BRADFORD WHITE®
CORPORATION

Flammable Vapor Ignition Resistant Water Heaters

SERVICE MANUAL

Troubleshooting Guide and Instructions for Service

(To be performed ONLY by qualified service providers)

For the Bradford White Defender Safety System Models:

URG230T*N
URG240S*N
URG240T*N
URG250L*N
URG250H*N
URG250T*N
URG250S*N
URG130T*N
URG140T*N
URG150T*N

(*) Denotes Warranty Year

WARNING
CANCER AND REPRODUCTIVE HARM
WWW.P65WARNINGS.CA.GOV

As required by the state of California Proposition 65.

Save this manual for future reference

The Bradford White

ECO DEFENDER

Safety System®

Ultra Low NOx Gas Water Heaters

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ECO Defender Series

WARNING: If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury, or death.

FOR YOUR SAFETY

Do not store or use gasoline or other flammable, combustible, or corrosive vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS!

- **Do not try to light any appliance.**
- **Do not touch any electrical switch; do not use any phone in your building.**
- **Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.**
- **If you cannot reach your gas supplier, call the fire department.**

Installation and service must be performed by a qualified installer, service agency or the gas supplier.

⚠ DANGER

Do not store or use gasoline or other flammable, combustible, or corrosive vapors and liquids in the vicinity of this or any other appliance.

IMPORTANT

Before proceeding, please inspect the water heater and its components for possible damage. DO NOT install any water heater with damaged components. If damage is evident then please contact the supplier where the water heater was purchased or the manufacturer listed on the rating plate for replacement parts.

⚠ WARNING

Water heaters are heat producing appliances. To avoid damage or injury, do not store materials against the water heater or vent-air intake system. Use proper care to avoid unnecessary contact (especially by children) with the water heater and vent-air intake components. **UNDER NO CIRCUMSTANCES MUST FLAMMABLE MATERIALS, SUCH AS GASOLINE OR PAINT THINNER BE USED OR STORED IN THE VICINITY OF THIS WATER HEATER, VENT-AIR INTAKE SYSTEM OR IN ANY LOCATION FROM WHICH FUMES COULD REACH THE WATER HEATER OR VENT-AIR INTAKE SYSTEM**

⚠ CAUTION

If sweat fittings are to be used DO NOT apply heat to the nipples on top of the water heater. Sweat the tubing to the adapter before fitting the adapter to the water connections. It is imperative that heat is not applied to the nipples containing a plastic liner.

⚠ WARNING

Hydrogen gas can be produced in an operating water heater that has not had water drawn from the tank for a long period of time (generally two weeks or more). Hydrogen gas is extremely flammable. To prevent the possibility of injury under these conditions, we recommend the hot water faucet to be open for several minutes at the kitchen sink before you use any electrical appliance which is connected to the hot water system. If hydrogen is present, there will be an unusual sound such as air escaping through the pipes as hot water begins to flow. Do not smoke or have open flame near the faucet at the time it is open.

⚠ WARNING

DO NOT ATTEMPT TO LIGHT ANY GAS APPLIANCE IF YOU ARE NOT CERTAIN OF THE FOLLOWING:

- Liquefied petroleum gases/propane gas and natural gas have an odorant added by the gas supplier that aids in the detection of the gas.
- Most people recognize this odor as a “sulfur” or “rotten egg” smell.
- Other conditions, such as “odorant fade” can cause the odorant to diminish in intensity, or “fade”, and not be as readily detectable.
- If you have a diminished sense of smell, or are in any way unsure of the presence of gas, immediately contact your gas supplier from a neighbor’s telephone.

Gas detectors are available. Contact your gas supplier, or plumbing professional, for more information.

⚠ WARNING

FAILURE TO INSTALL AND MAINTAIN A NEW, LISTED ¾” X ¾” TEMPERATURE AND PRESSURE RELIEF VALVE WILL RELEASE THE MANUFACTURER FROM ANY CLAIM THAT MIGHT RESULT FROM EXCESSIVE TEMPERATURE AND PRESSURES.

⚠ CAUTION

Turn off or disconnect the electrical power supply to the water heater before servicing. Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

Introduction

The Bradford White ECO-DEFENDER Safety System was designed to resist the ignition of flammable vapors that can occur outside of the water heater. In addition, the ECO-DEFENDER Safety System is designed to meet the stringent NOx emissions standards required in the South Coast Air Quality Management District (SCAQMD) Rule 1121. Use and installation are nearly identical to previous versions of atmospherically fired and vented water heaters. A number of exclusive design features are incorporated in the system that will require additional knowledge on the part of the qualified service provider. The following information will instruct service professionals on the function, proper diagnosis and repair of the water heaters employing the Bradford White ECO-DEFENDER Safety System®.

How the Safety System Works

During normal operation, most air for combustion is drawn into the water heater through the openings in the jacket door. This air travels into the burner venturi, mixing with the gas jet. This air is then mixed with gas inside the burner and drawn to the burner screen and is efficiently combusted producing Ultra Low NOx emissions. Additional air is drawn through the openings in the jacket. This air travels down and around the combustion chamber and enters through holes in the bottom of the corrosion resistant combustion chamber. The air then travels up through the oriented flame arrestor plate louvers, where the velocity of the air is increased and its direction altered. The air then mixes in a normal manner with the combustion products from the burner.

In the case where trace amounts of flammable vapors are present in the air flowing into the combustion chamber and burner venturi, the vapors are harmlessly ignited by the burner pilot flame. If flammable vapors are in sufficient quantity to prevent normal combustion, the burner and pilot flames are designed to shut down.

Should the flammable vapors continue to the burner, the flame arrestor plate and burner screen prevent the flames from traveling backwards and igniting vapors outside of the combustion chamber. This causes the thermopile to overheat and shuts down the main pilot and burner. The thermopile powers the intelligent diagnostic control which is capable of recognizing restricted airflow conditions caused by severe lint, dust and oil accumulation on the burner screen and arrestor plate. The intelligent diagnostic control will deactivate the burner and pilot in the unlikely event of restricted airflow.

It is intended for this manual to be used by qualified service personnel for the primary purpose of troubleshooting and repair of the Bradford White ECO-DEFENDER Series water heaters.

The Resideo WV8860 Gas Control will display status codes in the event of abnormal operation. Status codes are listed in the troubleshooting chart beginning on page 6 of this service manual. The troubleshooting chart will also indicate the probable cause for the status code and direct the service professional to a service procedure to properly diagnose the abnormal operation.

Contact the Bradford White technical support group immediately if diagnosis cannot be made using the methods described in this service manual.

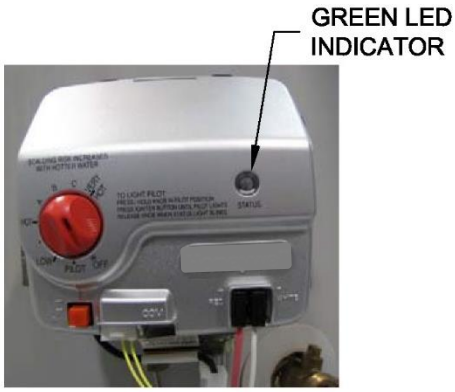
Tools Required for Service

Manometer:	A liquid “U” tube type or a digital (magnahelic) type can be used. This device is used to measure gas and/or air pressure and vacuum.
Multi-Meter:	A digital type is strongly recommended. This device is used to measure electrical values. The meter you select must have the capability to measure volts AC, volts DC, Amps, micro-amps and ohms.
Electronic Probes:	In some cases, standard multi-meter probes will damage or simply not be effective to obtain certain voltage and ohm readings. It will be necessary to have special electronic “pin” type multi-meter probes. These probes are available at most electronic wholesale outlets.
Thermometer:	Used to measure water temperature. An accurate thermometer is recommended.
Water Pressure Gage:	Used to measure water supply pressure. Also used to determine tank pressure by adapting to the drain valve of the heater.
Various Hand Tools:	Pipe wrench, channel locks, open end wrenches (3/8”, 7/16”, 1/2”), 12” crescent wrench, allen wrench set, screw drivers (common & Phillip’s), 1/4” nut driver, pliers (common & needle nose), socket set, side cutters, wire cutters, wire strippers, wire crimpers, torpedo level, small shop vacuum, step ladder, flashlight and 5-gallon pail.

ECO Defender Series V1

Troubleshooting

Observe green LED indicator on electronic gas control. Status flash codes are displayed with a three second pause before repeating. Check and repair the system as noted in the troubleshooting table below.



LED Status	Control Status	Probable Cause	Service Procedure
None (LED not on or flashing)	Pilot assembly is not lit.	Gas control is not powered. Light Pilot.	If the pilot will not stay lit replace pilot assembly. If problem persists, replace gas control.
One flash and three second pause	1. If setpoint knob is in "PILOT" position, then pilot flame is detected. Turn setpoint knob to desired setting. 2. If the setpoint knob is already at the desired setting, the water heater is satisfied.	1. Gas control is powered and waiting for setpoint knob to be turned to a water temperature setting. 2. Water heater is satisfied and operating normally.	Normal operation.
LED strobe (two quick flashes) and three second pause	Thermostat calling for heat (no faults).	Tank temperature below setpoint of thermostat.	Normal operation.
LED on continuously (solid)	Setpoint knob has been recently turned to the "OFF" position. Wait until LED goes out before attempting to relight.	Setpoint knob was turned to "OFF" position.	LED will not go out and the control will function normally the is lit.
Two flashes and three second pause	Weak pilot signal detected. System will reset when pilot flame is sufficient.	1. Thermopile failure. 2. Unstable pilot. 3. Pilot tube block or restricted.	1. See service procedure IV 2. See service procedure II 3. See service procedure II
Three flashes and three second pause	Insufficient water heating. System will reset.	1. Thermal sensor out of calibration. 2. Faulty gas control.	Replace gas control.

ECO Defender Series V1

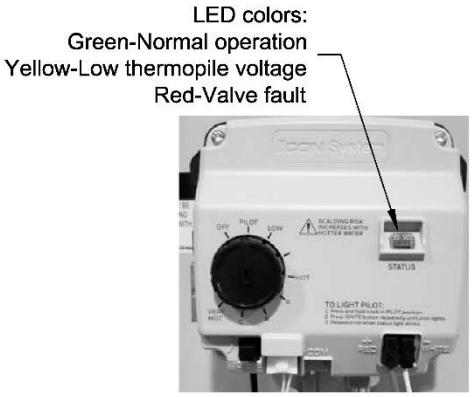
Troubleshooting

Observe green LED indicator on electronic gas control. Status flash codes are displayed with a three second pause before repeating. Check and repair the system as noted in the troubleshooting table below.

LED Status	Control Status	Probable Cause	Service Procedure
Four flashes three second pause	Excessive tank temperature. System must be reset.	1. Temperature sensor out of calibration. 2. Faulty gas control.	Replace gas control
Five flashes and three second pause	Temperature sensor fault.	1. Damage to the temperature sensor. 2. Temperature sensor resistance out of range.	1. Verify control is not wet or physically damaged 2. Turn set point knob to "OFF" position. Turn set point knob to "PILOT" position and light pilot. 3. Replace gas valve if five flash status persists.
Six flashes and three second pause	Chamber temperature sensor out of specification. Possible short.	1. Chamber temperature sensor out of calibration. 2. Possible short.	1. Reset gas control 2. Replace gas control.
Seven flashes and three second pause	Gas valve electronic fault detected.	1. Control needs to be reset. 2. Control is wet or physically damaged.	1. Reset gas control 2. Replace gas control.
Eight flashes and three second pause	Standing pilot remains on while setpoint knob is in "OFF" position.	Pilot valve stuck in open position.	Replace gas control
Ten flashes and three second pause.	Insufficient combustion air detected.	Insufficient combustion air.	1. Reset gas control 2. Replace gas control.

ECO Defender Series V2

Observe colored LED indicator on electronic gas control. Status flash codes are displayed with a three second pause before repeating. Check and repair the system as noted in the troubleshooting table below.

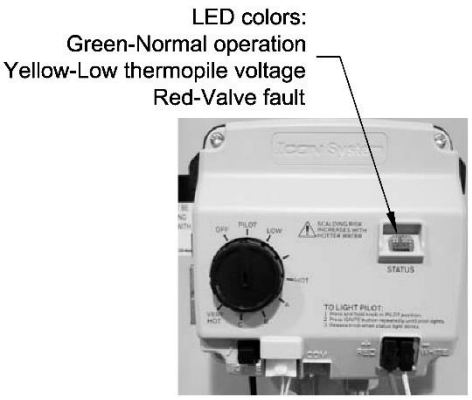


LED Status	Control Status	Probable Cause	Service Procedure
None (LED not on or flashing)	Millivolt power is not present. Light pilot.	Gas valve is functioning normally. Gas valve is not powered. Light pilot.	If the pilot will not stay lit replace pilot assembly. If problem persists, replace gas control.
One flash every four seconds (LED green)	Not an error. Indicates pilot is lit and main burner is off.	The knob can be turned to a desired setpoint temperature.	Normal operation.
One flash every second (LED green)	Not an error. Indicates main valve is open and main burner is lit.	None. Control will automatically shut main burner off when water temperature reaches the setpoint temperature.	Normal operation.
Two flashes and three second pause (LED yellow)	Low thermopile voltage; main valve not turned on.	Check thermopile and its connections. Check pilot flame.	1. See Service Procedure IV 2. See Service Procedure II 3. See Service Procedure II
Four flashes and three second pause (LED red)	Temperature cut-out limit reached, causing shutdown.	Check the valves and the water temperature sensor. Reduce the water temperature setpoint. Verify control operation, replace if exceeding setpoint.	Replace gas control.

ECO Defender Series V2

Troubleshooting

Observe colored LED indicator on electronic gas control. Status flash codes are displayed with a three second pause before repeating. Check and repair the system as noted in the troubleshooting table below.



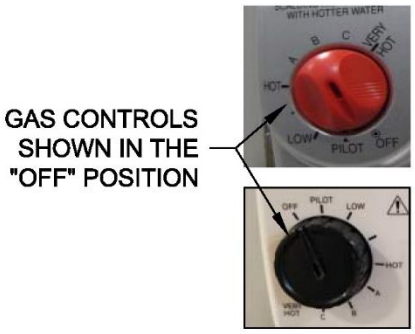
LED Status	Control Status	Probable Cause	Service Procedure
Five flashes and three second pause (LED red)	Electronics, sensor, or gas valve fault detected.	Check water temperature sensor and its connection for open circuits, shorts, or differences in resistance between the two sensor elements.	Replace gas control.
Six flashes and three second pause (LED red)	Door temperature sensor failure.	Check door temperature sensor and its connection for open circuits or shorts.	See service procedure X.
Solid ON (LED red)	Not an error–indicates that the control is in OFF position.	None; wait until LED turns off if you want to restart system.	LED will go out and the control will function normally once the pilot is lit.
Nine flashes and three second pause (LED red)	Tank leakage detected by accessory module.	Control recovers after receiving message from accessory module.	1. Check T&P valve. 2. Check all water fittings. 3. Pressurize and leak test tank.
Ten flashes and three second pause (LED red)	Abnormal combustion chamber temperature profile during heating cycle.	Clean all combustion air intakes to the appliance. Clean the burner. Remove all obstacles that may restrict air flow to the burner.	Replace gas control

ECO Defender Series

ED SERVICE PROCEDURE I
Burner Operation Inspection,
Cleaning and Replacement

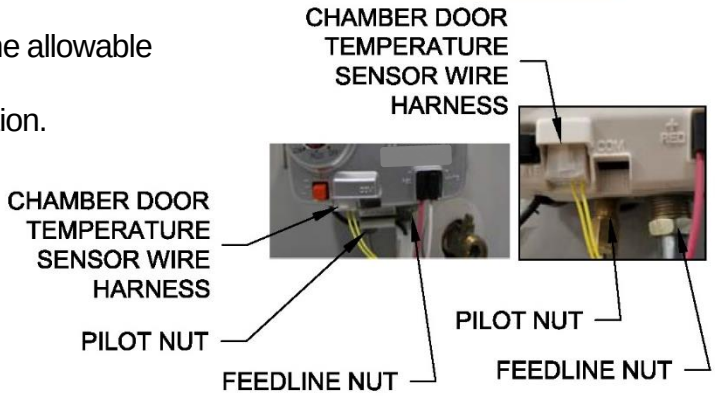
Burner Inspection

At periodic intervals (every 6 months) a visual inspection should be made of the pilot and main burner for proper operation and to assure no debris is accumulating.



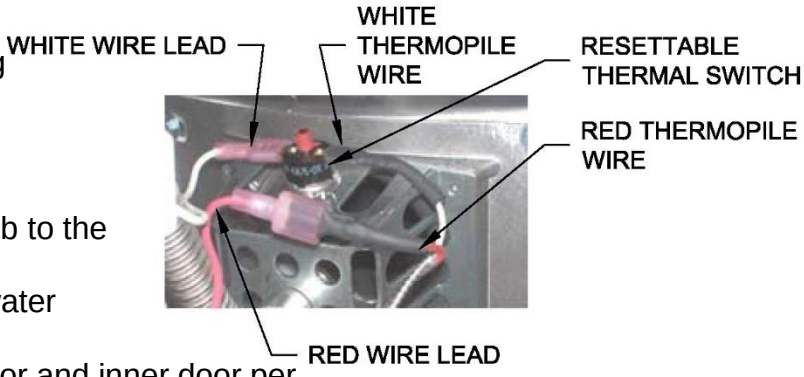
Pilot flame should be stable, some causes for an unstable pilot flame are:

a) Water heater vent is less than the allowable vent length.
b) Gas pressure is out of specification.
c) Pilot flame not fully engulfing spark/flame sensor.



Main burner should light smoothly from pilot and burn with a blue flame with a minimum of yellow tips.

Main burner must be free from any debris accumulation that may affect burner operation (see burner cleaning procedure below).

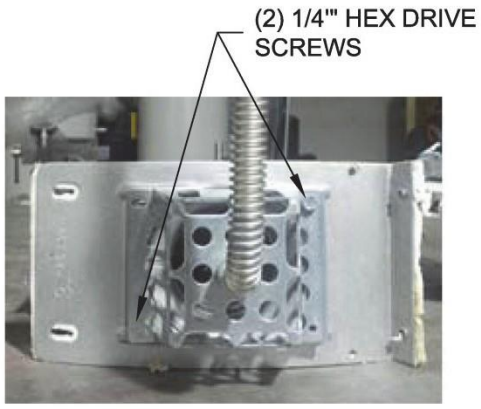


Burner Cleaning

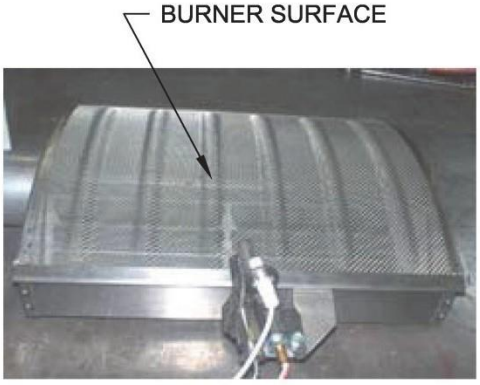
Step 1. Position gas control knob to the "OFF" position.
Step 2. Turn off gas supply to water heater.
Step 3. Remove outer jacket door and inner door per service procedure ED-X on page 21.
Step 4. Disconnect pilot tube (7/16" wrench) and feedline (3/4" wrench) from gas control.
Step 5. Disconnect chamber door temperature sensor from gas control.
Step 6. Disconnect resettable thermal switch's white and red wire leads from gas control.
Step 7. Remove burner assembly from combustion chamber.

Burner Cleaning (cont.)

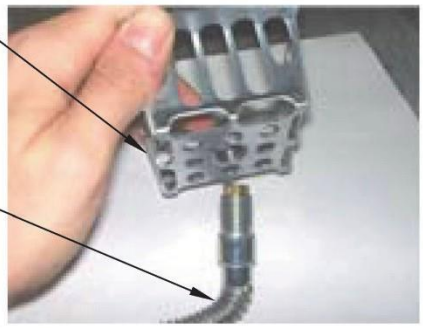
Step 8. Remove manifold mount from burner inner door by removing (2) ¼" hex drive screws.



Step 9. Thoroughly inspect burner surface area and burner port area. Remove any loose debris using a stiff brush, compressed air and/or a shop vacuum.



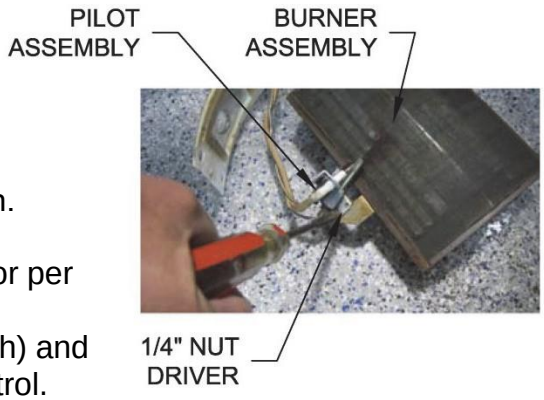
Step 10. Unscrew main burner orifice and feedline from manifold mount. Remove main burner orifice from feedline (1/2" wrench) inspect orifice, clean or replace if necessary.



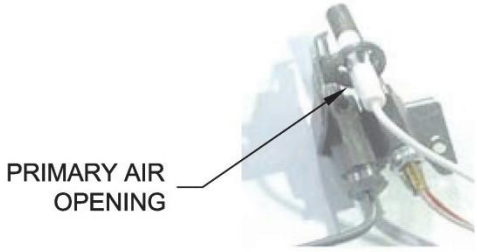
Step 11. Reassemble burner and reinstall into water heater. Restore gas supply and check for gas leaks.

Step 12. To resume operation, follow the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual.

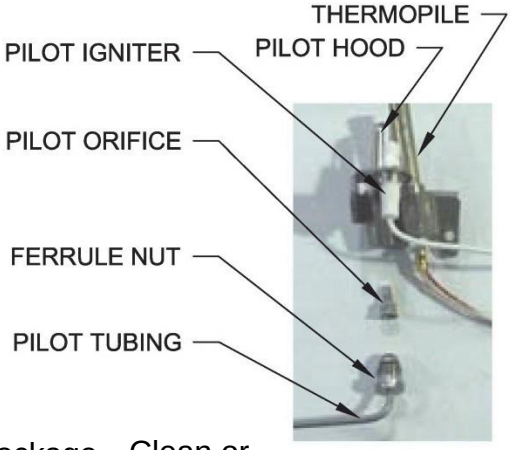
Pilot Inspection, Testing and Replacement



Step 1. Position gas control knob “OFF” position.
Step 2. Turn off gas supply to water heater.
Step 3. Remove outer jacket door and inner door per service procedure ED-X on page 21.
Step 4. Disconnect pilot tubing nut (7/16” wrench) and feedline nut (3/4” wrench) from gas control.
Step 5. Disconnect igniter/flame sense wire from gas control.
Step 6. Disconnect wire connections to the resettable thermal switch.
Step 7. Disconnect chamber door thermal sensor from gas control.
Step 8. Remove burner assembly from combustion chamber.
Step 9. Remove pilot assembly from burner (1/4” nut driver).
Step 10. Visually inspect igniter/flame sense wire for damage. Replace pilot if damage is found.
Step 11. With a multi-meter set to ohms setting, check continuity through igniter/flame sense wire. Replace pilot if no continuity.



Step 12. Visually inspect igniter/flame sense electrode for deterioration. Replace pilot as necessary. Electrode should not be in contact with pilot hood.
Step 13. Visually inspect igniter/flame sense electrode for oxidation build up. Carefully clean any oxidation using very fine emery cloth.
Step 14. Visually inspect pilot tubing for kinks or cracks. If damage is found, replace pilot.



Step 15. Inspect pilot tubing and pilot orifice for blockage:
  a. Remove ferrule nut from bottom of pilot assembly (7/16” wrench).
  b. Remove pilot tube and pilot orifice.
  c. Inspect pilot tubing and pilot orifice for blockage. Clean or replace as necessary.
Step 16. Reassemble pilot and install onto burner.
Step 17. Reinstall burner assembly to water heater.
Step 18. Restore gas supply and check for gas leaks.
Step 19. To resume operation, follow the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual.

Line Pressure

The gas control is designed for a maximum line pressure of 14.0” w.c. and a minimum line pressure of 1.0” w.c. over the water heater’s rated manifold pressure (check rating plate). Line pressure must be checked with the main burner on and off to assure proper readings.

Manifold Pressure Testing

(this procedure presumes a maximum line pressure of 14.0” w.c.)

Step 1. Set the gas control knob to the “OFF” position.

Step 2. Remove pressure tap plug and install 1/8” NPT pipe, coupling & pressure tap.

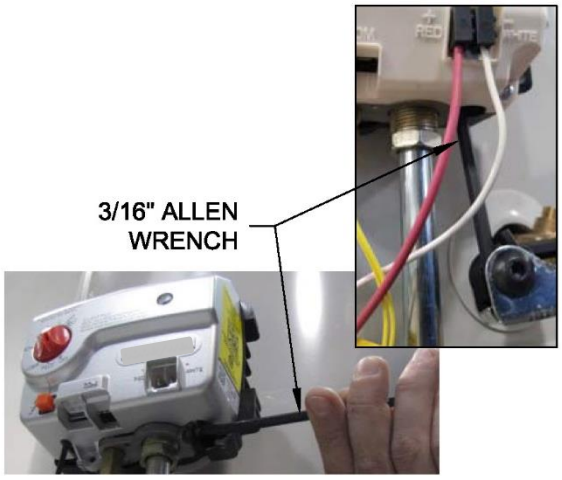
Step 3. Connect manometer to pressure tap.

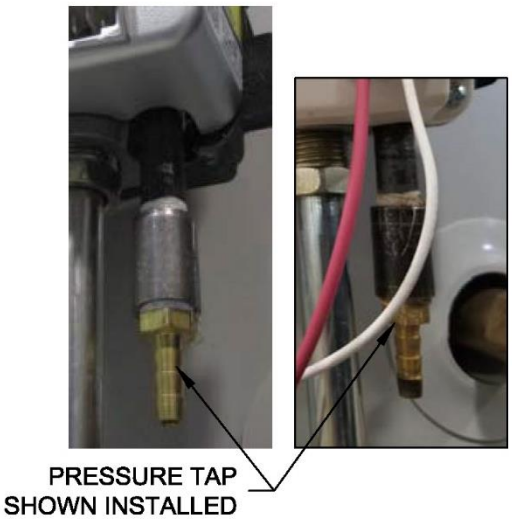
Step 4. Follow instructions located on the lighting instructions label and proceed to light the main burner and observe manometer reading.

Step 5. Proper manifold pressure operating range for Natural Gas is 5.0” ±0.5” w.c.

Step 6. If pressure is within the range specified in the previous step, set Gas Control knob to the “OFF” position, remove manometer and pressure tap, and replace pressure tap plug. Check for gas leaks prior to placing water heater back into operation by following the instructions located on the lighting label, or the lighting instructions located in the installation and operation manual.

Step 7. If gas pressure is outside the specification noted above, refer to page 16 to replace gas control.





Determine Water Temperature Inside Tank

⚠ WARNING

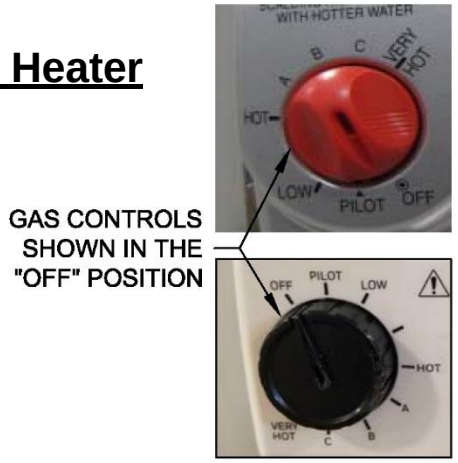
Stored water may be HOT WHEN PERFORMING THE FOLLOWING STEPS IN THIS PROCEDURE. Take necessary precaution to prevent personal injury.

Step 1. Position gas control knob to the “OFF” position.

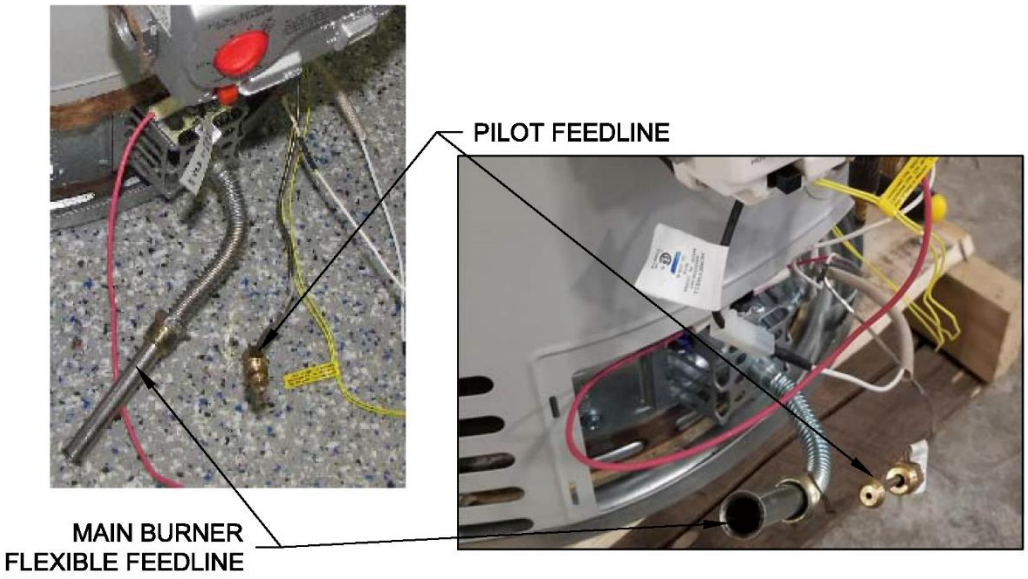
Step 2. Draw approximately 4 gallons of water from the drain valve into a container and discard. Draw an additional gallon and immediately measure water temperature using an accurate thermometer (It may be necessary to open a hot water faucet to allow heater to drain).

Step 3. Compare the measured water temperature with the setting on the gas control. In most instances, they should not differ by more than approx. 10°F.

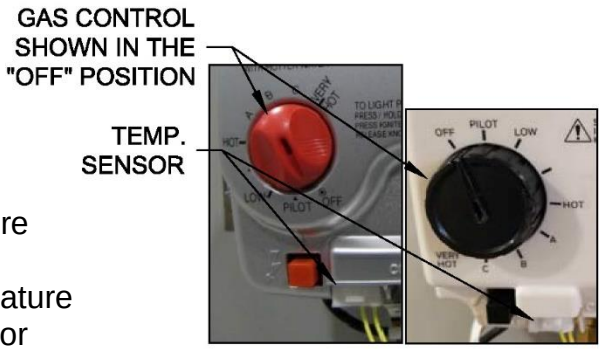
Gas Control Removal from Water Heater



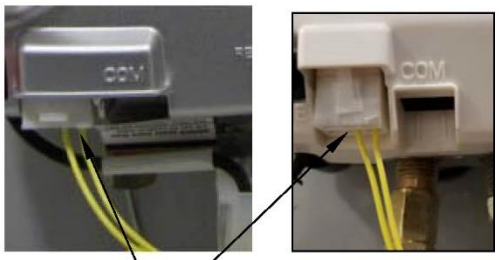
Step 1. Rotate the gas control knob to the "OFF" position.
Step 2. Drain the heater to a point below the gas control level.
Step 3. Turn off the gas supply to the water heater and disconnect gas piping from the gas control.
Step 4. Disconnect wire harnesses from the gas control.
Step 5. Remove the outer jacket burner access door.
Step 6. Disconnect main burner feedline, swing counter-clockwise away from gas control.
Step 7. Disconnect pilot tube from gas control and move away from gas control.
Step 8. Removal gas control from water heater by rotating counter clockwise. DO NOT use a wrench on the gas control body, damage to the gas control may occur. If necessary, use a length of ½" NPT pipe threaded into gas inlet of gas control.
Step 9. Install new gas control into water heater by rotating clockwise. DO NOT use a wrench on the gas control body, damage to the gas control may occur. If necessary, use a length of ½" NPT pipe threaded into gas inlet of gas control.
Step 10. Reattach main burner feedline, pilot tube and all wire harnesses.
Step 11. Reconnect gas supply piping to inlet of gas control.

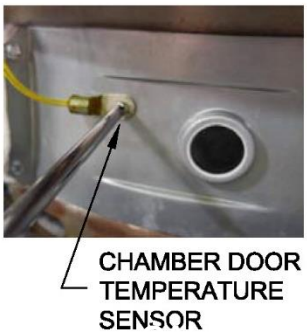


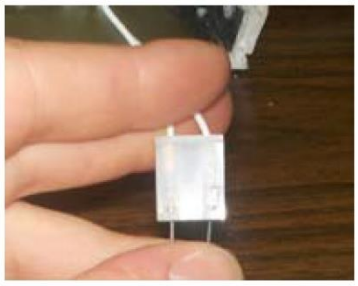
Chamber Sensor Testing



Step 1. Rotate the gas control knob to the “OFF” position.
Step 2. Disconnect the chamber sensor wire harness from the gas control.
Step 3. Remove the chamber door temperature sensor from the right side inner door (Phillips screw driver).
Step 4. Make sure that the ring terminal of the chamber door temperature sensor is not touching any surface. Using a multi-meter set to the ohms setting, insert one-meter probe (see caution) into each of the wire positions (see photo).
Step 5. Measure the ambient air temperature near the sensor. Compare the ambient temperature range to the expected resistance range on the chart below. Note that resistance increases as temperature decreases.







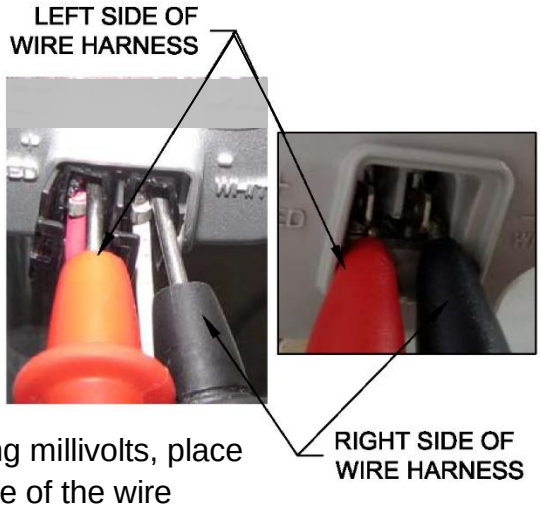
DO NOT use standard multimeter probes for this test. Doing so will damage connector. Use special pin type electronic probes or small diameter wire pins inserted into connector.

Sensor Resistance at Various Temperatures

Temperature Range (°F)	Resistance Range (kOhms)
41-50	279-175
50-59	219-139
59-68	173-112
68-77	137-90
77-86	110-72
86-104	89-59
104-113	73-48
113-122	60-39
122-131	49-32

Closed Circuit Thermopile Testing

115 volt potential exposure. Use caution to avoid personal injury.



Step 1. Closed circuit testing is the preferred method for testing the thermopile. Following the lighting instruction label on the heater, proceed to light the pilot and allow to operate for three minutes. If the pilot will not stay lit, hold the pilot button (rotate the gas control knob to the pilot position, push and hold in) during this test.

Step 2. Using a multimeter capable of measuring millivolts, place on lead of the multi meter on the left side of the wire harness and place the second lead of the multi meter on the right side of the wire harness.

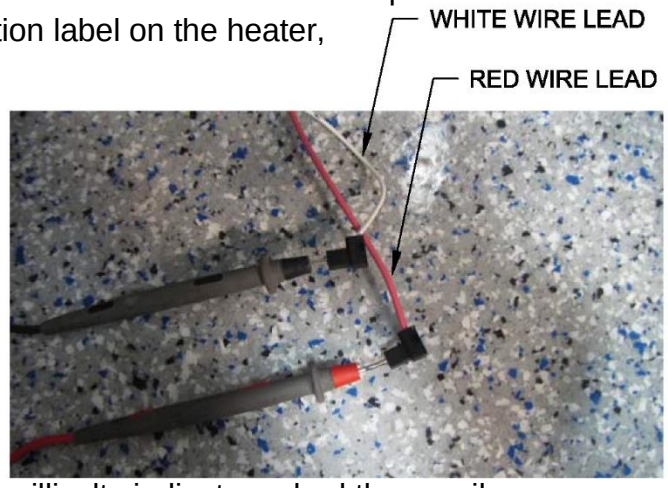
Step 3. If meter reads 300 millivolts or higher, the thermopile is OK. If reading is below 300 millivolts, replace the pilot assembly per service procedure ED-II on page 10.

Open Circuit Thermopile Testing

Step 1. Disconnect red thermopile wire from wire harness leading to the gas control. Disconnect the white thermopile wire from the resettable thermal switch.

Step 2. Using a multi meter capable of measuring millivolts, connect one lead to the red thermopile wire and one lead to the white thermopile wire.

Step 3. Following the lighting instruction label on the heater, proceed to light the pilot and allow the heater to operate for three minutes. **It will be necessary to hold the gas control knob down in the "PILOT" position continuously throughout this test.** A reading over 400 millivolts indicates a good thermopile output. A reading under 400 millivolts indicates a bad thermopile, replace the pilot assembly per service procedure ED-II on page 10.

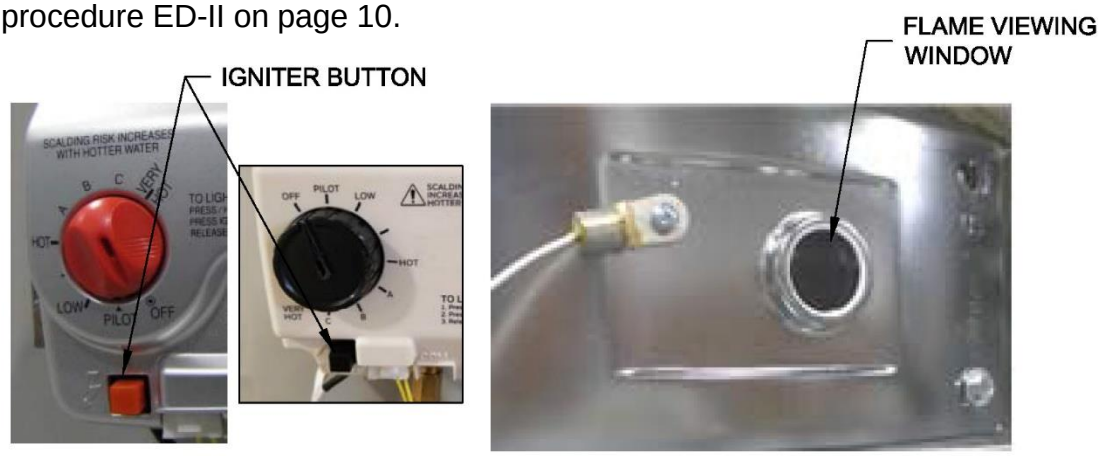


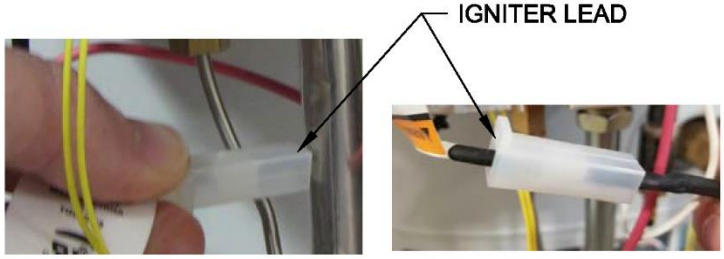
Igniter, Electrode Testing and Replacement

Step 1. Remove outer jacket door.

Step 2. Repeatedly depress the igniter button while viewing the pilot through the sight glass. If a spark is present, the circuit is OK. If there is no spark, proceed to step 3.

Step 3. Remove white wire from igniter. Hold the igniter lead from the gas control to an unpainted surface such as the feedline or gas control and depress the igniter. If there is a spark, the igniter is OK, the pilot is not functioning and must be replaced, see service procedure ED-II on page 10.





Resettable Thermal Switch Testing and Replacement

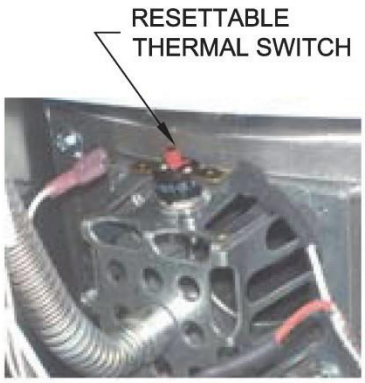
Step 1. Remove outer jacket door.

Step 2. Disconnect white wire leads from the resettable thermal switch.

Step 3. Using a multimeter capable of measuring continuity (Ohms), place one probe of the meter on one of the brass connection tabs of the resettable thermal switch, and the remaining probe on the other connection tab.

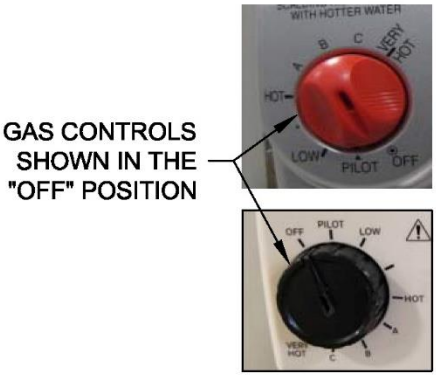
Step 4. If continuity is indicated, the switch is closed, allowing millivolt current to pass.

Step 5. If continuity is not indicated, the switch is open, possibly due to an overheating condition. The switch is designed to open at predetermined temperatures. An open switch can be reset by depressing the red colored button located at the center of the switch. The overheating condition must be determined prior to putting the water heater back into service.



PROBABLE CAUSE FOR RESETTABLE THERMAL SWITCH	
PROBABLE CAUSE	CORRECTIVE ACTION
Burner failure	Inspect burner per service procedure ED-I on page 8 and replace burner if
Weak switch or switch out of	Replace resettable thermal switch
Flammable vapor incident	Replace water heater

Resettable Thermal Switch Testing and Replacement (cont.)



Step 1. Rotate gas control knob to the "OFF" position.

Step 2. Remove outer jacket door.

Step 3. Disconnect wire leads from resettable thermal switch.

Step 4. Remove (2) ¼" hex drive screws from the manifold mount.

Step 5. Remove resettable thermal switch from manifold mount (Phillips screw driver).

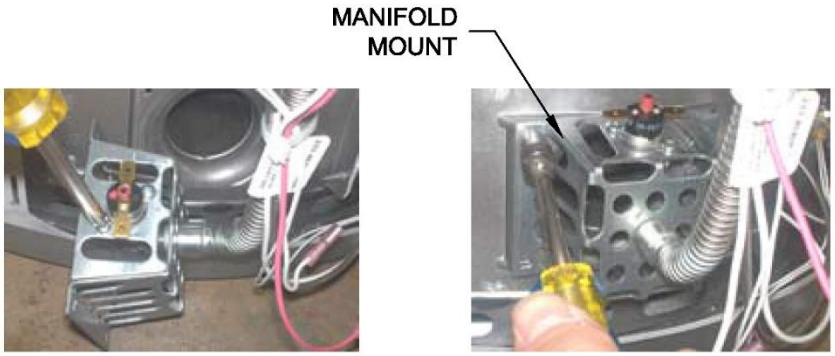
Step 6. Place new resettable thermal switch in place. Be sure contact surface of resettable thermal switch and manifold mount are free of any debris. Secure resettable thermal switch into place using screws from step 6. DO NOT OVER TIGHTEN SCREWS.

Step 7. Reconnect wire leads from gas valve and thermopile to resettable thermal switch.

Note: Wire terminations are interchangeable with either resettable thermal switch connection.

Step 8. Replace outer jacket door.

Step 9. To resume operation, follow the instructions located on the lighting instruction label or the lighting instruction located in the installation and operation manual.



Diptube Inspection & Replacement

⚠ WARNING

Water Heater components and stored water may be HOT when performing the following steps in this procedure. Take necessary precaution to prevent personal injury.

Step 1. Rotate gas control knob to the “OFF”.

Step 2. Turn off the cold-water supply to the water heater. Connect the hose to the drain valve of the water heater and route it to an open drain. Open a nearby hot water faucet to vent the water heater for draining. Open the drain valve of the water heater and allow the water heater to drain to a point below the inlet connection nipple.

Step 3. Disconnect the inlet nipple from the plumbing system.

Step 4. With an appropriate tool such as a pipe wrench, remove the inlet nipple/diptube from the water heater. Use caution not to damage the pipe threads.

Step 5. Visually inspect the inlet nipple/diptube. The Inlet nipple/diptube should be free of cracks and any blockages. The Hydrojet slots should be open and free of any blockages. Any damage such as cracks, restriction due to deformation or unintentional holes, are not field repairable and the inlet nipple/diptube must be replaced.

Step 6. Upon completion of an inspection or subsequent replacement, reinstall the inlet nipple/diptube into the water heater. Ensure pipe dope is used on the nipple’s threads. Connect the nipple to the plumbing system, resume the water supply and refill with water.

Step 7. To resume operation, follow the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual.

Anode Inspection & Replacement

⚠ WARNING

Water Heater components and stored water may be HOT when performing the following steps in this procedure. Take necessary precaution to prevent personal injury.

Step 1. Rotate the gas control knob to the “OFF” position.

Step 2. Turn off the cold-water supply to the water heater. Connect a hose to the drain valve of the water heater and route it to an open drain. Open a nearby hot water faucet to vent the water heater for draining. Open the drain valve of the water heater and allow the water heater to drain to a point below the outlet connection nipple.

Step 3. Disconnect outlet nipple from the plumbing system.

Step 4. With an appropriate tool such as a pipe wrench, remove the outlet nipple/anode from the water heater. Use caution not to damage the pipe threads.

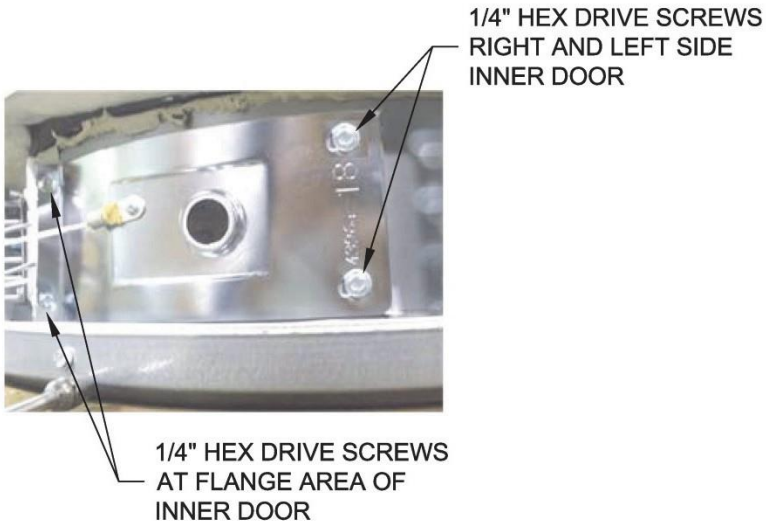
Step 5. Visually inspect the outlet nipple/anode. The outlet nipple/anode should show signs of depletion, this is normal. If depletion is ½ of the original anode diameter (approximately ¾” diameter), replacement is recommended. If any of the steel core of the anode is exposed, replacement is recommended.

Step 6. Upon completion of an inspection or subsequent replacement, reinstall the outlet nipple/anode into the water heater. Ensure pipe dope is used on the nipple’s threads. Connect the nipple to the plumbing system, resume the water supply and refill with water.

Step 7. To resume operation, follow the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual.

Inner Door Removal Procedure

Step 1. Rotate the gas control knob to the “OFF” position.
Step 2. Remove outer jacket burner access door.
Step 3. Disconnect chamber door temperature sensor wire harness from gas control.
Step 4. Remove (2) ¼” hex drive screws from right side inner door.
Step 5. Remove (2) ¼” drive screws from flange section of inner door.
Step 6. Remove (2) ¼” drive screws from left side inner door.
Step 7. Remove inner door and inspect per step 8.



Step 8. Fully inspect inner door gaskets for the following:

-Tears
-Missing Material
-Cracks
-Dirt or debris
-Other imperfections that will inhibit proper seal
-Gasket adhesion to inner door
-Material left on combustion chamber (around opening)

If the gasket is not affected by any of the above, gasket replacement is not required. If replacement is required, proceed to **Inner Door Gasket Replacement Procedure.**

Inner Door Gasket Replacement Procedure

⚠ WARNING

If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or death.

Step 9. After inspection of inner door as noted in step 8, completely remove gasket and adhesive residue from right and left side inner doors as needed.

Step 10. Use RTV sealant (recommended bead size 1/8") to secure the inner door gasket to the inner door sections (right & left). Refer to illustration on next page for proper application. Note the overlap configuration in the flange area of the inner door. Set the flange section first, this will help to achieve the proper overlap position.

Installation of Inner Door with Gasket

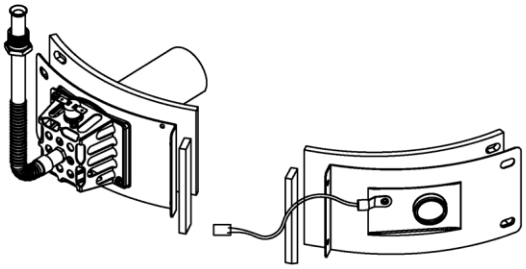
Step 11. Clean any residual gasket residue or other debris from the combustion chamber surface before installing the inner door/gasket assembly.

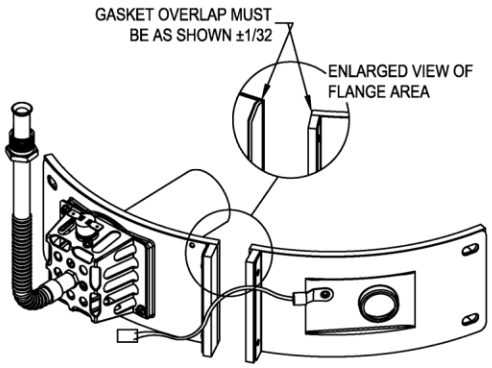
Step 12. Place the left side inner door into position first. Using the ¼" hex drive screws from step 6, secure left side inner door in place. **DO NOT OVER TIGHTEN SCREWS**

Step 13. Position pilot tube and igniter/sensor wire against left side inner door flange gasket.

⚠ WARNING

Stripped fastener connections may allow for seal breach of inner door. A seal breach may result in a fire or explosion causing property damage, personal injury or death. Do not over tighten screws in steps 12, 14 and 15.

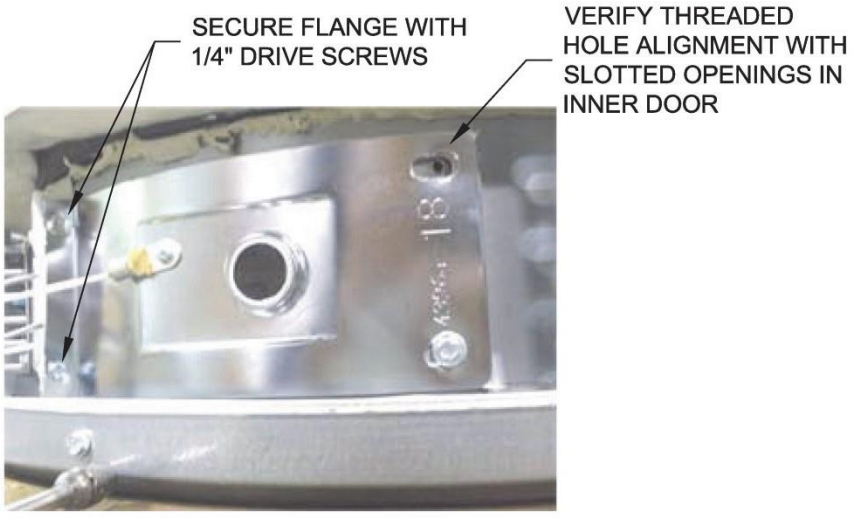




Installation of Inner Door with Gasket (cont.)

Step 14. Firmly place right side inner door flange against the left side inner door flange and secure with (2) ¼" hex drive screws from step 5. **DO NOT OVER TIGHTEN SCREWS**.

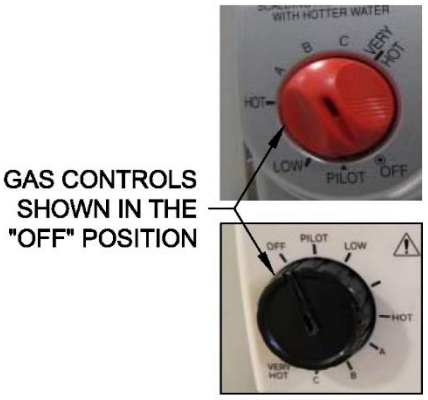
Step 15. Align right side inner door to combustion chamber and verify the fastener holes of the combustion chamber are aligned with right side inner door slotted opening. Verify seal integrity around combustion opening. Secure right side inner door using ¼" hex drive screws from step 4. **DO NOT OVER TIGHTEN SCREWS**. Verify both left and right sides of inner door are properly positioned and sealed against the combustion chamber.



Step 16. Replace outer jacket burner access door.

Step 17. To resume operation, follow the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual.

Flue Baffle Inspection and Replacement



Step 1. Rotate the gas control knob to the “OFF” position.

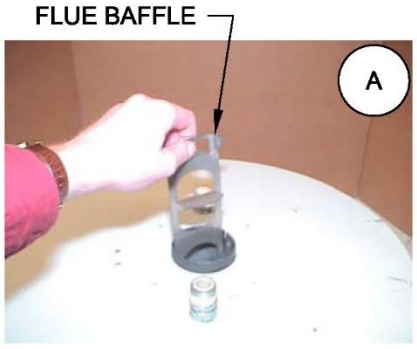
Step 2. Disconnect vent system from the exhaust adapter on top of the water heater.

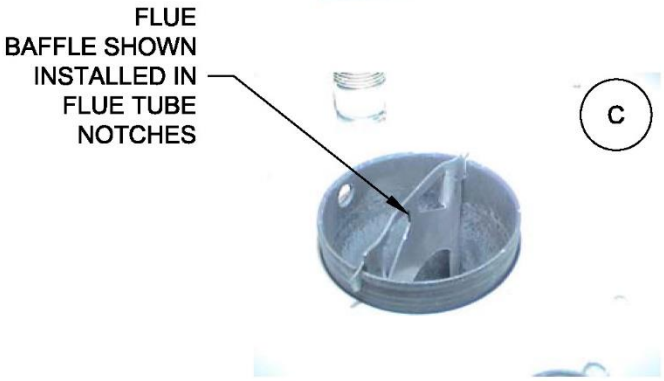
Step 3. Remove the draft diverter on top of the water heater.

Step 4. Remove the flue baffle from the heater (see photo A below).

Step 5. Inspect baffle for deterioration, missing restrictors. Clean any scale or debris build up. Replace with a new baffle as necessary.

Step 6. Reinstall baffle into the flue tube. Be sure hanger tabs are inserted into the notch locations at the top of the flue tube (see photos B & C).





Step 7. Check burner to ensure no scale has accumulated during this operation. See burner cleaning procedure on page 8.

Step 8. Reinstall the draft diverter on top of the water heater. Re-connect the vent system.

Step 9. To resume operation, follow the lighting instructions located on the lighting instruction label or the lighting instructions located in the installation operation manual.

ScreenLok® Flame Arrestor Cleaning

⚠ NOTICE

Some models are not equipped with the ScreenLok® Flame Arrestor.

Step 1. Rotate the gas control knob to the “OFF” position.

Step 2. Remove outer door.

Step 3. Remove outer jacket door and inner door per service procedure ED-X on page 24.

Step 4. Disconnect main burner feedline (3/4” wrench), pilot tube (7/16” wrench) and igniter/flame sensor wire from gas control and remove burner assembly from combustion chamber.

Step 5. Clean ScreenLok® Flame Arrestor using a stiff brush, compressed air and/or shop vacuum to remove any scale or other debris accumulation. Using a soft brush, clear jacket openings from any dirt, dust, restrictions or other obstructions.

Step 6. Remove any debris from burner assembly per procedure ED-I and reinstall burner assembly into combustion chamber.

Step 7. Reconnect feedline, pilot tube and igniter/flame sensor wire to the gas control

Step 8. Reinstall outer jacket door and inner door per service procedure ED-X on page 24.

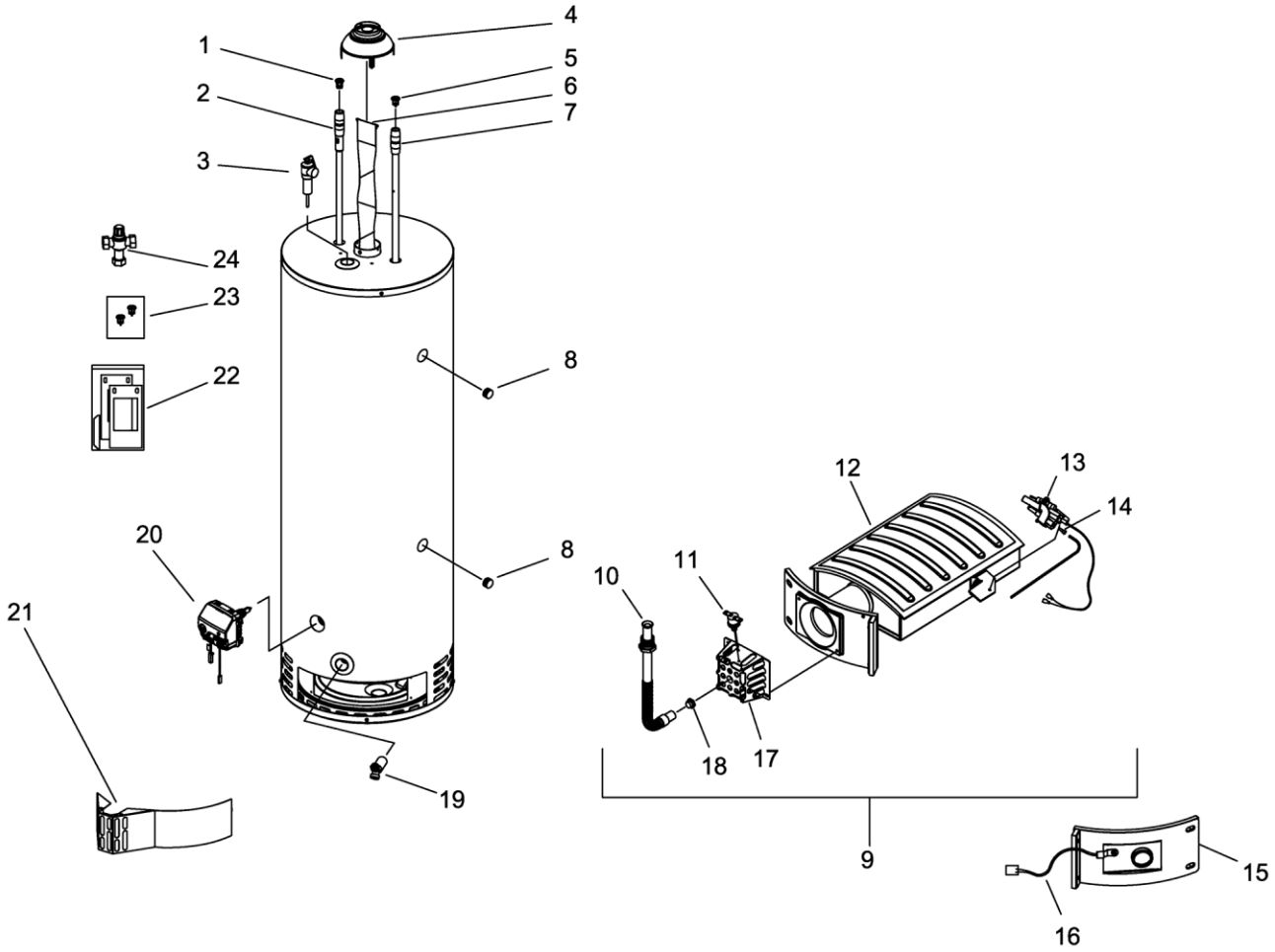
Step 9. To resume operation, follow the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual.

Glossary of Terms

BTU	British Thermal Units
GPM	Gallons per Minute
Hz	Hertz
kWh	Kilowatt hour Light
LED	Emitting Diode National
NPT	Pipe Thread Ohm
Homs	s of resistance Pounds
PSI	per Square Inch
RPM	Revolutions per minute
ECO	Energy Cut Out
VAC	Volts Alternating Current
“w.c.	Inches of Water Column
ºC	Degrees Centigrade
ºF	Degrees Fahrenheit

ECO Defender Series

Parts List



1. Heat Trap Outlet
2. Hot Water Outlet Anode
3. T&P Valve
4. Draft Diverter
5. Heat Trap Inlet
6. Flue Baffle
7. Inlet Diptube
8. ¾ NPT Plug (“H” Models only)
9. Burner Ass’y complete
10. Main Burner Feedline
11. Resettable Thermal Switch
12. Main Burner
13. Pilot Assembly
14. Pilot Orifice
15. Right Side Inner Door Ass’y
16. Thermal Switch Harness
17. Manifold Mount
18. Main Burner Orifice
19. Drain Valve
20. Polymer Gas Control
21. Outer Jacket Door
22. Inner Door Gasket Kit
23. Kit-Heat Trap Insert
24. ASSE Approved Mixing Valve

BRADFORD WHITE®
WATER HEATERS

United States

Sales	**1-800-523-2931**
Technical Support	**1-800-334-3393**
Email	***techsupport@bradfordwhite.com***
Warranty	**1-800-531-2111**
Email	***warranty@bradfordwhite.com***
Service Parts	**1-800-538-2020**
Email	***parts@bradfordwhite.com***

Canada

Sales	**1-866-690-0961 1-905-203-0600**
Fax	**905-636-0666**
Warranty	**1-800-531-2111**
Email	***warranty@bradfordwhite.com***
Technical Support	**1-800-334-3393**
Email	***techsupport@bradfordwhite.com***
Service Parts and Orders	***ca.orders@bradfordwhite.com***

For U.S. and Canada field service, contact your professional installer or local Bradford White sales representative.

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