



U TTW[®] 75 Series

Gas Water Heaters



SERVICE

MANUAL

Troubleshooting Guide
and Instructions for Service

(To be performed ONLY by
qualified service providers)

Models Covered by This Manual:

U2TW75T*RN

UTW475S76R*N

(*) Denotes Warranty Years

Bradford White

U2TW Series

Gas Water Heaters

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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.



CAUTION

Incorrect operation of this appliance may create a hazard to life and property and will nullify the warranty.



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 3/4" X 3/4" 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 new Bradford White U2TW & UTW4 water heaters are designed to provide reliable performance with enhanced standard features. New design features include reliable spark to pilot ignition system, enhanced diagnostics, simplified servicing, significantly quiet operation and additional vent lengths. In addition, the U2TW & UTW4 water heaters provide Ultra Low NOx emissions.

Spark to Pilot Ignition System - employing the spark to pilot ignition system promotes reliable and consistent pilot and main burner ignitions to provide hot water on demand.

Integrated Immersion Thermostat/Gas Control Valve with LED - was developed for ease of troubleshooting by providing simple diagnostic codes to pinpoint an installation or component performance issue.

Powerful Blower - will eliminate problems with difficult venting situations.

Quieter and Cooler Blower Operation - blower noise is significantly reduced for both interior and exterior environments. Cooler operation increases blower life by reducing bearing wear and noise.

Rugged Wiring Connections - receptacle type connections promote error free wiring.

Increased Vent Lengths - increased venting performance is achieved while maintaining Energy Factor & FHSR performance.

The U2TW & UTW4 water heaters use a combustion system where flue gases are combined with dilution air to reduce the flue gas temperature in the blower. The diluted flue gases are evacuated to the exterior through low temperature vent materials. The gas control maintains water temperature, ignition sequence and regulates gas flow. A safety circuit consisting of a pressure switch and blower temperature switch verifies proper conditions exist for safe and reliable operation. If a situation outside of normal operating parameters exists, the gas control diagnostic LED will flash a code to positively identify an operational issue.

This service manual is designed to facilitate problem diagnosis and enhance service efficiency. Please read the service manual completely before attempting service on this new series of power vent models.

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 U2TW Series water heaters. Understanding the sequence of operation section of this manual will contribute greatly to troubleshooting the water heater.

The Honeywell WV4462A Electronic Gas Control will display error codes in the event of abnormal operation. Error codes are listed in the troubleshooting chart beginning on page 12 of this service manual. The troubleshooting chart will also indicate the probable cause for the error code and direct the service professional to a service procedure to properly diagnose the abnormal operation.

In some difficult to diagnose conditions, it may be necessary to isolate the heater from the vent system to determine the problem.

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 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 reading. 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 Gauge:	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 & Phillips), 1/4" nut driver, pliers (common & needle nose), socket set, side cutters wire cutters, wire strippers, wire crimpers, torpedo level, small shop vac, step ladder, flashlight and 5 gallon pail.

Specifications

Power supply	Dedicated 115VAC, 60 Hz, 15A
Gas Supply Pipe	Minimum 1/2" NPT (schedule 40 black iron pipe recommended)
Approved Gas Type	Natural.
Gas Pressure	6.0" W.C. min. and 14.0" W.C. max.
Venting System	Power vent through the wall or vertical through the roof
Approved Vent Materials	PVC, CPVC or ABS
Minimum Clearance for Servicing	18" from top, 24" from front, 4" sides and rear.
Water Supply Pressure	150 PSI maximum allowable working pressure. Check local codes for supply pressure
Thermal well ECO Limit	Residential 188°F (87°C), Commercial 199°F (93°C)
Residential Temperature Set Point Range	60°F (16°C) to 160°F (71°C) (Approximate temperatures)
Commercial Temperature Set Point Range	80°F (27°C) to 180°F (82°C) (Approximate temperatures)
Blower Temperature Switch	Normally closed, opens @ 165°F (74°C), auto reset @ 130°F (54°C).
Pressure switch	U2TW75 and UTW475S Models: Normally open, closes on vacuum increase @ -1.28, opens on vacuum decrease @ -1.25
Blower	U2TW75 and UTW475S Models: 115VAC, 60Hz, 3.1 amps, 3000 RPM, 68 CFM@0.4" W.C.

Vent Tables

Venting Specifications:

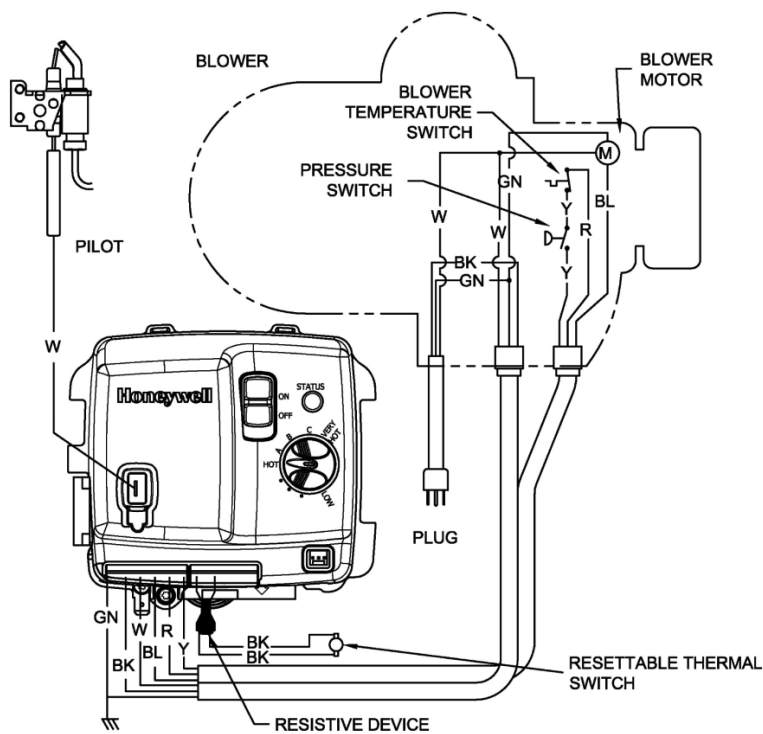
3" Diameter (7.6 cm) PVC Vent Connector Lengths			
Terminating	# of Elbows	Maximum Length ft (m)	Minimum Length ft (m)
Through the Wall	1	45 (13.7)	2 (.6)
Through the Wall	2	40 (12.2)	2 (.6)
Through the Wall	3	35 (10.7)	2 (.6)
Through the Wall	4	30 (9.1)	2 (.6)
Through the Roof	0	50 (15.2)	7 (2.1)
Through the Roof	1	45 (13.7)	7 (2.1)
Through the Roof	2	40 (12.2)	7 (2.1)
Through the Roof	3	35 (10.7)	7 (2.1)

4" Diameter (10.2 cm) PVC Vent Connector Lengths			
Terminating	# of Elbows	Maximum Length ft (m)	Minimum Length ft (m)
Through the Wall	1	175 (53.3)	10 (3.1)
Through the Wall	2	170 (51.8)	10 (3.1)
Through the Wall	3	165 (50.3)	10 (3.1)
Through the Wall	4	160 (48.8)	10 (3.1)
Through the Wall	5	155 (47.2)	10 (3.1)
Through the Roof	0	180 (54.9)	15 (4.6)
Through the Roof	1	175 (53.3)	15 (4.6)
Through the Roof	2	170 (51.8)	15 (4.6)
Through the Roof	3	165 (50.3)	15 (4.6)
Through the Roof	4	160 (48.8)	15 (4.6)

Control Timings

<u>Ignition State</u>	<u>Timing</u>
Pre-purge	2 Seconds
Trial for Ignition	90 Seconds
Flame Stabilization Period	3 Seconds
Inter-purge	15 Seconds
Flame Failure Response Time	1.5 Seconds (2 second. Maximum; 1 second minimum.)
Post-purge	15 Seconds
PS Fault Delay (failed open/close)	Retry after 2 Minutes
Soft Lockout	Retry after 5 Minutes
ECO Limit Lockout	Indefinite (cycle power to restart)
Verify Resistive Delay	Retry after 2 Minutes (repeats 5 times)
Simulated Resistive Load Lockout	Indefinite (cycle power to restart)
Hardware Error Lockout	Indefinite (self clears if fault clears for at least 15 seconds)

Wiring Diagram



Power up Sequence

1 Start Up.

Upon power up, the control runs a safe-start check with a typical start-up delay of 1-5 seconds.

2 Simulated Resistive Load Device Check.

To assure no outputs are energized if the "Simulated Resistive device" is out of range, the control will test the device for proper operating range. If the device is within range the control resumes normal operation with no perceivable delay. If the device is out of range, the control LED immediately flashes *7 times* with 3 second pause.

Normal Heating Sequence

1 Thermostat Calls for Heat.

Prior to energizing blower, gas control checks safety circuit to insure the circuit is open. Normal switch positions in the safety circuit are as follows:

- a) Pressure switch normally open.
- b) Blower temperature switch normally closed.

If the safety circuit is closed, the control waits 4 seconds, gas control LED flashes *2 times* with 3 second pause. Gas control waits 2 minutes then, blower runs for 30 seconds. This cycle repeats until safety circuit opens.

2 Blower Energizes.

3 Blower Pre-purge Period (2 seconds)

4 Pressure Switch Proves Blower/Vent System Operation.

If the pressure switch does not close within 30 seconds, the control LED Flashes *3 times* with 3 second pause. The blower runs for 30 seconds every 2 minutes trying to get the pressure switch or blower temperature switch to close. This cycle repeats as long as there is a call for heat.

5 Trial for Pilot Ignition (90 seconds).

- a) The gas control lights the pilot by activating spark igniter and gas flow to pilot burner.
- b) If flame is not sensed within 90 seconds, igniter and gas flow are deactivated, blower will post purge and control LED flashes *6 times* with 3 second pause.

6 Main Burner Ignition

After pilot flame is sensed, gas control activates main valve for main burner ignition. The gas control will ignore flame and pressure switch signals for 3 seconds allowing for main burner to stabilize.

Normal Heating Sequence (cont.)

7 Steady State Operation.

During Steady State Operation the Control Monitors:

Thermostat temperature sensor- When set point temperature is satisfied, gas valve is shut down and blower will post purge for 15 seconds. Control LED flashes a short flash once every 4 seconds (*idle*) status code.

Pressure switch / Blower temperature switch- If either switch opens, pilot valve and main valve is shut down. The blower continues to run for 30 seconds attempting to close the circuit. The control LED Flashes 3 times with 3 second pause.

Flame Sensor- If flame is lost, pilot & main valve are shut down, blower runs for 15 seconds. Control attempts to re-light pilot 4 times. If unsuccessful, Blower is shut down and control proceeds to 5 minute lockout. Control re-attempts to light pilot starting at normal heating sequence #2.

8 Thermostat Satisfies.

9 Burner Off.

10 Blower Post Purge (15 seconds).

Abnormal Operation

1. Simulated Resistive Device Fault:

- a) **If the resistance is greater than 70,000 Ohms** - the gas control immediately turns off all outputs. Control waits and monitors resistance for 30 seconds. If the resistance is greater than 70,000 ohms after 30 seconds, the gas control proceeds to verify resistive delay for 2 minutes and flashes 8 times then once with a three second pause. This process is repeated 5 times until the control either returns to normal operation or proceeds to flashing 7 times with a 3 second pause.
- b) **If the resistance is below 3000 ohms** - The gas control immediately turns off all outputs and proceeds to flash 8 times then once with three second pause. The error self clears if the resistance returns to normal range for at least 15 seconds.

2. Temperature Sensor Fault:

- a) **Temperature sensor detected open circuit** - The gas control Immediately turns off all outputs and proceeds to flash 8 times then twice with three second pause. The error self clears if the fault clears for at least 15 seconds.
- b) **Temperature sensors not reading the same temperature within $\pm 5.5^{\circ}\text{F}$** - The gas control Immediately turns off all outputs and proceeds to flash 8 times then three times with three second pause. The error self clears if the fault clears for at least 15 seconds.
- c) **Water temperature in excess of ECO (Energy Cut Out) limit** - The gas control immediately turns off pilot & main valve and proceeds to flash 4 times with 3 second pause. Blower continues to run until gas control is reset. The set point knob should be turned to the minimum temperature setting for at least 6 seconds and then turned clockwise by at least 45° .

Abnormal Operation (cont.)

3. Pressure Switch/Blower Temperature Fault:

- a) **Pressure switch closed at start of call for heat** - The gas control waits four seconds then, proceeds to flash *2 times* with 3 second pause. The control waits 2 minutes and then turns on blower for 30 seconds. The blower turns off after 30 seconds and the control waits for pressure switch to open. Any time the Pressure switch opens, the blower turns on (or stays on) and the control proceeds to wait for pressure switch to close.
- b) **Pressure switch or blower temperature switch failed open** - The gas control runs the blower for 30 seconds waiting for the pressure switch and/or blower temperature switch to close. If either switch does not close in 30 seconds, the blower turns off and the control flashes *3 times* with 3 second pause. The gas control waits two minutes before turning on the blower for another 30 seconds to see the circuit close. This cycle repeats as long as there is a call for heat or until the circuit closes.
- c) **Pressure switch or blower temperature switch opens during burner operation** - The gas control turns off the pilot and main valve, runs blower for 15 seconds (inter-purge) waiting for pressure switch and/or blower temperature switch to close. If either switch fails to close, the control proceeds as described in 3b above. If the circuit closes again by the end of the inter-purge, the recycle counter is incremented, if the recycle count has not reached its limit (4), another trial for ignition begins. If the recycle count has been reached, the gas control turns off the blower and flashes *6 times then 2 times* with 3 second pause. The gas control waits 5 minutes before repeating ignition sequence.

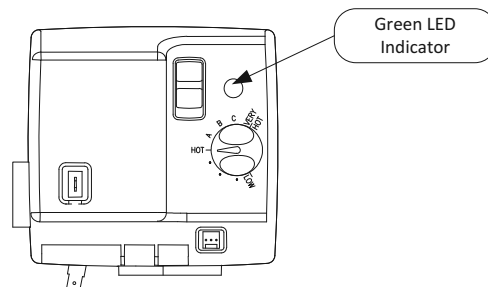
4. Trial For Ignition Fault:

- a) **Pressure switch opens during trial** - The gas control turns off igniter and pilot valve. The gas control proceeds as described in 3b above. If the pressure switch closes within 30 seconds the gas control will continue with trial for ignition starting at blower pre-purge.
- b) **Flame Not Sensed** - The gas control energizes the spark igniter attempting to light the pilot and prove flame. If flame is not sensed within 90 seconds, the igniter turns off, the pilot valve is closed and the gas control runs the blower through post purge and flashes *6 times then once* with 3 second pause. The control waits 5 minutes before repeating the ignition sequence.

5. Flame Sensing Fault:

- b) **Flame lost during run** - The gas control turns off pilot and main valves, runs blower for 15 seconds (inter purge). The gas control increments the recycle count, if the recycle count has not reached its limit (4), another trial for ignition begins. If the recycle count has been reached, the gas control turns off the blower and flashes *6 times then 3 times* with 3 second pause. The gas control waits 5 minutes before repeating the ignition sequence.
- c) **Flame sensed out of sequence** - the gas control only looks for pilot flame when the blower is running. If flame is present when the pilot valve is not open, the gas control proceeds to wait for flame loss and flashes *5 times* with 3 second pause. This continues until flame is lost, once the flame signal is lost, the control flashes *6 times then 4 times* with 3 second pause. The control waits 5 minutes before repeating the ignition sequence.

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



<u>LED Status</u>	<u>Control Status</u>	<u>Probable Cause</u>	<u>Service Procedure</u>
None, control LED not on or flashing	No electrical power	Control power switch in "OFF" position. Supply voltage interrupted.	Turn power on.
Short flash, once every four seconds	Stand-by mode, Waiting for call for heat (no fault)	Temperature demand is satisfied.	Normal operation. Adjust thermostat to temp level.
"Heartbeat", alternates bright/dim	Thermostat calling for heat (no fault).	Tank temperature below set point of thermostat.	Normal operation. Adjust thermostat to temp level.
Short flash once per second	Weak pilot signal on last call for heat.	1. Unstable pilot. 2. Pilot tube blocked or restricted. 3. Oxidation build up on pilot electrode. 4. Wire damage to pilot assembly or bad connection at gas valve.	1-4. Page 19
Two flash, three second pause	Pressure switch not working-closed position.	1. Pressure switch tubing kinked or blocked. 2. Blocked pressure tap on switch or blower. 3. Faulty pressure switch.	Page 20
Three flash, three second pause	Pressure switch or blower temp. switch not working -open position.	1. Vent blockage or improper vent configuration. 2. Pressure switch tubing kinked or blocked. 3. Faulty pressure switch. 4. Blower not spinning up to speed. 5. Blower temp or exhaust temp too high. 6. Faulty blower temperature switch.	1. Check vent or vent tables 2 & 3. Page 20 4. Page 22 5 & 6 Page 23
Four flash, three second pause	Excessive tank temperature. System must be reset.	1. Thermal well sensor out of calibration. 2. Faulty gas control. 3. Plumbing leak	1-2. Replace gas control, page 26
Five flash, three second pause	Undesired-false pilot flame present.	1. Pilot valve stuck in open position.	Replace gas control, page 26

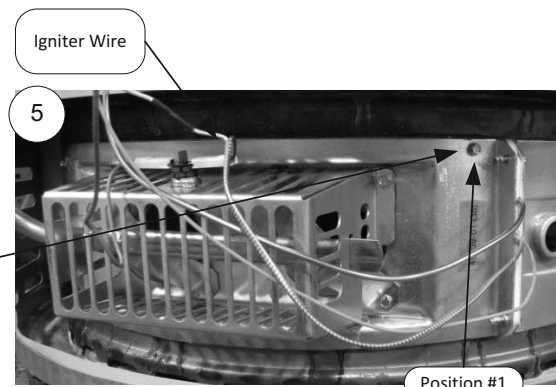
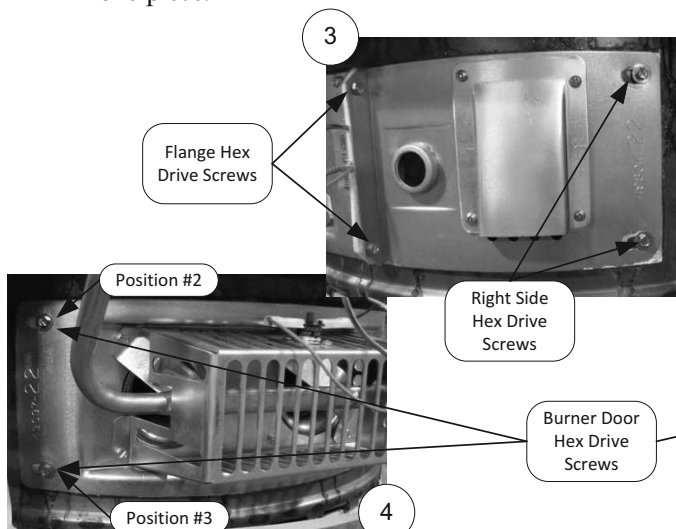
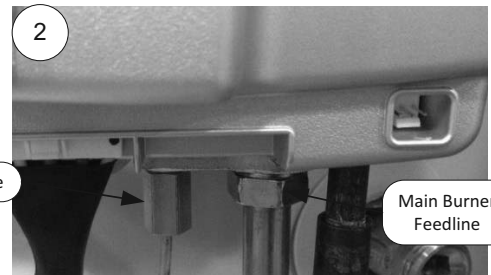
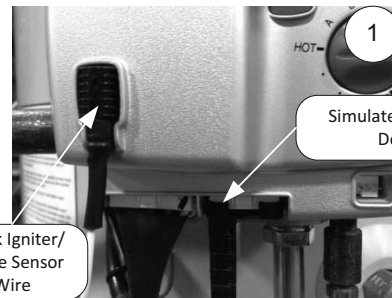
<u>LED Status</u>	<u>Control Status</u>	<u>Probable Cause</u>	<u>Service Procedure</u>
Six-one flash, three second pause	Failed to light pilot. System auto resets.	1. Unstable pilot. 2. Pilot tube blocked or restricted. 3. Oxidation build up on pilot electrode. 4. Wire damage to pilot assembly or bad connection at gas valve.	1-4. Page 16
Six-two flash, three second pause	Pressure switch or blower temp switch opened during burner operation. System auto resets.	1. Vent blockage or improper vent configuration. 2. Pressure switch tubing kinked or blocked. 3. Faulty pressure switch. 4. Vent termination being affected by wind. 5. Blower not spinning up to speed. 6. Blower temp or exhaust temp too high. 7. Faulty blower temperature switch.	1. Check vent or vent tables 2 & 3. Page 20 4. Refer to venting section of installation manual 5. Page 22 6 & 7. Page 23
Six-three flash, three second pause	Pilot flame extinguished. System auto resets.	1. Unstable pilot. 2. Pilot tube blocked or restricted. 3. Oxidation build up on pilot electrode. 4. Wire damage to pilot assembly or bad connection at gas valve. 5. Insufficient combustion air. 6. Gas pressure is out of specification.	1-4. Page 16 5. Refer to installation manual
Six-four flash, three second pause	Undesired-false pilot flame sensed. System auto resets.	Pilot valve stuck in open position.	Replace gas control, page 26
Seven flash, three second pause	Simulated Resistive Device Harness out of specification.	1. Simulated resistive device out of specification. 2. Resettable thermal switch open.	1. Page 28 2. Page 29
Eight-one flash, three second pause	Simulated Resistive Device Harness specification check.	1. Simulated resistive device out of specification. 2. Resettable thermal switch open.	1. Page 28 2. Page 29
Eight-three flash, three second pause	Thermal well sensor damaged or unplugged	1. Damage to thermal well wire. 2. Thermal well sensor resistance out of range.	1 & 2. Replace gas control, page 26
	Gas valve electronics fault detected	1. Control needs to be reset. 2. Control is wet or physically damaged.	1. Interrupt power supply 2. Replace gas control, page 26
Eight-four flash, three second pause	Gas valve fault detected.	1. Control needs to be reset. 2. Control is wet or physically damaged.	1. Interrupt power supply 2. Replace gas control, page 26

U TTW® SERVICE PROCEDURE I
Burner and Inner Door/Gasket Removal,
Inspection, Replacement and Reinstallation

Inner Door Removal Procedure

- Step 1. Position gas control power switch to the “OFF” position and unplug heater from wall outlet.
- Step 2. Remove outer jacket burner access door.
- Step 3. Remove wire clip from main burner feedline.
- Step 4. Inner Door Removal.
- Disconnect the spark igniter/flame sensor wire and the simulated resistive device from the gas control (see photo 1).
 - Disconnect main burner feed line ($\frac{3}{4}$ " wrench), pilot tube ($\frac{7}{16}$ " wrench) and igniter wire from gas control (see photo 2).
 - Remove (2) $\frac{1}{4}$ " hex drive screws from right side inner door (see photo 3).
 - Remove (2) $\frac{1}{4}$ " hex drive screws from flange section of inner door (see photo 3).
 - Remove (3) $\frac{1}{4}$ " hex drive screws from burner door (see photos 4&5). The burner door and burner are one-piece.

Gas Control shown in the “OFF” position



- Remove burner and inner door and inspect per step 5.

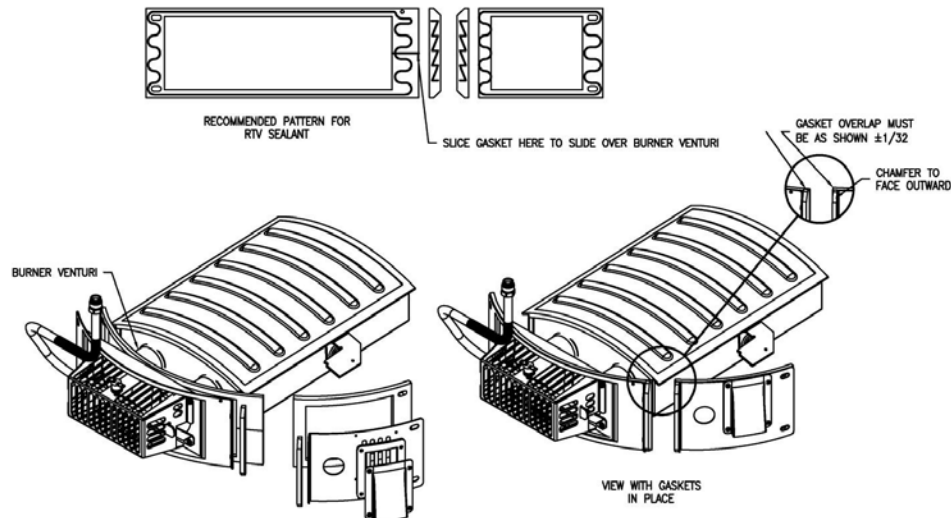
- Step 5. Fully inspect burner door and right side inner door gaskets for the following:
- >Tears
 - >Missing Material
 - >Cracks
 - >Dirt or debris
 - >Other imperfections that will inhibit proper seal
 - >Gasket adhesion to inner door
 - >Material left on combustion chamber (around opening)

If the gasket is not effected 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 6. After inspection of inner door as noted in step 5, completely remove gasket and adhesive residue from burner door and right side inner door as needed.
- Step 7. Use RTV sealant (recommended bead size 1/8") to secure the inner door gasket to the inner door sections (right & burner). The burner door gasket must be sliced in the location shown on the illustration below in order to slide the gasket over the burner venturi. Refer to illustration below for proper RTV sealant application. Note the overlap configuration in the flange area of the inner door. Ensure that the chamfer of the gasket faces outward. Set the flange section first, this will help to achieve the proper overlap position.



Re-installation of Inner Door With Gasket

- Step 8. Clean any residual gasket residue or other debris from combustion chamber surface before re-installing the inner door/gasket assembly.
- Step 9. Place the burner door into position first. Tighten the feed line nut to the gas control. Use the 1/4" hex drive screw without the built-in washer to secure burner door to the chamber at position #1. Use the 1/4" hex drive screws with the built-in washer to secure the door at positions #2 & #3 (see photos 4&5, on page 14).
DO NOT OVER TIGHTEN SCREWS.

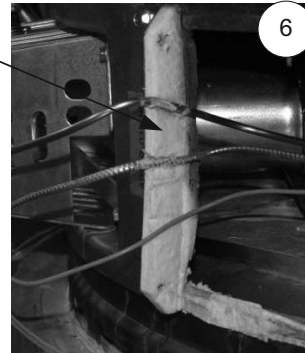
⚠ WARNING
Stripped fastener connections may allow for seal breach of inner door. A seal breach may result in a fire or explosion causing property damage, personal injury or death. Do not over tighten screws in steps 9, 11 and 12.

If a fastener connection is stripped, contact the manufacturer listed on the water heater rating plate.

U TTW® SERVICE PROCEDURE I
Burner and Inner Door/Gasket Removal,
Inspection, Replacement and Reinstallation

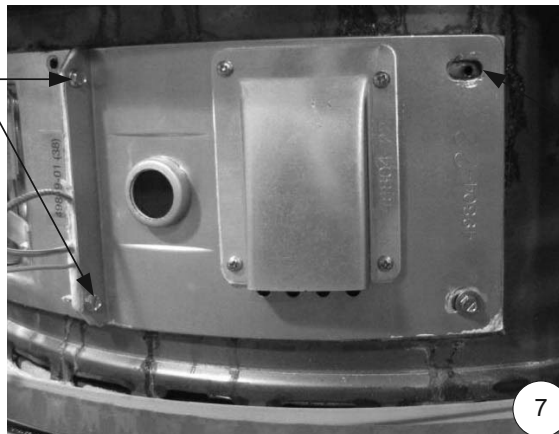
- Step 10. Position thermopile wires, pilot tube and igniter wire against burner door flange gasket (see photo 6).

Position Thermopile Wire,
Pilot Tube and Igniter Wire



- Step 11. Firmly place right side inner door flange against the burner door flange and secure with two 1/4" drive screws from step 4d (see photo 7). **DO NOT OVER TIGHTEN SCREWS.**
- Step 12. Align right side inner door to combustion chamber and verify the fastener holes of the combustion chamber are aligned with the right side inner door slotted opening (see photo 7). Verify seal integrity around combustion opening. Secure right side inner door using 1/4" hex drive screws from step 4c. **DO NOT OVER TIGHTEN SCREWS.** Verify both burner and right sides of the inner door are properly positioned and sealed against the combustion chamber.

Secure flange with 1/4"
drive screws.



Verify threaded hole
alignment with slotted
openings in inner door.

- Step 13. Reconnect spark igniter/flame sensor wire and simulated resistive device to the gas control (See photos 1&2 on page 14).
- Step 14. Reconnect the pilot tube to the gas control and tighten.
- Step 15. Replace outer jacket burner access door.
- Step 16. To resume operation follow the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual.

Main Burner Inspection, Cleaning and Replacement

At periodic intervals (not more than 6 months) a visual inspection should be made of the main burner for proper operation and to insure no debris is accumulating.

Main burner should light smoothly from pilot and burn with a blue flame with a minimum of yellow tips. After approximately 5 minutes of operation the burner screen will become radiant and the flame will soften and turn orange. If the burner screen does not become radiant after 5 minutes of operation it must be cleaned (see burner cleaning procedure below).

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

⚠ DANGER

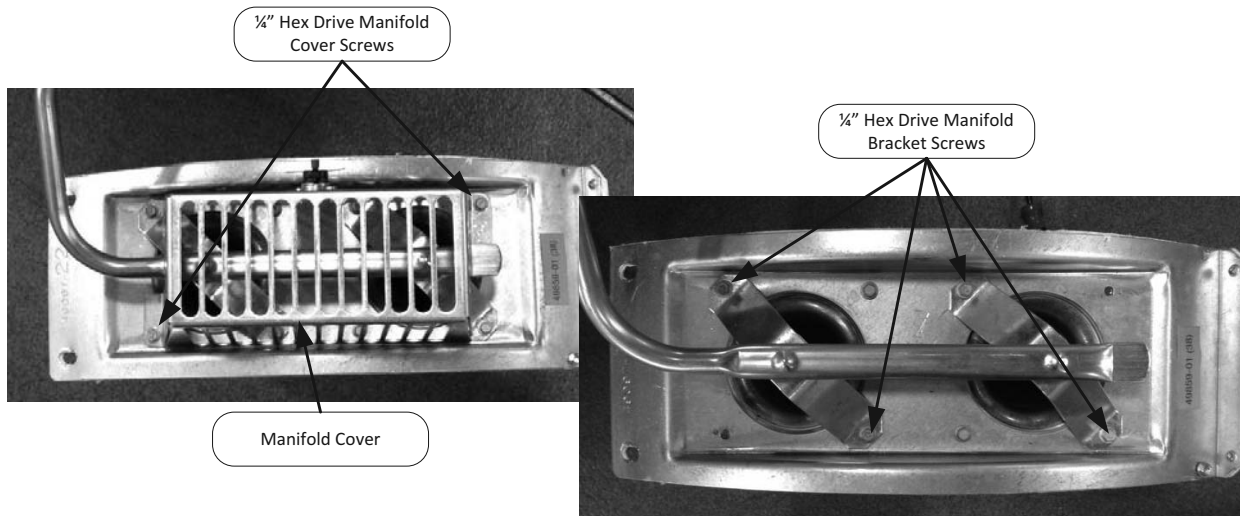
Under no circumstances shall flammable materials be used or stored in the vicinity of the water heater. If flammable vapors are present, a fire or explosion may result causing property damage, personal injury or death.

⚠ WARNING

Inner door and burner components may be HOT when performing this operation. Take necessary precaution to prevent personal injury.

Burner Cleaning

- Step 1. Remove burner and inner door assembly per SERVICE PROCEDURE I, steps 3 through 4.
- Step 2. Remove manifold cover from burner inner door by removing (2) ¼" hex drive screws and then sliding manifold cover to the right. Use a stiff brush, compressed air and/or shop vacuum to remove any debris build up from the manifold mount.
- Step 3. Remove manifold brackets from burner by removing (4) ¼" hex drive screws.



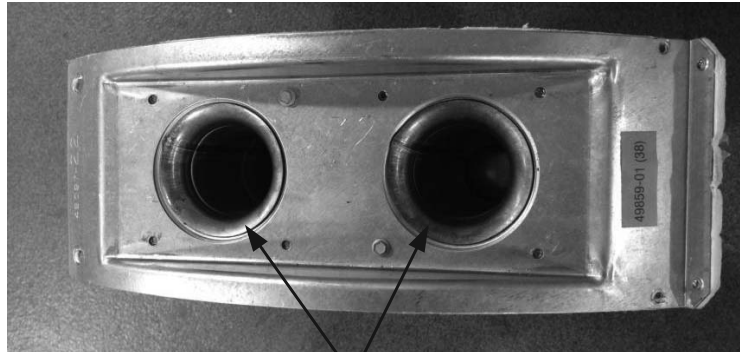
U TTW® SERVICE PROCEDURE II
Burner Operation Inspection,
Cleaning and Replacement

Burner Cleaning (Continued)

- Step 4. Thoroughly inspect burner screen and burner venturis and remove any loose debris accumulation. Inspect burner screen for any openings larger than the normal screen openings.
- Step 5. Use compressed air and/or a vacuum to remove any scale or other debris accumulation from the burner screen and venturis.

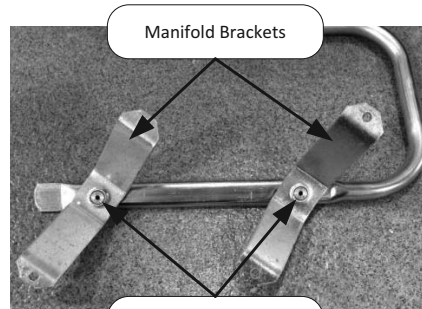


Burner Screen



Burner Venturis

- Step 6. Disconnect (unscrew) manifold brackets from main burner orifices.



Main Burner Orifices

- Step 7. Remove main burner orifice from feed line (1/2" wrench). Inspect and clean if necessary



- Step 8. Remove pilot assembly, refer to SERVICE PROCEDURE III for cleaning and inspection.
- Step 9. Reassemble burner.
- Step 10. Reinstall burner and inner door per SERVICE PROCEDURE I, steps 5 through 16.
- Step 11. To resume operation, follow the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual.

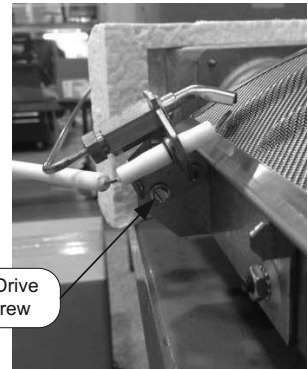
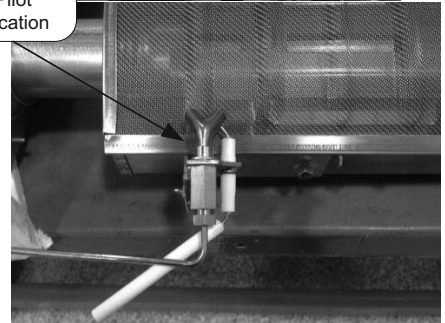
Pilot Assembly Inspection, Testing and Replacement

- Step 1. Position gas control power switch to the "OFF" position and unplug water heater from wall outlet.
- Step 2. Remove outer jacket door.
- Step 3. Remove burner and right side of inner door per SERVICE PROCEDURE I, steps 3 and 4.
- Step 4. Remove burner assembly from combustion chamber.
- Step 5. Remove pilot/electrode assembly from burner ($\frac{1}{4}$ " drive tool)
- Step 6. Inspect pilot for kinks or cracks in the pilot tube. If found, the pilot must be replaced.
- Step 7. Inspect pilot orifice:
- a) Remove $\frac{7}{16}$ " nut from bottom of pilot assembly.
 - b) Remove pilot tube and pilot orifice.
 - c) inspect pilot orifice for blockage, must be cleaned or replaced.

Gas Control shown in the "OFF" position



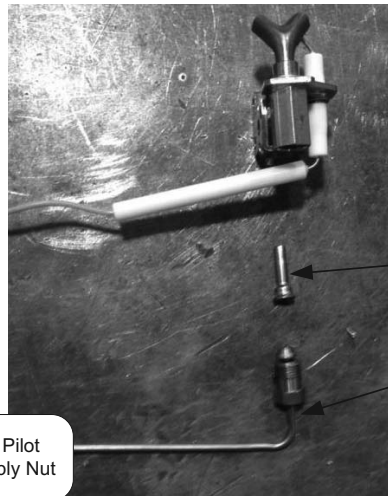
Pilot Location



$\frac{1}{4}$ " Hex Drive Pilot Screw



$\frac{7}{16}$ " Pilot Assembly Nut



Pilot Orifice

Pilot Tube

- Step 8. Install pilot/electrode assembly to burner, secure with screw from step 5.
- Step 9. Install burner and inner door per SERVICE PROCEDURE I, steps 5 through 16.
- Step 10. To resume operation follow the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual.

U TTW[®] SERVICE PROCEDURE IV

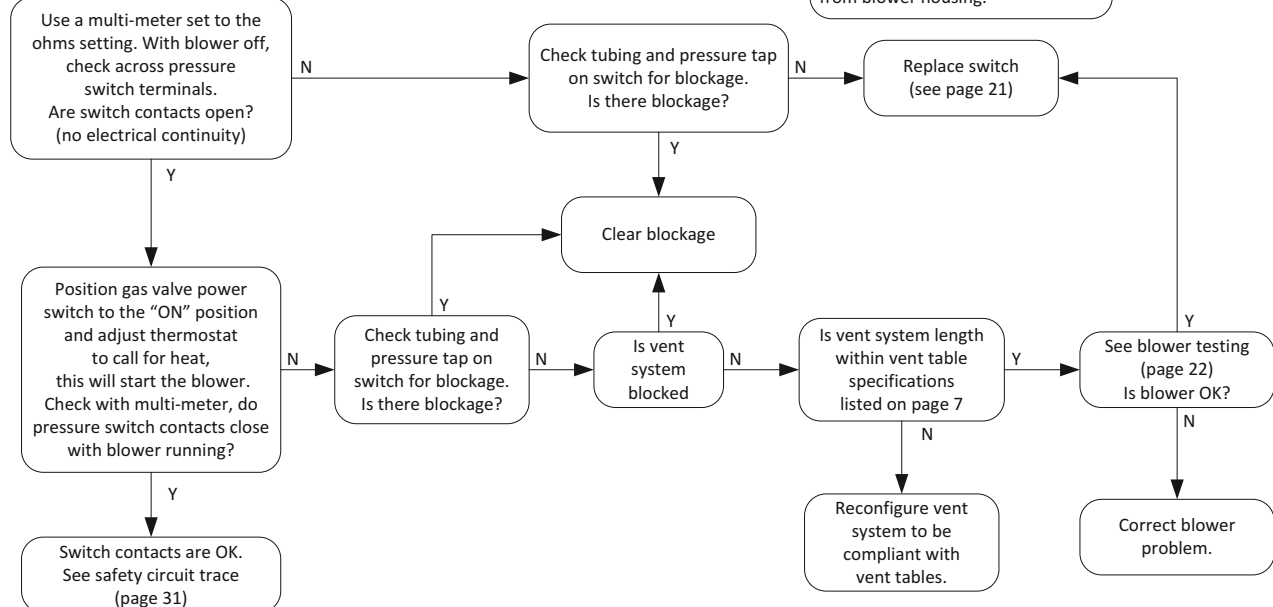
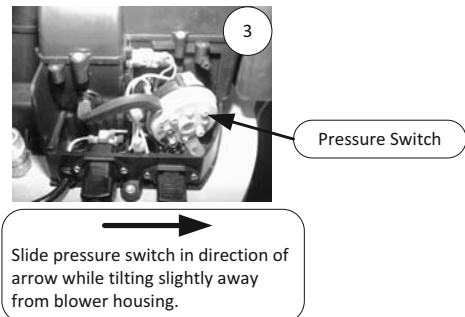
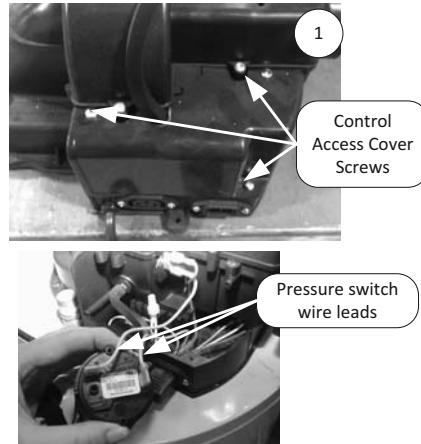
Pressure Switch Testing and Replacement

Pressure Switch Testing

- Step 1. Position gas control power switch to the "OFF" position.
- Step 2. Remove the three screws (Phillips screw driver) from control access cover on blower assembly and remove cover (see photos 1 and 2).
- Step 3. Carefully remove pressure switch from blower housing (see photo 3).

⚠ WARNING
115 volt potential exposure. Use caution making voltage checks to avoid personal injury.

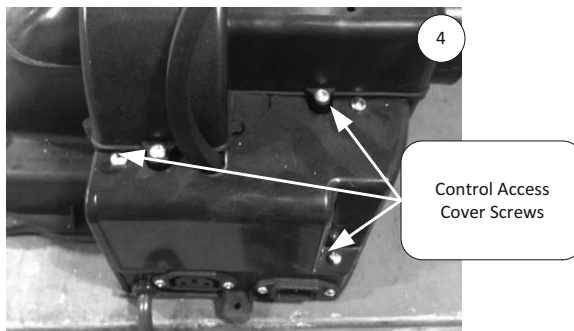
With steps 1, 2 & 3 complete, disconnect wire leads from pressure switch.



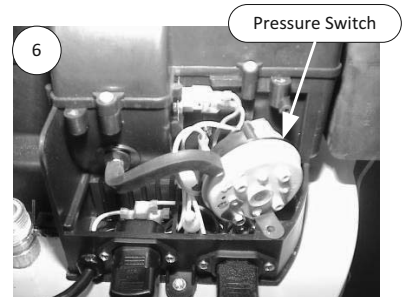
Pressure Switch Replacement

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

- Step 1. Position gas control power switch to the “OFF” position.
- Step 2. Remove the three screws (Phillips screw driver) from control access cover on blower assembly and remove cover (see photos 4 and 5).



- Step 3. Carefully remove pressure switch from blower housing (see photo 6).



→
Slide pressure switch in direction of
arrow while tilting slightly away
from blower housing.

- Step 4. Disconnect tubing from pressure switch (see photo 7).
- Step 5. Disconnect yellow wires from pressure switch (see photo 8).



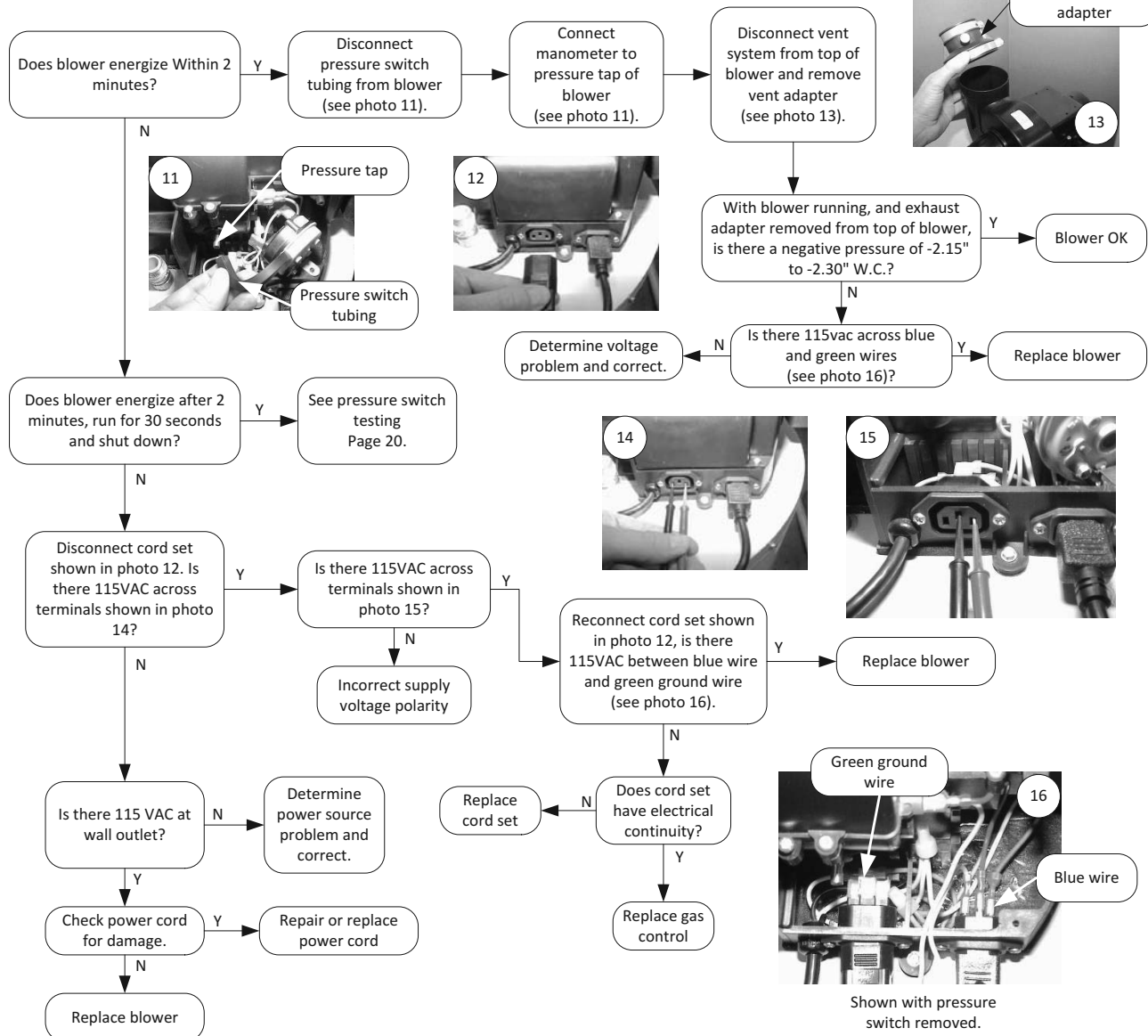
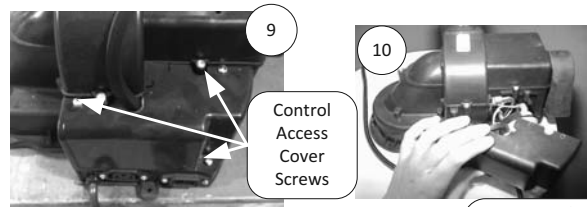
- Step 6. Reconnect wires from step 5 to new pressure switch.
- Step 7. Reconnect tubing to new pressure switch.
- Step 8. Carefully position pressure switch into blower housing.
- Step 9. Position gas control power switch to “ON” position and verify proper heater operation.
- Step 10. Replace control access cover from step 2.

Blower Testing



WARNING
115 volt potential exposure. Use caution when making voltage checks to avoid personal injury.

- Step 1. Position gas control power switch to "ON" position and adjust control to call for heat.
- Step 2. Remove the three screws (Phillips Screw driver) from control access cover on blower assembly and remove cover (see photos 9 and 10).



Blower Removal

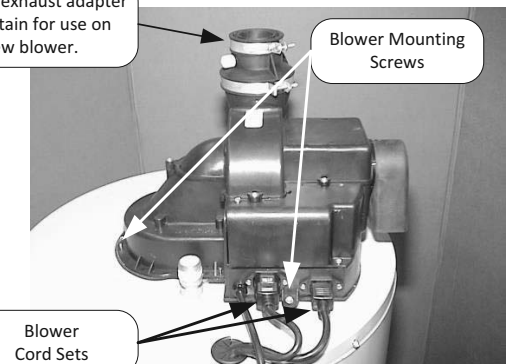
- Step 1. Position gas control power switch to the “OFF” position and unplug heater from wall outlet.
- Step 2. Disconnect vent system from exhaust adapter on top of blower.
- Step 3. Remove exhaust adapter from blower (blade screw driver) and retain for use on new blower.
- Step 4. Unplug cord sets from blower.
- Step 5. Remove the three blower mounting screws (1/4" nut driver).
- Step 6. Remove blower with gasket from water heater.

Gas Control shown in the “OFF” position



Remove exhaust adapter and retain for use on new blower.

Blower Mounting Screws



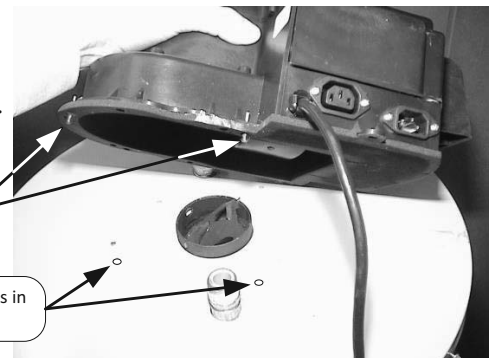
Blower Cord Sets

Blower Installation

- Step 7. Clean any debris from jacket head of water heater.
- Step 8. Set new blower with gasket in place using locating pins on blower flange to line up with location holes in jacket head. Be sure not to damage gasket.
- Step 9. Secure blower in place using mounting screws from step 6.
- Step 10. Re-install exhaust adapter from step 4.
- Step 11. Reconnect vent system to exhaust adapter.
- Step 12. Reconnect cord sets from step 5.
- Step 13. Plug blower power cord into wall outlet.
- Step 14. Position gas control power switch to the “ON” position.
- Step 15. Verify proper blower operation.

Locating Pins on blower flange

Pin location holes in jacket head

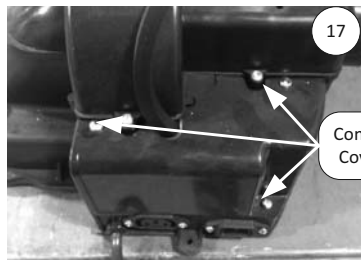


Blower Temperature Switch Testing.

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

- Step 1. Position gas control power switch to the "OFF" position.
- Step 2. Remove the three screws (Phillips screw driver) from control access cover on blower and remove cover (see photos 17 and 18).
- Step 3. Locate blower temperature switch (see photo 19).

Gas Control shown in the "OFF" position



Control Access
Cover Screws



18

Switch Setting

Opens on rise @ approximately 165°F
Auto resets on fall @ approximately 130°F

Cool switch to
below 130°F

Disconnect wire leads to
switch. Using a multi-meter
set to the ohms setting, is
there continuity between the
switch terminals?

N

Replace switch
(see page 25).

Y

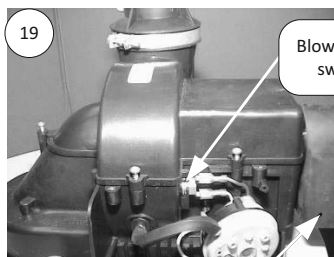
Reconnect wire leads and
observe heater operation. Do
exhaust gas temperatures rise
to or above 165°F?

Y

Do switch contacts
open?

19

Blower temperature
switch location



Air mixing inlet

N

Exhaust
temperature is too
hot.

Common causes for high exhaust temperature

1. Vent length is below minimum allowable.
2. Vent diameter not to specification.
3. Restricted dilution air inlet.
4. Missing or deteriorated flue baffle.
5. Gas pressure is out of specification.

Do switch contacts
open?

Y

Replace switch
(see page 25).

N

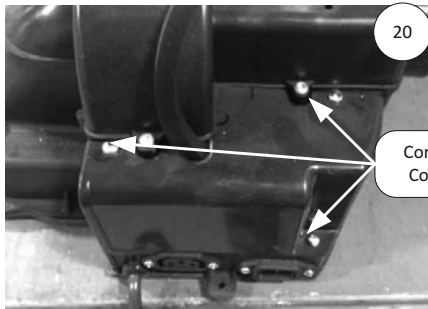
Switch OK

Blower Temperature Switch Replacement.

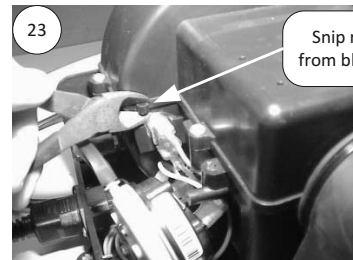
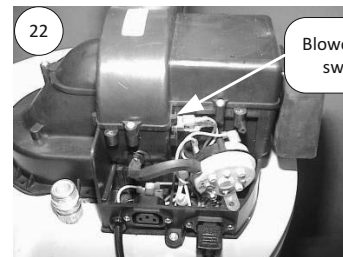
⚠ WARNING
115 volt potential exposure. Use caution
to avoid personal injury.

- Step 1. Position gas control power switch to the “OFF” position and unplug water heater from wall outlet.
- Step 2. Remove the three screws (Phillips screw driver) from the control access cover on blower and remove cover (see photo 20 and 21).

Gas Control shown in the “OFF” position



- Step 3. Locate blower temperature switch (see photo 17)
- Step 4. Disconnect red and yellow wire leads from switch.
- Step 5. With an appropriate tool such as side cutters, snip the retaining lug from the blower housing to allow removal of temperature switch (see photo 18).
- Step 6. Remove switch from blower housing.
- Step 7. Install new switch. Be sure switch is properly seated in mounting area.
- Step 8. Reconnect red and yellows wires to new switch. Wires are interchangeable with either terminal.
- Step 9. Position gas control power switch to the “ON” position and verify proper heater operation.
- Step 10. Replace control access cover from step 2.

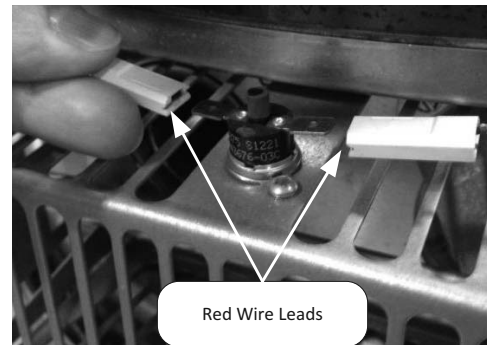
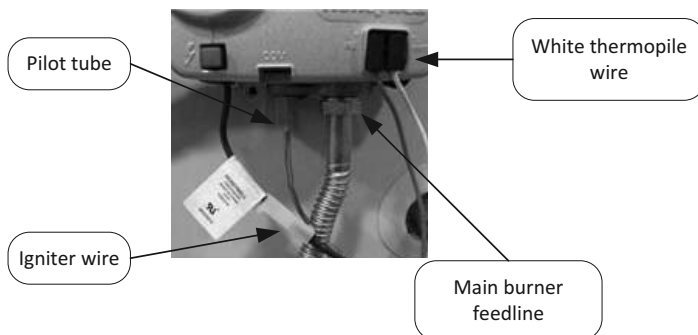


Gas Control Replacement

- Step 1. Rotate knob of the gas control to the "OFF" position.
- Step 2. Turn off gas supply to water heater.
- Step 3. Disconnect gas supply line from gas control.
- Step 4. Turn off water supply and drain water heater completely.
- Step 5. Remove the wire clip from the feedline.
- Step 6. Disconnect main burner feedline, pilot tube, white thermopile wire and igniter wire from gas control and bend the main burner feedline and pilot tube out of the way. Also disconnect the red wire leading from the thermopile from the red wire leading from the gas control.
- Step 7. Remove the gas control from the water heater by rotating counter-clockwise. It may be necessary to use a length of ½" NPT pipe threaded into the inlet of the gas control.



Gas Control shown in the "OFF" position



- Step 8. Install new gas control into the water heater.
 - a) Install gas control into water heater by rotating clockwise. DO NOT use a wrench on the gas control body or damage to the gas control may occur. If necessary, use a length of ½" NPT pipe threaded into gas inlet of gas control.
 - b) Position the main burner feedline and pilot tube back to the gas control and attach to the gas control. Connect the igniter wire and the white thermopile wire to the gas control. Connect the red wire from the gas control to the resettable thermal switch and connect the red wire from the thermopile to the resettable thermal switch.
 - c) Gather the igniter wire, white thermopile wire and red thermopile wire near the side of the feedline. Use the clip that was removed in Step 5 to secure the wires to the feedline.
 - d) Connect gas supply to inlet of gas control.

Step 9. Resume the water supply to the water heater. Be sure that the tank is full before operation is resumed.

Step 10. Check the main burner feedline and pilot feedline for gas leaks.

Step 10. To resume operation follow the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual.

Manifold Pressure Testing (this procedure presumes a maximum line pressure of 14.0" w.c.)

- Step 1. Position gas control power switch to the "OFF" position.
- Step 2. Remove pressure tap plug (3/16" hex wrench) 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 operating range for natural gas is: 5.0" $\pm$ 0.5" w.c.
- Step 6. If pressure is within the range specified in the previous step, position gas control power switch 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 instruction 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 "Gas Control Testing and Replacement" to replace Gas Control or valve body.

Gas Control shown in the "OFF" position



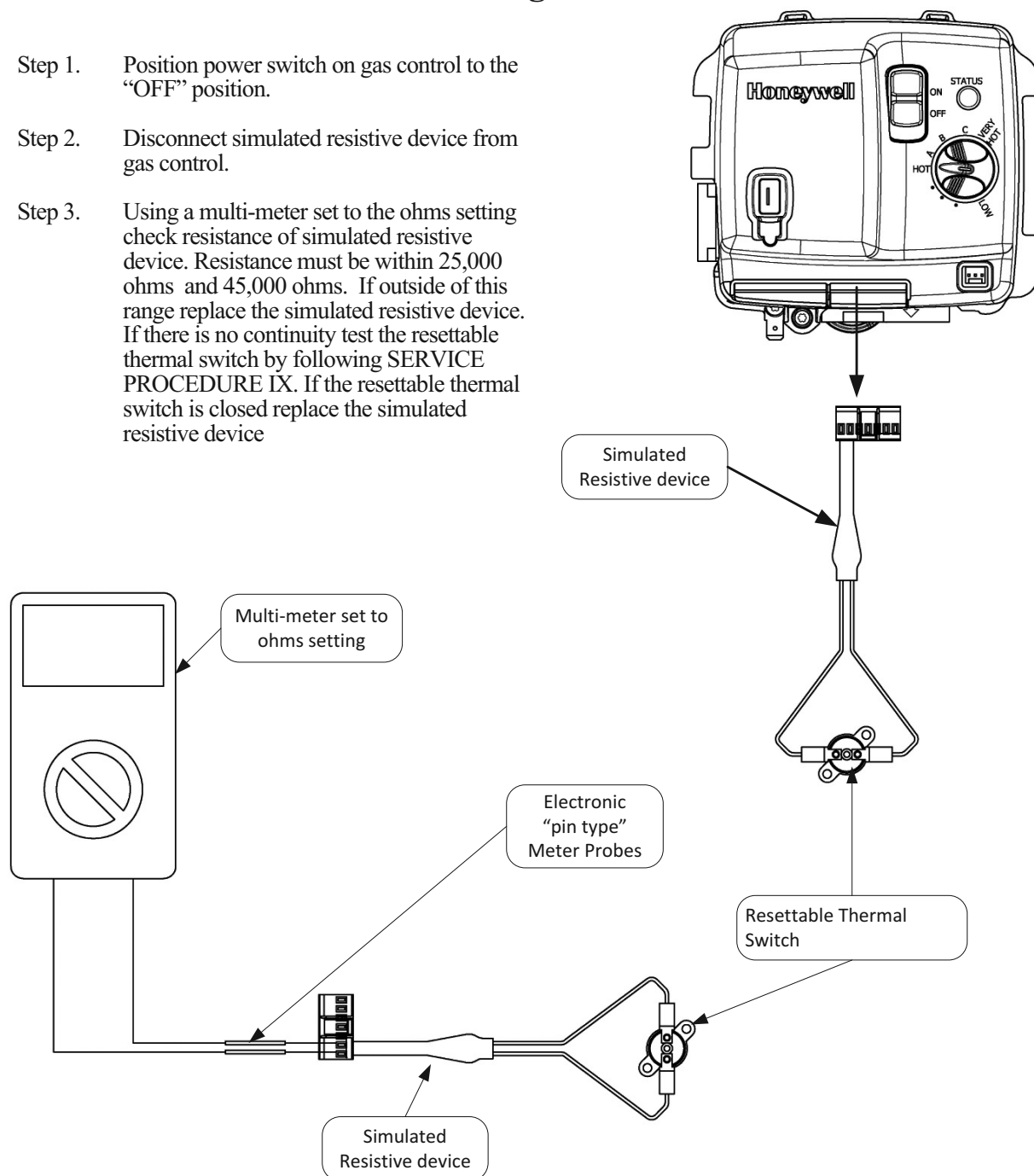
ECO (Energy Cut Out) Testing

The Honeywell Gas Control is designed with an ECO device that will reset.

To reset the Gas Control after an error code (4), rotate the set-point knob to the minimum temperature setting for at least 6 seconds and then rotate the set-point knob clockwise by at least 45°. This will reset the gas control and return the water heater to normal operation.

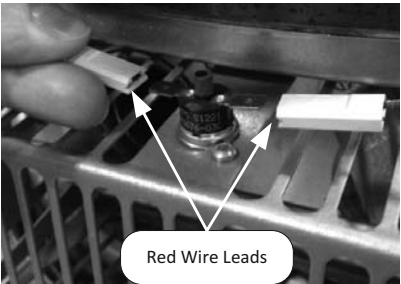
Simulated Resistive Device Testing

- Step 1. Position power switch on gas control to the "OFF" position.
- Step 2. Disconnect simulated resistive device from gas control.
- Step 3. Using a multi-meter set to the ohms setting check resistance of simulated resistive device. Resistance must be within 25,000 ohms and 45,000 ohms. If outside of this range replace the simulated resistive device. If there is no continuity test the resettable thermal switch by following SERVICE PROCEDURE IX. If the resettable thermal switch is closed replace the simulated resistive device



Resettable Thermal Switch Continuity Testing

- Step 1. Remove outer jacket door.
- Step 2. Disconnect red wire leads from resettable thermal switch.



- Step 3. Using a multimeter capable of measuring continuity (Ohms), place one probe of 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 current to pass.
- Step 5. If continuity is not indicated, the switch is open, possibly due to an over heating 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 in service.

PROBABLE CAUSE FOR RESETTABLE THERMAL SWITCH ACTIVATION	
PROBABLE CAUSE	CORRECTIVE ACTION
Burner Failure	1. Inspect burner per SERVICE PROCEDURE II 2. Replace burner per SERVICE PROCEDURE II
Weak switch or switch out of calibration.	1. Replace resettable thermal switch

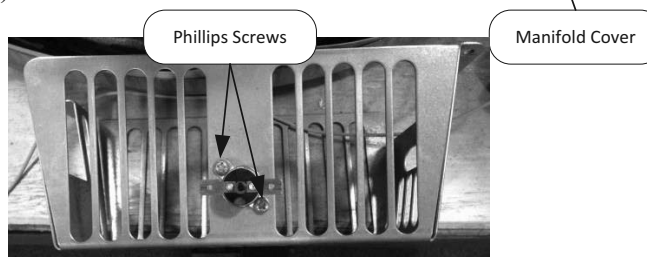
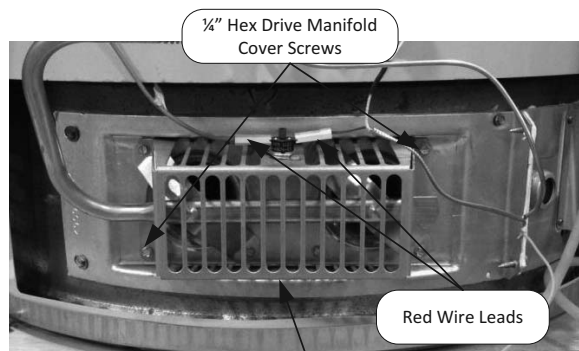
Resettable Thermal Switch Replacement

- Step 1. Position gas control power switch to the "OFF" position.
- Step 2. Remove outer jacket door.
- Step 3. Disconnect red wire leads from resettable thermal switch.

Gas Control shown in the "OFF" Position



- Step 4. Remove (2) 1/4" hex drive screws from the manifold cover and slid to the right to remove from burner assembly.
- Step 6. Remove resettable thermal switch from manifold cover (Phillips screw driver).



- Step 7. Place new resettable thermal switch in place. Be sure contact surface of resettable thermal switch and manifold cover are free of any debris. Secure resettable thermal switch into place using screws from step 6. **DO NOT OVER TIGHTEN SCREWS.**
- Step 8. Place manifold cover back in position and secure using the screws from step 4.
- Step 9. Reconnect wire leads from gas control and thermopile to resettable thermal switch.

Note: Wire termination is interchangeable with either resettable thermal switch connection.

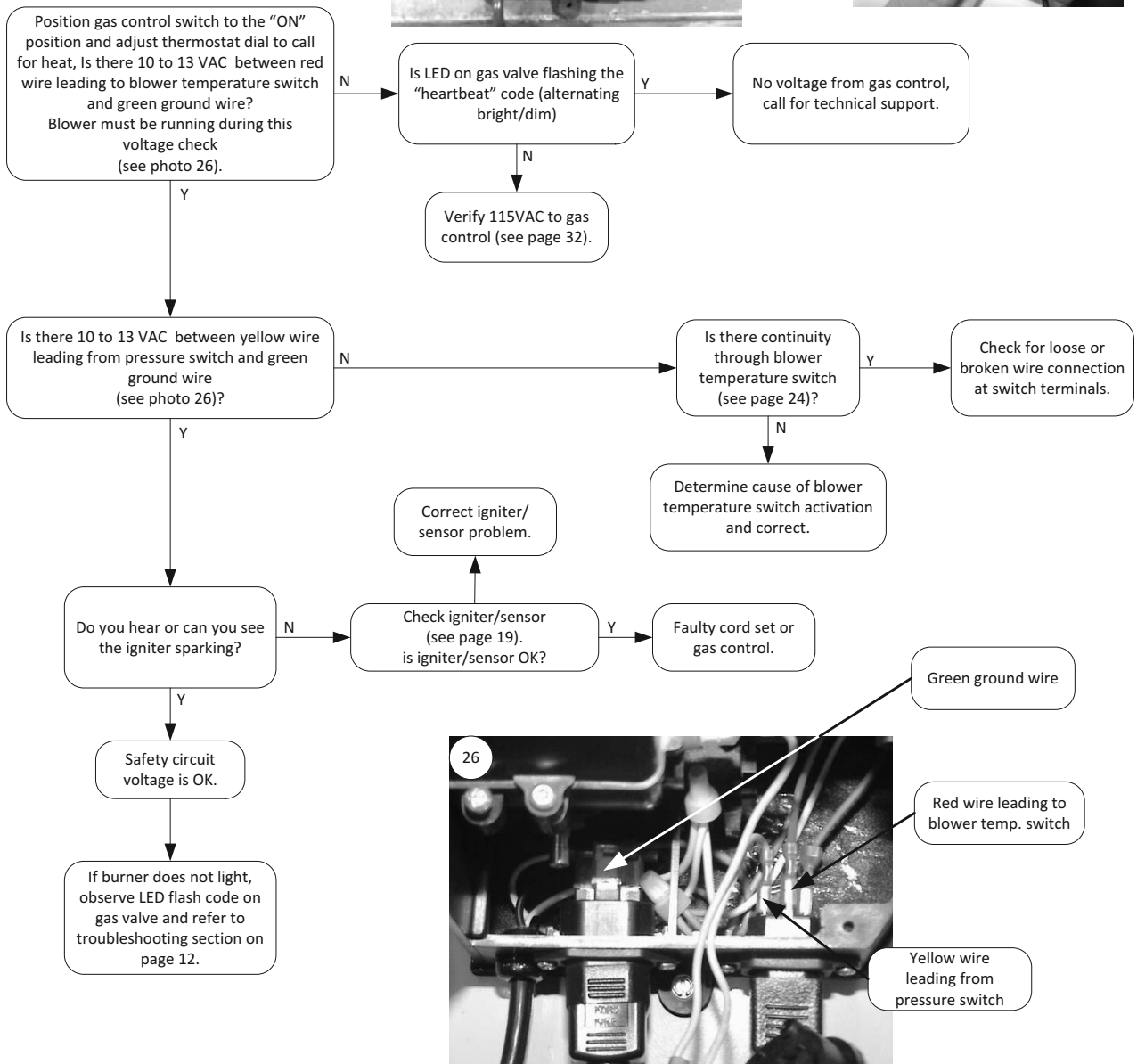
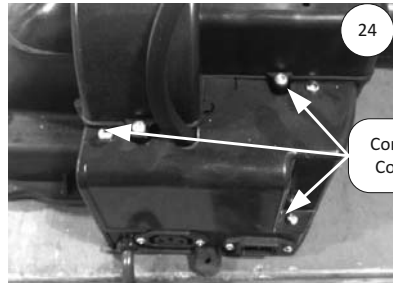
- Step 10. Replace outer jacket door.
- Step 11. To resume operation follow the instructions located on the lighting instructions label or the lighting instructions located in the installation and operation manual.

Safety Circuit Voltage Trace

⚠ WARNING
115 volt potential exposure. Use caution making voltage checks to avoid personal injury.

NOTE: This procedure assumes a cool tank.

Step 1. Remove three screws (Phillips Screw driver) from control access cover on blower and remove cover (see photo 24 and 25).

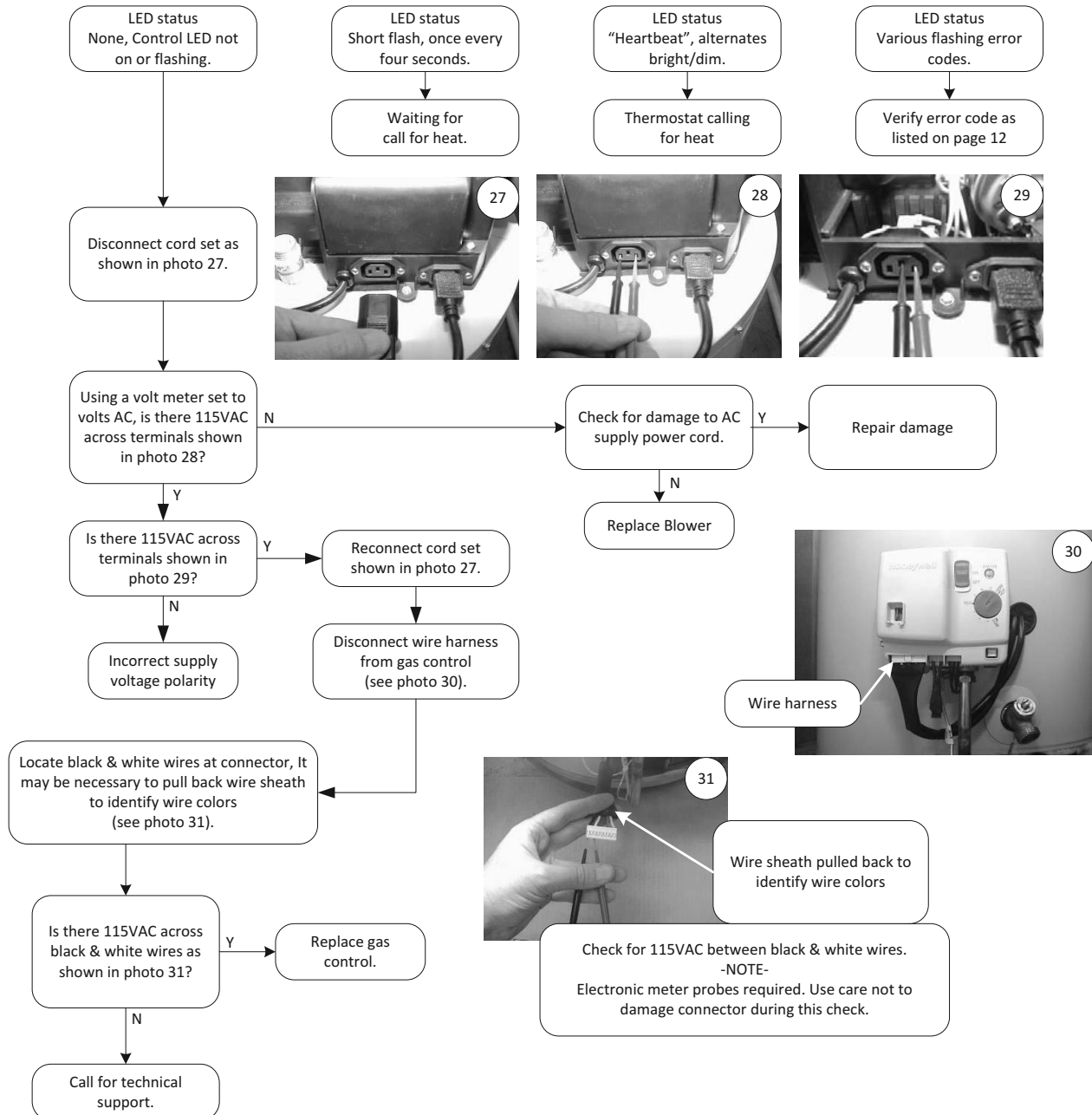


115 VAC Circuit Trace

⚠ WARNING
115 volt potential exposure. Use caution making voltage checks to avoid personal injury.

Step 1. Verify 115VAC and proper polarity at wall outlet.

Step 2. With unit plugged in and control power switch in the “ON” position verify LED status.



Dip Tube Inspection and 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. Position gas control power switch to the “OFF” position and unplug water heater from wall outlet.

Gas Control shown in the “OFF” Position



- Step 2. Turn off cold water supply to water heater. Connect hose to drain valve of water heater and route to an open drain. Open a nearby hot water faucet to vent heater for draining. Open drain valve of water heater and allow heater to drain to a point below the inlet connection nipple.
- Step 3. Disconnect inlet nipple from plumbing system.
- Step 4. With an appropriate tool such as a pipe wrench, remove inlet nipple/dip tube from the water heater. Use caution not to damage pipe threads.
- Step 5. Visually inspect inlet nipple/dip tube. Inlet nipple/dip tube should be free of cracks and any blockage. Hydro-jet slots should be open and free of any blockage.
- Any damage such as cracks, restriction due to deformation or unintentional holes are not field repairable and the inlet nipple/dip tube must be replaced.
- Step 6. Upon completion of inspection or subsequent replacement, reinstall inlet nipple/dip tube into water heater. Connect nipple to plumbing system, resume 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 and 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. Position gas control power switch to the “OFF” position and unplug water heater from wall outlet.

Gas Control shown in the “OFF” Position

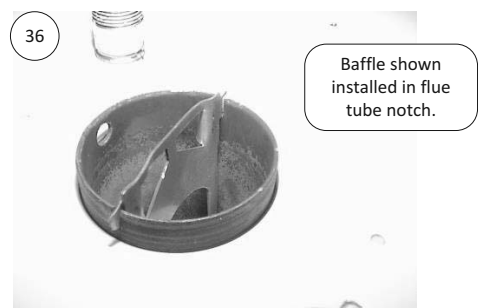
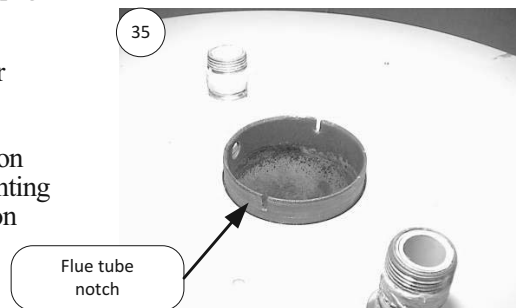
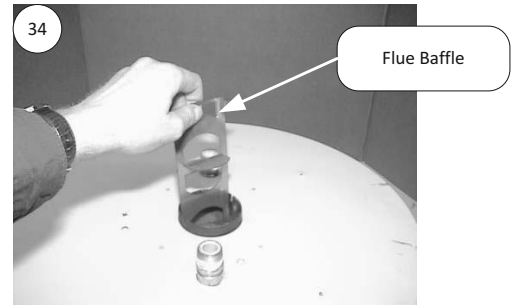
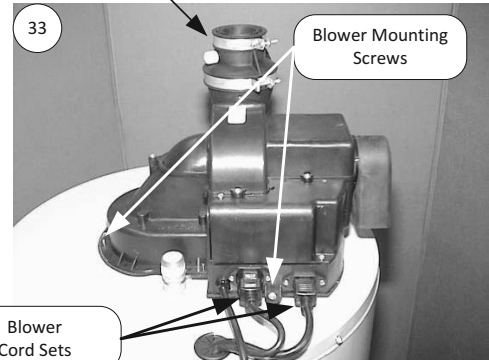


- Step 2. Turn off cold water supply to water heater. Connect hose to drain valve of water heater and route to an open drain. Open a nearby hot water faucet to vent water heater for draining. Open drain valve of water heater and allow water heater to drain to a point below the outlet connection nipple.
- Step 3. Disconnect outlet nipple from plumbing system.
- Step 4. With an appropriate tool such as a pipe wrench, remove outlet nipple/anode from the water heater. Use caution not to damage pipe threads.
- Step 5. Visually inspect outlet nipple/anode. Outlet nipple/anode should show signs of depletion, this is normal. If depletion is $\frac{1}{2}$ of the original anode diameter (approximately $\frac{3}{4}$ ” diameter), replacement is recommended. If any of the steel core of the anode is exposed, replacement is recommended.
- Step 6. Upon completion of inspection or subsequent replacement, reinstall outlet nipple/anode into water heater. Connect nipple to plumbing system, resume 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.

Remove blower to gain access to flue baffle

- Step 1. Position gas control power switch to the “OFF” position and unplug water heater from wall outlet.
- Step 2. Disconnect vent system from exhaust adapter on top of blower.
- Step 3. Unplug cord sets from blower. (see photo 33).
- Step 4. Remove the three blower mounting screws (¼" nut driver) (see photo 33).
- Step 5. Remove blower with gasket from water heater.
- Step 6. Remove flue baffle from Heater (see photo 34).
- Step 7. Inspect baffle for deterioration, missing restrictors. Clean any scale or debris build up. Replace with new baffle as necessary.
- Step 8. Reinstall baffle into flue tube. Be sure baffle hanger tab are inserted into notch location at the top of the flue tube (see photos 35 & 36).
- Step 9. Check Burner to insure no scale has accumulated during this operation. See burner cleaning procedure on page 14.
- Step 10. Reinstall blower on water heater. Connect vent system and cords set to blower. Plug water heater into wall outlet.
- Step 11. To resume operation follow the lighting instruction located on the lighting instruction label or the lighting instruction located in the installation and operation manual.

Disconnect vent system from exhaust adapter.



Glossary of Terms

BTU	British Thermal Units
GPM	Gallons per Minute
Hz	Hertz
KWh	Kilowatt hour
LED	Light Emitting Diode
NPT	National Pipe Thread
Ohms	Ohms (resistance)
PSI	Pounds per Square Inch
RPM	Revolutions per Minute
ECO	Energy Cut Out
VAC	Volts Alternating Current
W.C.	Inches of Water Column
°C	Degrees Centigrade
°F	Degrees Fahrenheit

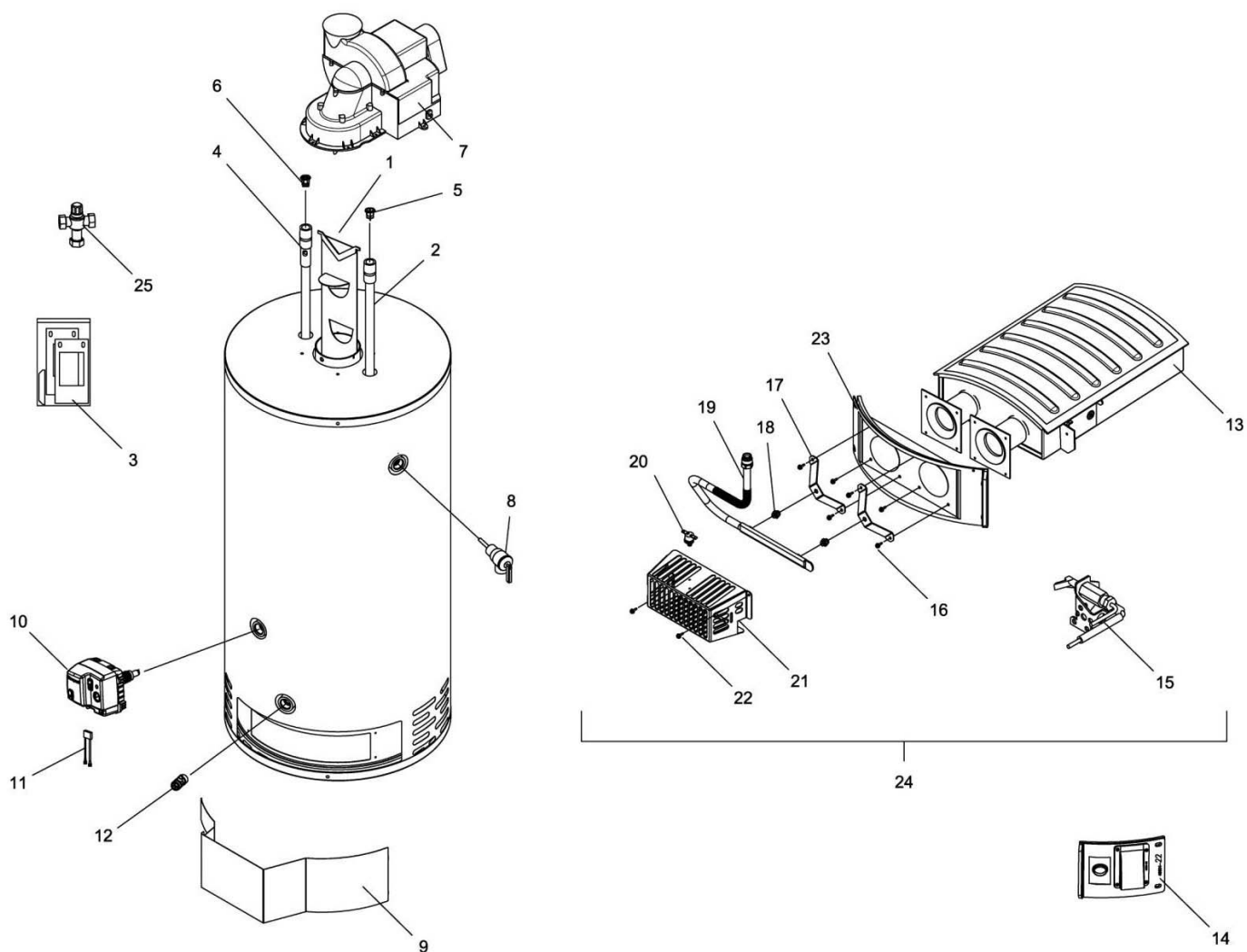
NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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[illegible]

Parts List



1. Flue Baffle
2. Inlet Dip Tube
3. Inner Door Gasket Kit
4. Hot Water Outlet Anode
5. Heat Trap Inlet
6. Heat Trap Outlet
7. Blower Assembly
8. T&P Valve
9. Outer Door
10. Gas Control
11. Gas Control Wire Harness
12. Brass Drain Valve

13. Ultra Low NOx Burner
14. Right Side Inner Door Assembly
15. Pilot Assembly
16. 1/4" Manifold Mount Hex Head Screw
17. Manifold Mount
18. Main Burner Orifice
19. Main Burner Feedline
20. Resettable Thermal Switch
21. Manifold Cover
22. 1/4" Manifold Cover Hex Head Screw
23. Burner Door
24. Main Burner Assembly



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