is the most accurate device for measuring gas pressure. If you use a dial-type manometer, it should be calibrated periodically with this type of manometer.

Thermostat Wrench - This tool allows for easier and safer removal of the gas thermostat control. An adjustable version for different size controls is available through most RV distributors or you may fabricate one from angle iron. We do not recommend using a pipe wrench because it may damage the control causing it to go out of calibration.

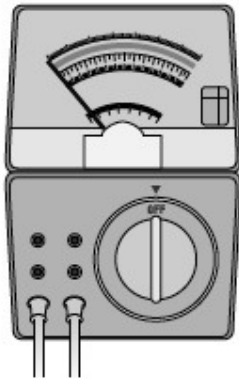
U-TUBE MANOMETER

with 1/8" pipe nipple

**THERMOSTAT WRENCH**

Multi-meter - This is the most versatile meter and will test AC voltage and continuity. A continuity test can be used to test for a blown E.C.O. on a gas control.

Magnet Assembly Thermocouple Tester - This assembly can be obtained at an electronics or hardware store. This same assembly can also be removed from a Robertshaw control. It will verify if a thermocouple is good.

**MULTI-METER TO TEST
AC VOLTAGE AND CONTINUITY****MAGNET ASSEMBLY TO TEST
THERMOCOUPLE**

For testing, screw a thermocouple into the tester, heat the thermocouple for 25 seconds and then press the plunger down. If the plunger pops up in less than 25 seconds, the thermocouple is faulty.

Common Hand Tools - 1/8" and 1/4" nut drivers, open end wrenches, flat blade and Phillips screw drivers.

Leak Test Solution - A solution that bubbles when applied to gas fittings or connections showing when a gas leak is present.

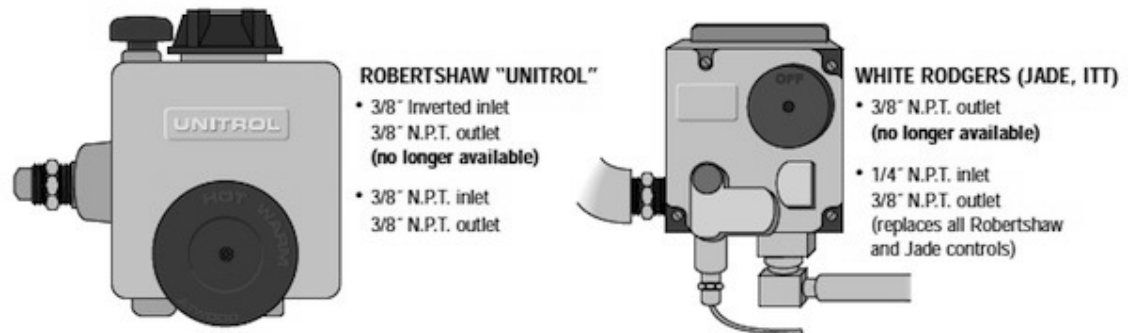
Gas Thermostat Controls and Pilot Assemblies

Only two makes of gas controls have been used on our pilot model water heaters. They are the Robertshaw "Unitrol" and White Rodger (formerly Jade or ITT).

The Robertshaw control came in two different sizes of gas inlets: 3/8" inverted flare and 3/8" N.P.T. The inverted inlet control is no longer available. Therefore, the water heater gas line connection will have to be modified to 3/8" N.P.T. in order to use the current Robertshaw control.

The White Rodger control is the valve we are using on all production today. Formerly it had a 3/8" N.P.T. inlet. Now it is only available with a 1/4" inlet. This improvement eliminates the adapter fitting into the control allowing the use of only a single 45 degree elbow (3/8" flare x 1/4" N.P.T.). If you are replacing a current 1/4" inlet model control with a earlier model 3/8" inlet control you may have in stock, the adapter fitting that mates the control and elbow fitting is still available.

Although the controls appear quite different in size, the White Rodger and Robertshaw control are interchangeable. Their manifolds will both line up with the burner tube properly. Both controls have a port to test gas pressure through the valve. This can be accomplished by removing the cover screw and inserting a 1/8" pipe nipple. After attaching your manometer hose to this fitting, the manometer should register 10" W.C. through the valve while it is operating.



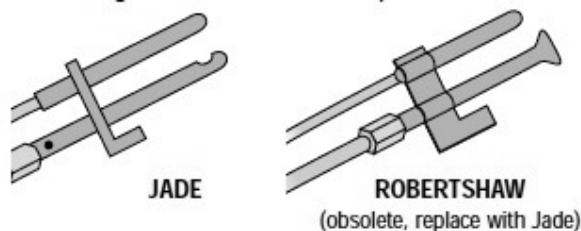
There are two main pilot assemblies that you will encounter in the field.

The first is an earlier model Robertshaw pilot assembly with a 1/4" pilot gas line that mounted on the left side of the main burner.

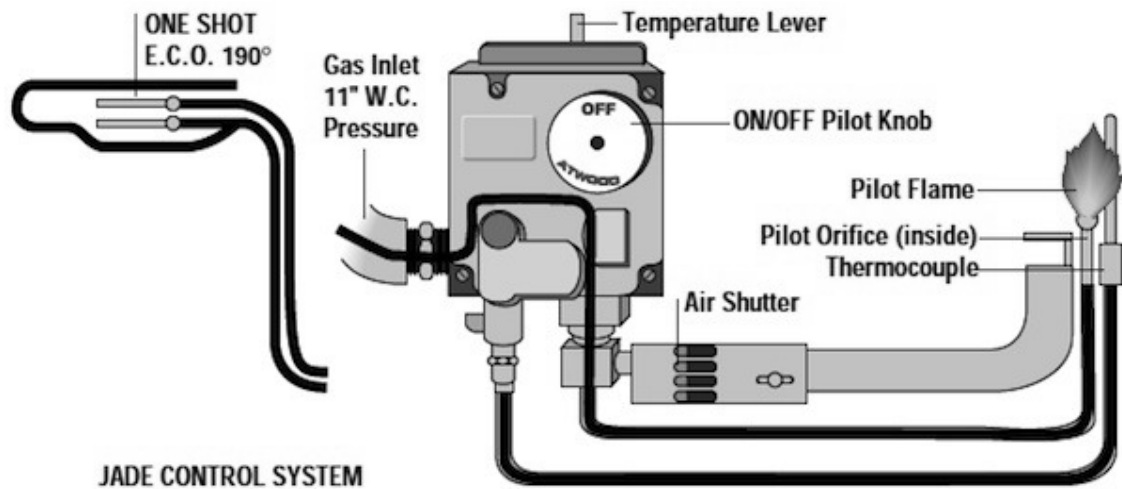
The current pilot is the Jade assembly with a 1/8" pilot gas line and it mounts on the right side of the main burner.

The Robertshaw pilot is no longer available and the Jade pilot must be substituted. When installing a Jade assembly in place of a Robertshaw assembly, if there is not a location on the right side of the main burner to mount the Jade pilot, a new burner that has the proper mounting holes will have to be purchased.

Note: The size of the gas line does not have any affect on the size of the pilot flame. Only the gas pressure and pilot orifice regulate the height of the pilot flame.



Pilot Sequence of Operation



PILOT OPERATION

- Gas Pressure 11" W.C. to control is necessary. Set with two gas appliances running.
- Gas Control supplies gas to pilot orifice when control ON/OFF pilot knob is held at pilot position.
- Pilot Orifice meters gas to heat thermocouple. Flame should be high enough to engulf the thermocouple.
- Thermocouple generates millivoltage to the gas control's magnet assembly.
- Magnet when it receives 12 millivolts or more it allows gas to flow freely to pilot without holding pilot knob.
- E.C.O. passes millivolts through the gas control and back to thermocouple. Trips permanently open if water temperature exceeds 190°F.

MAIN BURNER OPERATION

- Gas Control supplies gas to main burner when control knob is set to "ON" position and the temperature lever is set to desired temperature after pilot is lit.
- Main Burner Orifice meters gas through burner tube.
- Main Burner pilot ignites gas when it reaches end of this tube. Flame height adjusted by sliding air shutter. Ideal setting is 1/4 way open (.20"). Flame should be primarily blue with a trace of yellow.
- Temperature Knob setting of knob determines burner cycle and water temperature.

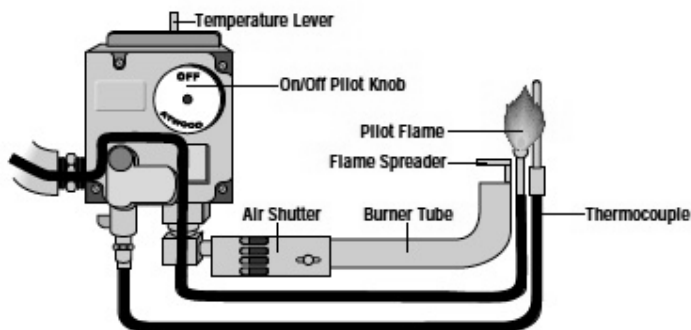
Temperature range is 70°F - 140°F.

Pilot and Main Burner

Pilot Adjustment

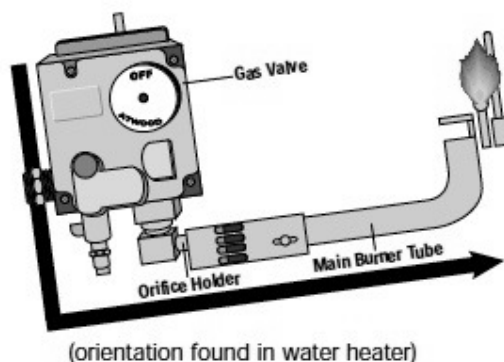
Only the gas pressure, gas valve and the pilot orifice regulate the height of the pilot flame. Early model gas controls have a pilot adjustment screw, but this screw has very little effect on the pilot. The pilot adjustment has been removed from the current White Rodger control. The flame should be high enough to

engulf the thermocouple at all times. A pilot flame any larger could blow the E.C.O. in the gas control. This is typically the result of enlarging the pilot orifice hole with a pin or similar item. For further corrective measures, refer to the trouble-shooting guide.



Main Burner Adjustment

The gas pressure, air shutter cleanliness of the burner tube and orifice regulate the main burner flame. The main burner flame should be mainly blue with a trace of yellow and fairly quiet. If it is not, adjust the gas pressure to 11" W.C., ensure that the main burner air shutter is 1/4 way open and verify that the main burner flame spreader is square to the end of the main burner. For further corrective measures, refer to the trouble-shooting guide.

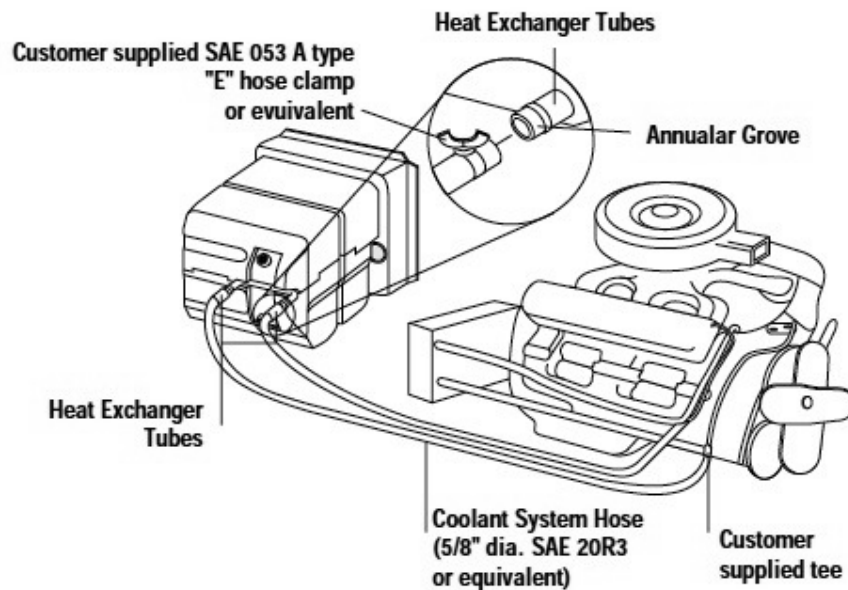


Main Burner Alignment

The manifold and main burner should be as perfectly aligned as possible. In other words, the gas valve should be rotated at the same angle as the main burner tube. If it is not, rotate the gas control and/or the orifice holder so that the orifice disperses gas straight down the center of the burner tube. If the valve must be backed off any, check for water leaks at the coupling the control screws into before you operate the water heater.

CAUSE	SOLUTION
PILOT OUTAGE	
Gas pressure incorrect	Set pressure to a minimum of 11" W.C. with two or more appliances running
Blocked "U" tube	Remove obstruction
Improper main burner alignment	Re-align main burner and main burner orifice holder and gas valve
Improper air adjustment	Adjust main burner air shutter approximately 1/4 open
Weak thermocouple	Replace thermocouple
Poor pilot flame	Clean or replace pilot orifice
Weak gas control magnet	Replace gas control
Defective E.C.O. in control	Replace gas control and check the pilot flame. It should be high enough to engulf the thermocouple at all times.
PILOT OUTAGE WHEN BUTTON OR KNOB IS RELEASED	
Thermocouple not hot	Hold button or knob for 30 seconds before releasing
Thermocouple loose	Tighten connection at gas control
Weak thermocouple	Replace thermocouple
Weak gas control magnet	Replace gas control
Defective E.C.O. in control	Replace gas control
MAIN BURNER WILL NOT IGNITE	
Blocked main burner orifice	Clean or replace orifice
Main burner flame spreader mis-alignment	Square flame spreader to end of main burner
Blocked main burner	Remove blockage
Improper air adjustment	Adjust main burner air shutter approximately 1/4 open
Blocked "U" tube	Remove blockage
Gas control out of calibration	Replace gas control
ERRATIC MAIN BURNER FLAME	
Improper gas pressure	Set inlet pressure to a minimum of 11" W.C. with two or more appliances running
Improper air adjustment	Adjust main burner air shutter approximately 1/4 open
Partial blockage of main burner	Remove blockage
Partial blockage of main burner orifice	Clean or replace orifice
Flame spreader misaligned	Re-align spreader or replace main burner
Blockage in "U" tube	Remove blockage
Poor gas supply	Replace gas supply
Exhaust grille blocked	Remove blockage
Improper main burner alignment	Re-align main burner, main burner orifice holder and gas valve
SMOKING AND SOOTING	
Gas pressure incorrect	Set pressure to a minimum of 11" W.C. with two or more appliances running
Poor gas supply	Replace gas supply
Improper pilot flame	Clean or replace pilot orifice
Improper air adjustment	Adjust main burner air shutter approximately 1/4 open
Flame spreader mis-aligned	Re-align or replace main burner
Blocked main burner	Remove blockage
Improper main burner alignment	Re-align main burner, main burner orifice holder and gas valve
Blocked "U" tube	Remove blockage
INSUFFICIENT WATER TEMPERATURE	
Temperature selector out of place	Re-set to desired position
Bypass levers improperly positioned	Reposition levers
Improper air adjustment	Adjust main burner air shutter approximately 1/4 way open
Partial main burner blockage	Remove blockage
Improper main burner adjustment	Re-align main burner and main burner orifice holder
Flame spreader mis-aligned	Re-align or replace main burner
Blocked "U" tube	Remove blockage

Engine Heat Exchange System



The engine heat exchange system allows a motor home to heat the water while traveling. This convenient option allows you to arrive at your destination with hot water. Operating a pilot or electronic water heater on gas while in transit is a dangerous practice.

This system consists of a U-shaped aluminum tube that is attached to the outside of the tank with welds. SAE hoses are attached to both ends of this tube and are spliced into the engine coolant system.

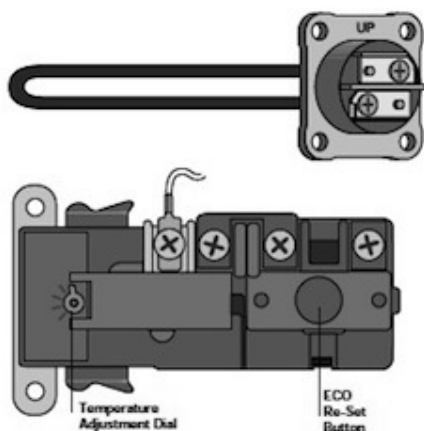
When the engine is running, the hot coolant flows past the tank through this tube and by means of heat transfer through the welds, heating the water. The design of this system will not allow the water to reach a boiling point. It will typically heat the water to about 130° F. in about 2-3 hours of driving.

YOU DO NOT NEED AN AFTERMARKET HEATING ELEMENT ON AN ATWOOD WATER HEATER. THE USE OF AFTERMARKET HEATING ELEMENT DEVICES MAY ALSO RESULT IN DAMAGE TO COMPONENTS OR WATER HEATER. Atwood's written warranty states - "failure or damage resulting from any alteration to our water heater is the owner's responsibility". ANY ALTERATION, LIKE THE ADDITION OF AN AFTERMARKET HEATING ELEMENT DEVICE, WILL VOID THE WARRANTY.

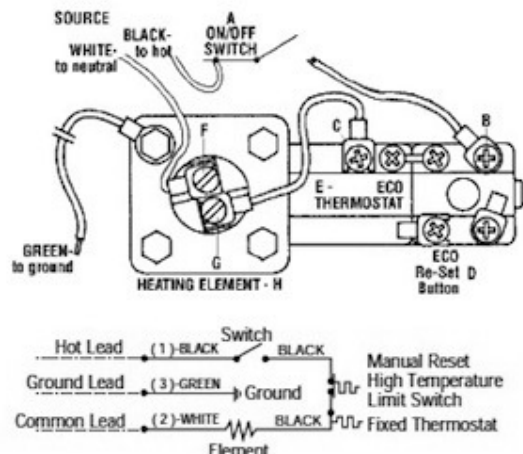
Temperatures produced by these heating elements can exceed the 190°F. limit of the ECO on pilot model gas control valves. This gas control valve contains a one-shot ECO. When this ECO blows, the control is completely non-functional and must be replaced. **THIS WILL BE A NON-WARRANTABLE SITUATION.**

When Aftermarket heating elements are inserted into the drain plug, customers are more prone not to flush their tanks. Not flushing the tank accelerates tank corrosion on both our pilot and electronic ignition water heaters creating a situation where the tank may have to be replaced. **THIS WILL BE A NON-WARRANTABLE SITUATION.**

BOLT-IN Heating Element, Thermostat & ECO



110VAC Trouble-Shooting Wiring Schematic



Early model water heaters with 110 VAC heating capacity used a bolt-on heating element and a one piece thermostat/E.C.O.. This 110 VAC system has an adjustable rectangular thermostat that is surface mounted to the inner tank and retained by a steel clip.

The temperature settings are HI, MEDIUM, and LOW. If the thermostat is making unobstructed contact with the aluminum tank and it is set to the HI position, it should heat the water to 130° F. It will take longer to heat a tank of water on electric than gas. The heating element was changed in 1996 from 1500W to 1400W bringing the amperage draw down to 12.7 amps and allowing more cushion for the 15 amp circuit breaker that is normally placed in line. This change adds a few minutes to the heating time. There are 110 VAC aftermarket conversion kits being offered by distributors in which the heating element is screwed into the tank where the drain plug is located. We do not offer such a kit. Our kit includes the tank with the 110 VAC components already installed in it.

In the case where the 110VAC portion of the water heater is not heating water, the following diagnostic steps and repairs should be investigated:

Turn POWER OFF to the appliance before removing junction box cover.

Perform the following steps with POWER ON to water heater.

1. Verify switch-A is in ON position.
2. Insure there is 110VAC to the unit (measure voltage across the black and white lead to the appliance with POWER ON). If none, trace wiring back and make appropriate wire repair.

Perform the following steps with POWER OFF to water heater.

3. ECO Re-set Button-D should be depressed.
4. Check for continuity between screw-B and screw- C of thermostat. If none, replace thermostat.
5. If water is insufficiently hot, check ECO / Thermostat-E is on high.
6. Verify a good wire connection between thermostat screw-C and heating element screw-G. Correct if necessary.

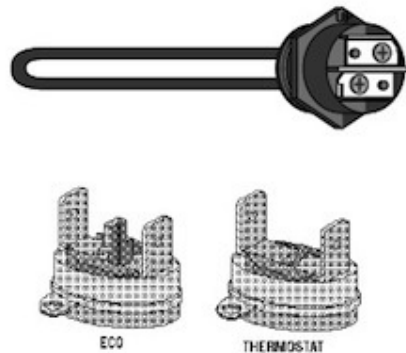
7. There should be continuity between heating element screw-G and screw-F. If none, element is bad and should be replaced. Do not over-tighten self-tapping screws when installing new element.

8. Check for continuity between element screw-G and flange of element. If there is, element has shorted. Element should be replaced.

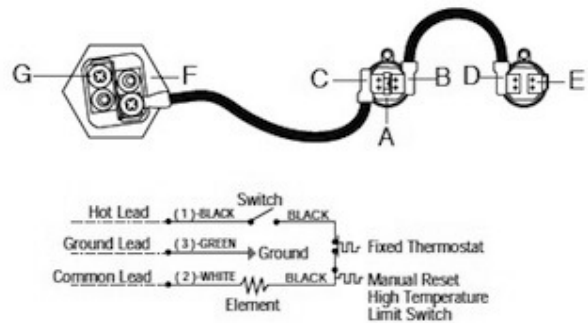
9. Verify ground connection.

NOTE: Heating element can be operated on an empty tank for a limited period of time before it self destructs.

SCREW-IN Heating Element, Thermostat & ECO



110VAC Trouble-Shooting Wiring Schematic



Current production water heaters with the 110 VAC heating option use a screw-in heating element, a separate pre-set thermostat and a separate ECO.

The screw-in heating element is rated at 1400 watts just like the bolt-on element. It is an incolloy element and can be run for a limited amount of time in a dry tank without shorting out.

CAUTION: If the heating element is allowed to run with a dry tank, allow the tank to cool down for 2-3 hours before adding water. Adding water before the tank cools sufficiently could collapse the tank.

The thermostat and ECO are pre-set surface-mounted discs. The thermostat is set at 140° F and is the same thermostat used on the gas side of the electronic ignition water heaters. The ECO is a backup thermostat and will trip if the thermostat fails and the water temperature exceeds 170° F.

When the 110VAC portion of the water heater is not heating water, the following diagnostic steps and repairs should be investigated:

Turn POWER OFF to the appliance before removing junction box cover.

Perform the following steps with POWER ON to water heater.

1. Verify switch is in ON position.
2. Insure there is 110VAC to the unit (measure voltage across the black and white lead to the appliance with POWER ON). If none, trace wiring back and make appropriate wire repair.

Perform the following steps with POWER OFF to water heater.

3. Manual reset ECO high limit switch-A should be depressed. Check for continuity between TERMINAL B and TERMINAL C of ECO.

4. Check for continuity between TERMINAL D and TERMINAL E of thermostat. If there is none, replace thermostat.

5. If water is insufficiently hot, insure thermostat is flush with tank.

6. Verify a good wire connection between ECO TERMINAL-C and heating element TERMINAL-F. Correct if necessary.

7. Check for continuity between heating element TERMINAL-F and TERMINAL-G. If none, element is bad and should be replaced. Do not over-tighten selftapping screws when installing new element.

8. There should NOT BE CONTINUITY between element screw-G and flange of element. If there is, element has shorted. Element should be replaced.

9. Verify ground connection.

NOTE: Heating element can be operated on an empty tank for a limited period of time before it self destructs.

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