



UPDX Series

Ultra Low NOx Power Direct Vent
Gas Water Heaters



SERVICE MANUAL

Troubleshooting Guide
and Instructions for Service

(To be performed ONLY by
qualified service providers)

Models Covered by This Manual:

UPDX250T*FRN
UPDX265T*FRN
UPDX275T*FRN
UPDX50S50FR*N
UPDX65S55FR*N
UPDX75S55FR*N
(* Denotes Warranty Years)

Bradford White UPDX Series

Ultra Low NOx Power Direct Vent Gas Water Heaters

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UPDX 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.



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.

UPDX Series

Introduction

The new Bradford White UPDX2 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 quieter operation, additional vent lengths, certified FVIR technology and 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 & First Hour Supply performance.

The UPDX2 water heaters use a combustion system where flue gases are combined with dilution air to reduce the flue gas temperature in the blower, combustion air and dilution air are drawn from outside the building. 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 identify an operational issue.

This service manual is designed to facilitate problem diagnosis and enhance service efficiency. To further promote quicker service times the new gas control can be removed and replaced without draining the water heater. A special tool is required and will be provided with each gas valve kit shipped from our Service Parts department.

Please read the service manual completely before attempting service on this new series of power direct vent models.

How the Safety System Works

During normal operation, air for combustion is drawn into the water heater through the intake vent pipe from outside your building. The air travels into the closed combustion chamber. The air then mixes in a normal manner with supplied gas and is efficiently combusted, producing Ultra Low NOx emissions.

In the unlikely event trace amounts of flammable vapors are present in the area surrounding the water heater, the sealed combustion system prevents the flammable vapors from reaching the ignition source. In addition the flammable vapor sensor will stop the water heater from operating if a significant amount of flammable vapors are present.

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

The Honeywell 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.
Gas Control Service Tool:	BWC part number 239-45991-00. A specialized tool designed to remove the gas control from gas control thermal well. Available from your Bradford White parts supplier.
Various Hand Tools:	Pipe wrench, channel locks, open end wrenches (3/8", 7/16", 1/2"), 12" crescent wrench, Allen wrench set, screw drivers (slotted & 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.

Power supply	Dedicated 115VAC, 60 Hz, 15A
Gas Supply Pipe	Minimum 1/2" NPT (schedule 40 black iron pipe recommended)
Approved Gas Type	Natural. Unit must match gas type supplied.
Gas Pressure	6.0" W.C. min. for Nat gas, 11.0" W.C. min. for L.P. gas, 14.0" W.C. maximum (Nat. & L.P.)
Venting System	Power direct 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 SetPoint Range	60°F (16°C) to 160°F (71°C) (Approximate temperatures)
Commercial Temperature SetPoint Range	80°F (27°C) to 180°F (82°C) (Approximate temperatures)
Blower Temperature Switch	Normally closed, opens @ 155°F (68°C), auto reset @ 128°F (54°C).
Pressure switch	Standard Altitude-Normally open, closes at differential pressure of -.80. High Altitude-Normally open, closes at differential pressure of -.73.
Blower	115VAC, 60Hz, 3.1 amps.

Venting Specifications for:

48 Gallon

65 Gallon

75 Gallon

This water heater is approved for installation with the following PVC, CPVC or ABS Schedule 40 venting material.

The maximum and minimum vent lengths listed in this table are for the exhaust portion of the vent. The intake portion of the vent must be equal to or less than the length of the exhaust.

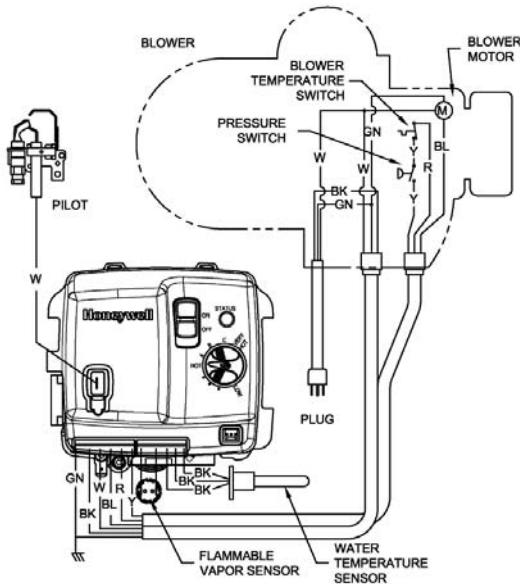
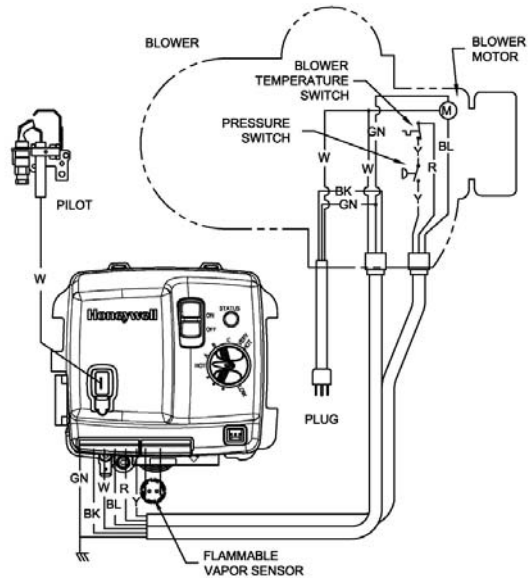
3" Diameter (7.6 cm) PVC Vent Connector Lengths					
Terminating	# of Elbows	Maximum 48, 65 gal.		Maximum 75 gal.	
		Maximum Length ft (m)	Minimum Length ft (m)	Maximum Length ft (m)	Minimum Length ft (m)
Through the Wall	1	55 (16.8)	2 (.6)	45 (13.7)	2 (.6)
Through the Wall	2	50 (15.2)	2 (.6)	40 (12.2)	2 (.6)
Through the Wall	3	45 (13.7)	2 (.6)	35 (10.7)	2 (.6)
Through the Wall	4	40 (12.2)	2 (.6)	30 (9.1)	2 (.6)
Through the Roof	0	60 (18.3)	7 (2.1)	50 (15.2)	7 (2.1)
Through the Roof	1	55 (16.8)	7 (2.1)	45 (13.7)	7 (2.1)
Through the Roof	2	50 (15.2)	7 (2.1)	40 (12.2)	7 (2.1)
Through the Roof	3	45 (13.7)	7 (2.1)	35 (10.7)	7 (2.1)

4" Diameter (10.2 cm) PVC Vent Connector Lengths					
Terminating	# of Elbows	Maximum 48, 65 gal.		Maximum 75 gal.	
		Maximum Length ft (m)	Minimum Length ft (m)	Maximum Length ft (m)	Minimum Length ft (m)
Through the Wall	1	95 (29.0)	10 (3.1)	85 (25.9)	10 (3.1)
Through the Wall	2	90 (27.4)	10 (3.1)	80 (24.4)	10 (3.1)
Through the Wall	3	85 (25.9)	10 (3.1)	75 (22.9)	10 (3.1)
Through the Wall	4	80 (24.4)	10 (3.1)	70 (21.3)	10 (3.1)
Through the Wall	5	75 (22.9)	12 (3.6)	65 (19.8)	12 (3.6)
Through the Roof	0	100 (30.5)	15 (4.6)	90 (27.4)	15 (4.6)
Through the Roof	1	95 (29.0)	15 (4.6)	85 (25.9)	15 (4.6)
Through the Roof	2	90 (27.4)	15 (4.6)	80 (24.4)	15 (4.6)
Through the Roof	3	85 (25.9)	15 (4.6)	75 (22.9)	15 (4.6)
Through the Roof	4	80 (24.4)	15 (4.6)	70 (21.3)	15 (4.6)

Control Timings

<u>Ignition State</u>	<u>Timing</u>
Pre-purge	15 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

FOR MODELS WITH SERIAL #'S
BEGINNING WITH J OR SOONERFOR MODELS WITH SERIAL #'S
BEGINNING WITH K OR LATER

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. Flammable Vapor Check.

To assure no outputs are energized if the "Flammable Vapor Sensor" is out of range, the control will test the "Flammable Vapor Sensor" for proper operating range. If the "Flammable Vapor Sensor" is within range the control resumes normal operation with no perceptible delay. If the "Flammable Vapor Sensor" is out of range, the control LED immediately flashes *7 times* followed by a 3 second pause.

Normal Heating Sequence

1. Thermostat Calls for Heat.

Prior to energizing the blower, the gas control checks the 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 gas control waits 4 seconds, then the gas control LED flashes 2 times followed by a 3 second pause. The gas control waits 2 minutes then, the blower runs for 30 seconds. This cycle repeats until the safety circuit opens.

2. Blower Energizes.

3. Blower Pre-purge Period (15 seconds).

4. Differential Pressure Switch Proves Blower/Vent System Operation.

- a) If the pressure switch does not close within 30 seconds, the control LED Flashes 3 times followed by a 3 second pause.
- b) 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 the spark igniter and gas flow to the pilot burner.
- b) If flame is not sensed within 90 seconds, the igniter and gas flow are deactivated. The blower will post purge and the gas control LED flashes *6 times* followed by a 3 second pause.

6. Main Burner Ignition

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

Normal Heating Sequence (continued)

7. Steady State Operation.

During steady state operation the gas control monitors:

Thermostat Temperature Sensor- When the setpoint temperature is satisfied, the gas control is shut down and the blower will post purge for 15 seconds. The gas control LED flashes a short flash once every 4 seconds (*idle*) status code.

Pressure Switch / Blower Temperature Switch- If either switch opens the pilot valve and main valve are shut down. The blower continues to run for 30 seconds attempting to close the circuit. The control LED flashes 3 *times* followed by a 3 second pause.

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

8. Thermostat Satisfies.

9. Burner Off.

10. Blower Post-purge (15 seconds).

Abnormal Operation

1. Flammable Vapor Sensor Fault:

- a) **If the Flammable Vapor Sensor Resistance is Greater than 70,000 Ohms** - the gas control immediately turns off all outputs. The gas 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 7 *times followed by* a 3 second pause. This process is repeated 5 times until the gas control either returns to normal operation or proceeds to a lockout mode flashing 7 *times* followed by a 3 second pause.
- b) **If the Flammable Vapor Sensor Resistance is Below 3000 ohms** - The gas control immediately turns off all outputs and proceeds to flash 8 *times then 1 time* followed by a 3 second pause. The error self clears if the resistance returns to the 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 3 times followed by a 3 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 3 times* followed by a 3 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 the pilot and main valve and proceeds to flash 4 *times* followed by a 3 second pause. Blower continues to run until the 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 45° .

Abnormal Operation (cont.)

3. Pressure Switch/Blower Temperature Fault:

- a) **Pressure Switch Closed at Start of Call for Heat** - The gas control waits 4 seconds then, proceeds to flash 2 times followed by a 3 second pause. The gas control waits 2 minutes and then turns on the blower for 30 seconds. The blower turns off after 30 seconds and the gas control waits for the pressure switch to open. Any time the pressure switch opens, the blower turns on (or stays on) and the control proceeds to waiting for the 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 followed by a 3 second pause. The gas control waits 2 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 the blower for 15 seconds (inter-purge) waiting for the pressure switch and/or blower temperature switch to close. If either switch fails to close, the gas 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 control turns off the blower and flashes *6 times then 2 times* followed by a 3 second pause. The gas control waits 5 minutes before repeating ignition sequence.

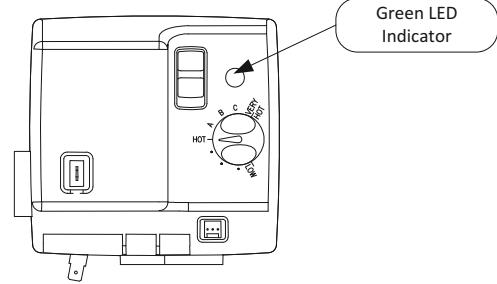
4. Trial For Ignition Fault:

- a) **Pressure Switch Opens During Trial** - The gas control turns off the 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* followed by a 3 second pause. The control waits 5 minutes before repeating the ignition sequence.

5. Flame Sensing Fault:

- a) **Flame Lost During Run** - The gas control turns off the pilot and main valves and runs the 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* followed by a 3 second pause. The control waits 5 minutes before repeating the ignition sequence.
- b) **Flame Sensed Out of Sequence** - the gas control only looks for pilot flame when the blower is running. If a flame is present when the pilot valve is not open the control proceeds to wait for flame loss and flashes *5 times* followed by a 3 second pause. This continues until flame is lost, once the flame signal is lost, the gas control flashes *6 times then 4 times* followed by a 3 second pause. The gas control waits 5 minutes before repeating the ignition sequence.

Observe green LED indicator on 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.

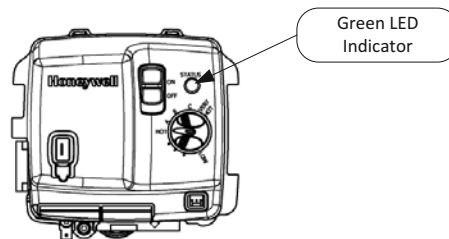


(For models with serial numbers starting with K or later see chart on page 15.)

<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 desired temp. level.
"Heartbeat", alternates bright/dim	Thermostat calling for heat (no fault).	Tank temperature below setpoint of thermostat.	Normal operation. Adjust thermostat to desired 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 18
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.	1-3. Page 19
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. 7. Intake vent length exceeds exhaust vent length. 8. Frozen intake or exhaust vent terminal.	1. Check vent or vent tables 2 & 3. Page 19 4. Page 21 5 & 6. Page 23 8. Page 41
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. Page 25 2. Replace gas control, page 27 & 29
Five flash, three second pause	Undesired-false pilot flame present.	1. Pilot valve stuck in open position.	1. Replace gas control, page 27 & 29

<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.	<ol style="list-style-type: none"> 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 18
Six-two flash, three second pause	Pressure switch or blower temp switch opened during burner operation. System auto resets.	<ol style="list-style-type: none"> 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. 8. Insufficient combustion air. 	<ol style="list-style-type: none"> 1. Check vent or vent tables. 2 & 3. Page 19 4. Refer to venting section of installation manual 5. Page 21 6 & 7. Page 23 8. Refer to installation manual.
Six-three flash, three second pause	Pilot flame extinguished. System auto resets.	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 1-4. Page 18 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 27 or 29
Seven flash, three second pause	Flammable Vapor Sensor fault detected	<p>WARNING: EXPLOSION HAZARD</p> <ul style="list-style-type: none"> * Indicates gasoline vapors were detected at potentially explosive levels. * Verify no gasoline vapors are still present * Reset the control by cycling power to the appliance or by cycling the ON/OFF switch. * Replace the Flammable Vapor Sensor element if a gasoline spill event occurred. 	Page 32
Eight-one flash, three second pause	Flammable Vapor Sensor out of specification.	<ul style="list-style-type: none"> * Verify Flammable Vapor Sensor (FVS) resistance is not below 25 K Ohms. * Check wiring to FVS and confirm it is not shorted. * Replace control if everything above checks out OK. 	Page 32
Eight-three flash, three second pause	Thermal well sensor damaged or unplugged	<ol style="list-style-type: none"> 1. Damage to thermal well wire. 2. Thermal well sensor resistance out of range. 	Page 25
	Gas valve electronics fault detected	<ol style="list-style-type: none"> 1. Control needs to be reset. 2. Control is wet or physically damaged. 	<ol style="list-style-type: none"> 1. Interrupt power supply 2. Replace gas control, page 27 or 29
Eight-four flash, three second pause	Gas valve fault detected.	<ol style="list-style-type: none"> 1. Control needs to be reset. 2. Control is wet or physically damaged. 	<ol style="list-style-type: none"> 1. Interrupt power supply 2. Replace gas control, page 27 or 29

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.



(The following chart is for models with serial numbers starting with K or later.)

<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 desired temp. level.
"Heartbeat", alternates bright/dim	Thermostat calling for heat (no fault).	Tank temperature below setpoint of thermostat.	Normal operation. Adjust thermostat to desired 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 18
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.	1-3. Page 19
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. 7. Intake vent length exceeds exhaust vent length. 8. Frozen intake or exhaust vent terminal.	1. Check vent or vent tables. 2 & 3. Page 19 4. Page 21 5 & 6. Page 23 8. Page 41
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 31
Five flash, three second pause	Undesired-false pilot flame present.	1. Pilot valve stuck in open position.	1. Replace gas control, page 31

<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.	<ol style="list-style-type: none"> 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 18
Six-two flash, three second pause	Pressure switch or blower temp switch opened during burner operation. System auto resets.	<ol style="list-style-type: none"> 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. 8. Insufficient combustion air. 	<ol style="list-style-type: none"> 1. Check vent or vent tables. 2 & 3. Page 19 4. Refer to venting section of installation manual 5. Page 21 6 & 7. Page 23 8. Refer to installation manual.
Six-three flash, three second pause	Pilot flame extinguished. System auto resets.	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 1-4. Page 18 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 31
Seven flash, three second pause	Flammable Vapor Sensor fault detected	<p>WARNING: EXPLOSION HAZARD</p> <ul style="list-style-type: none"> * Indicates gasoline vapors were detected at potentially explosive levels. * Verify no gasoline vapors are still present * Reset the control by cycling power to the appliance or by cycling the ON/OFF switch. * Replace the Flammable Vapor Sensor element if a gasoline spill event occurred. 	Page 32
Eight-one flash, three second pause	Flammable Vapor Sensor out of specification.	<ul style="list-style-type: none"> * Verify Flammable Vapor Sensor (FVS) resistance is not below 25 K Ohms. * Check wiring to FVS and confirm it is not shorted. * Replace control if everything above checks out OK. 	Page 32
Eight-two flash, three second pause	Temperature sensor damaged or unplugged	<ol style="list-style-type: none"> 1. Damage to Temperature Sensor. 2. Thermal well sensor resistance out of range. 	1 & 2. Replace gas control, page 31
Eight-three flash, three second pause	Gas valve electronics fault detected	<ol style="list-style-type: none"> 1. Control needs to be reset. 2. Control is wet or physically damaged. 	<ol style="list-style-type: none"> 1. Interrupt power supply 2. Replace gas control, page 31
Eight-four flash, three second pause	Gas valve fault detected.	<ol style="list-style-type: none"> 1. Control needs to be reset. 2. Control is wet or physically damaged. 	<ol style="list-style-type: none"> 1. Interrupt power supply 2. Replace gas control, page 31

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 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

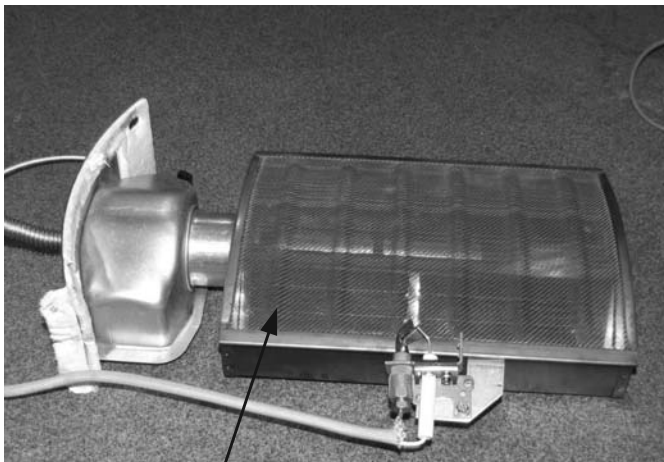
Under no circumstances shall flammable materials be used or stored in the vicinity of the water heater. With the inner door removed the Bradford White Defender Safety System will be deactivated. If flammable vapors are present, a fire or explosion may result causing property damage, personal injury or 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 UPDX SERVICE PROCEDURE XV, steps 1 through 9.
- Step 2. Thoroughly inspect burner screen and burner venturi and remove any loose debris accumulation. Inspect burner screen for any openings larger than the normal screen openings.
- Step 3. Use compressed air and/or a vacuum to remove any scale or other debris accumulation from the burner screen and venturi.



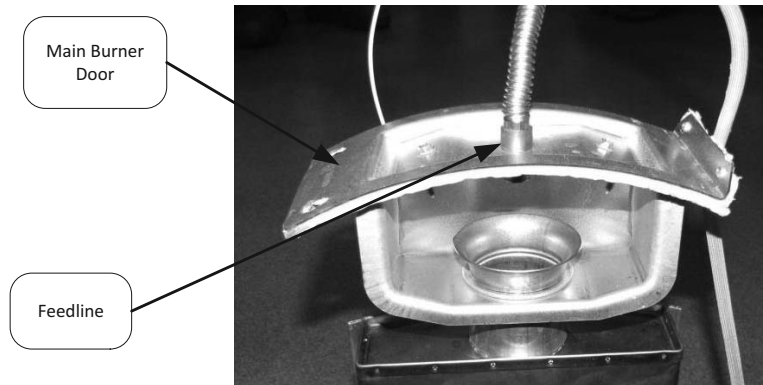
Burner Screen



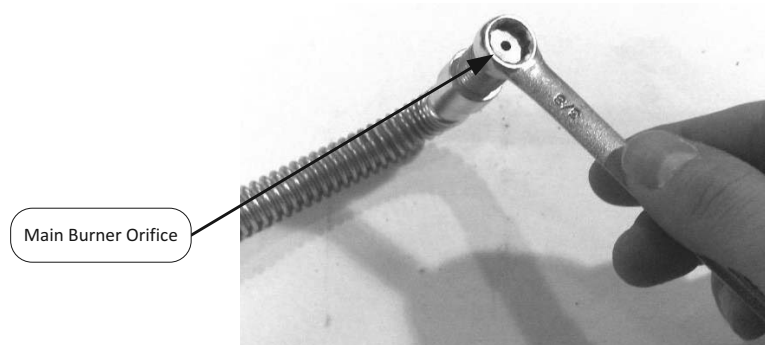
Burner Venturi

Burner Cleaning (Continued)

Step 4. Disconnect (unscrew) feedline from the main burner door.



Step 5. Remove main burner orifice from feed line (3/8" wrench). Inspect and clean if necessary



Step 6. Remove pilot assembly, refer to UPDX SERVICE PROCEDURE II for cleaning and inspection.

Step 7. Reassemble burner.

Step 8. Reinstall burner and inner door per UPDX SERVICE PROCEDURE XV, steps 10 through 22.

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.

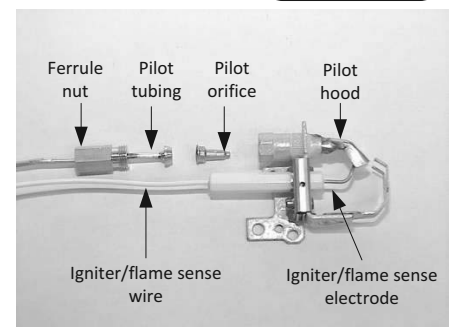
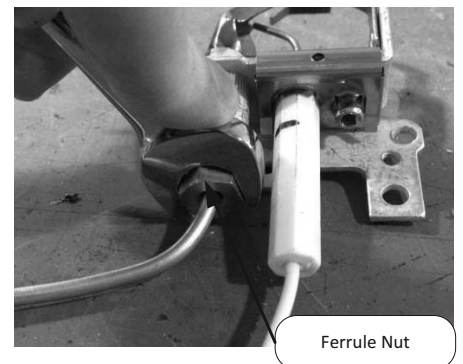
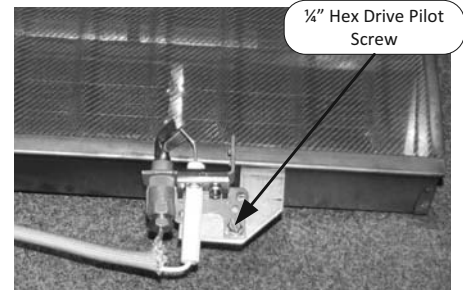
Step 10. Reassemble burner and reinstall into water heater. Restore gas supply and check for gas leaks.

Step 11. To resume operation follow the instruction located on the lighting instruction label or the lighting instruction located in the installation and operating manual.

Pilot assembly Inspection, Cleaning and Replacement

- Step 1. Position gas control power switch to the "OFF" position and unplug heater from wall outlet.
- Step 2. Turn off gas supply to water heater.
- Step 3. Remove outer jacket door and remove main burner per service procedure XV, steps 1 through 9 on page 38.
- Step 7. Remove pilot assembly from main burner ($\frac{1}{4}$ " nut driver).
- Step 8. Visually inspect igniter/flame sense wire for damage. Replace pilot if damage is found.
- Step 9. With a multi-meter set to the ohms setting, check continuity through igniter/flame sense wire. Replace pilot if no continuity.
- Step 10. Visually inspect igniter/flame sense electrode for deterioration. Replace pilot as necessary. Electrode should not be in contact with pilot hood. If so, carefully adjust electrode to a gap distance of $\frac{3}{32}$ " (0.09") from pilot hood.
- Step 11. Visually inspect igniter/flame sense electrode for oxidation build up. Carefully clean any oxidation using very fine emery cloth.
- Step 12. Visually inspect pilot tubing for kinks or cracks. If damage is found replace pilot.
- Step 13. Inspect pilot tubing and pilot orifice for blockage:
a) Remove ferrule nut from bottom of pilot assembly ($\frac{7}{16}$ " wrench).
b) Remove pilot tube and pilot orifice.
c) Inspect pilot tubing and pilot orifice for blockage. Clean or replace as necessary.
- Step 14. Reassemble pilot and install to feedline. Reinstall burner assembly to water heater. Restore gas supply and check for gas leaks.
- Step 15. To resume operation follow the instructions located on the lighting instructions label or the lighting instructions located in the installation and operation manual.

Gas Control shown in the "OFF" Position



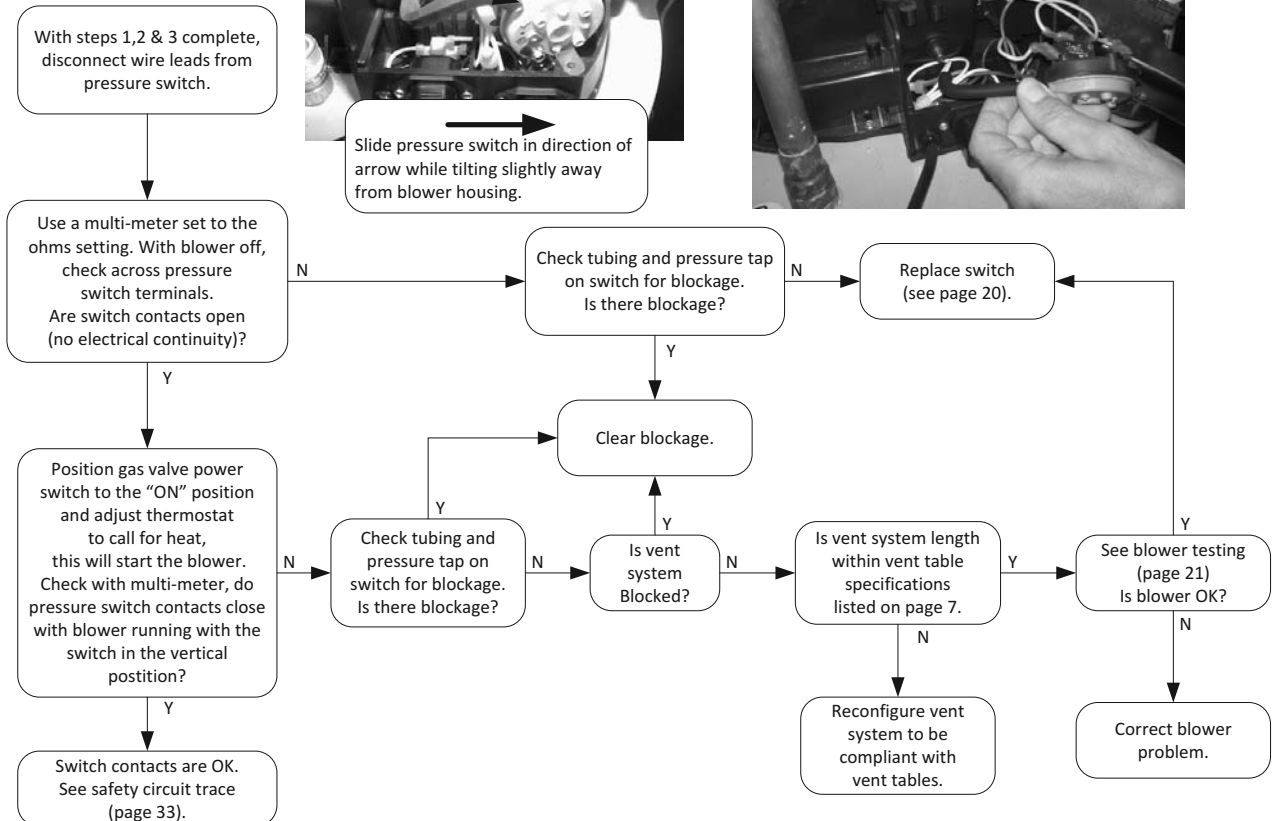
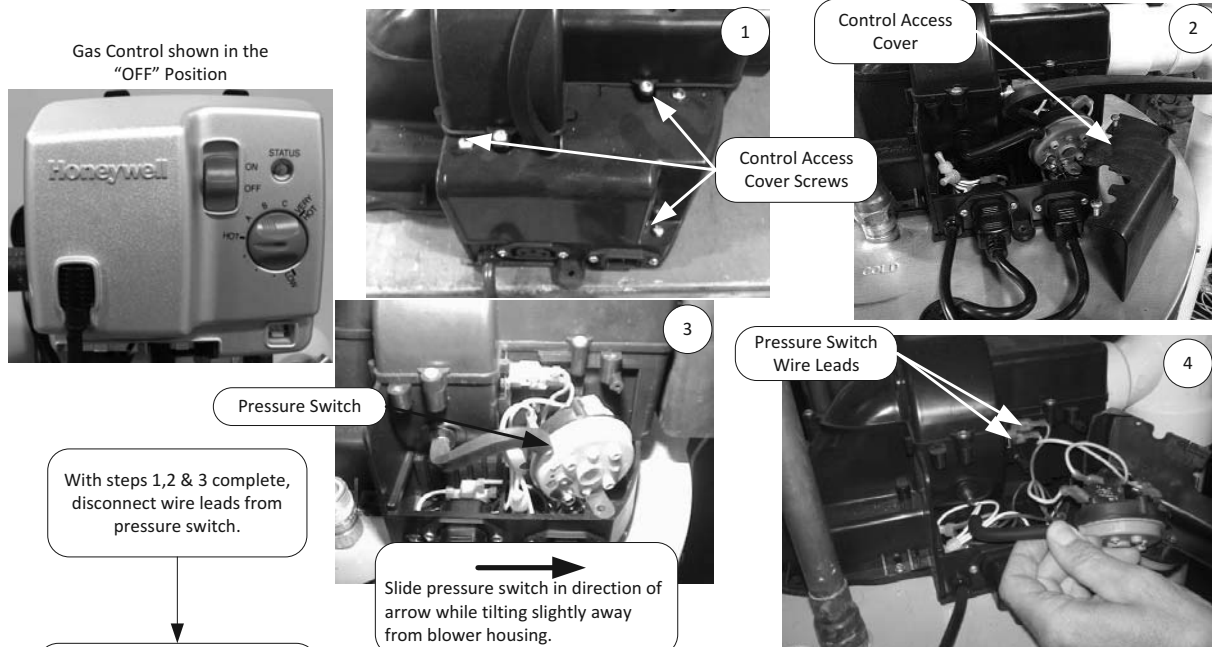
Pressure Switch Testing

- 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.



Pressure Switch Replacement

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 photo 5 and 6).

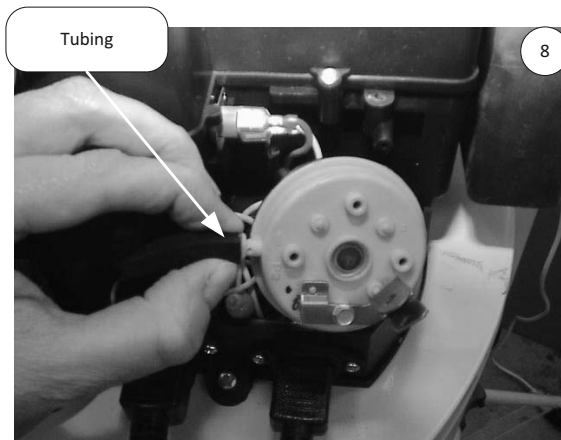
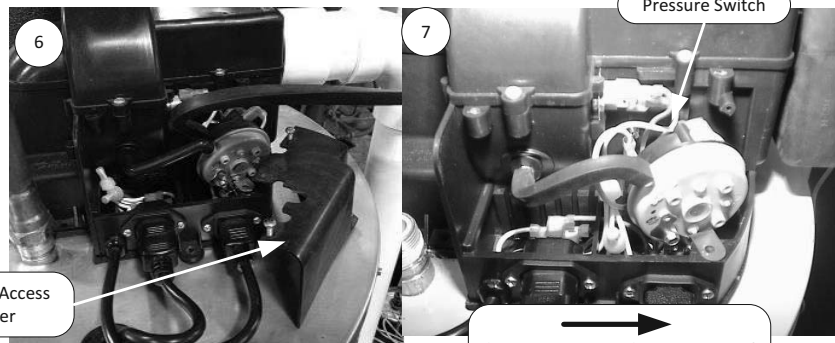
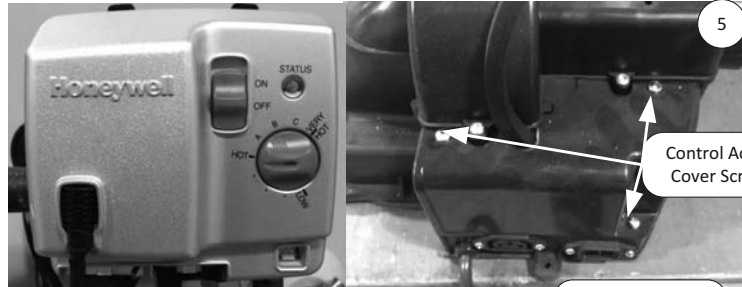
Step 3. Carefully remove pressure switch from blower housing (see photo 7).

Step 4. Disconnect tubing from pressure switch (see photo 8).

Step 5. Disconnect yellow wires from pressure switch (see photo 9).

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

Gas Control shown in the "OFF" Position



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

Step 1. Position gas control power switch to the "ON" position and adjust control to call for heat.

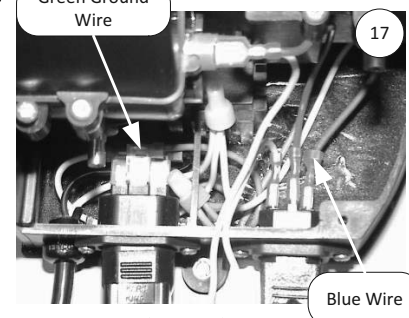
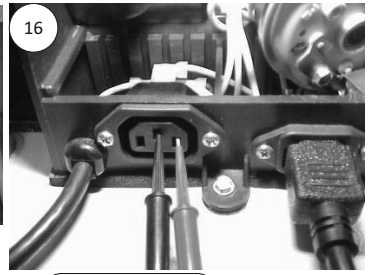
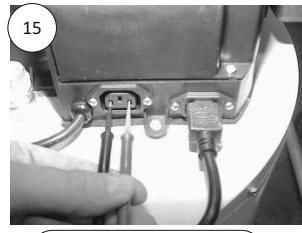
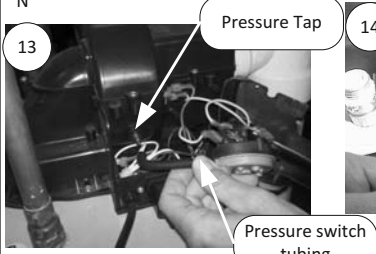
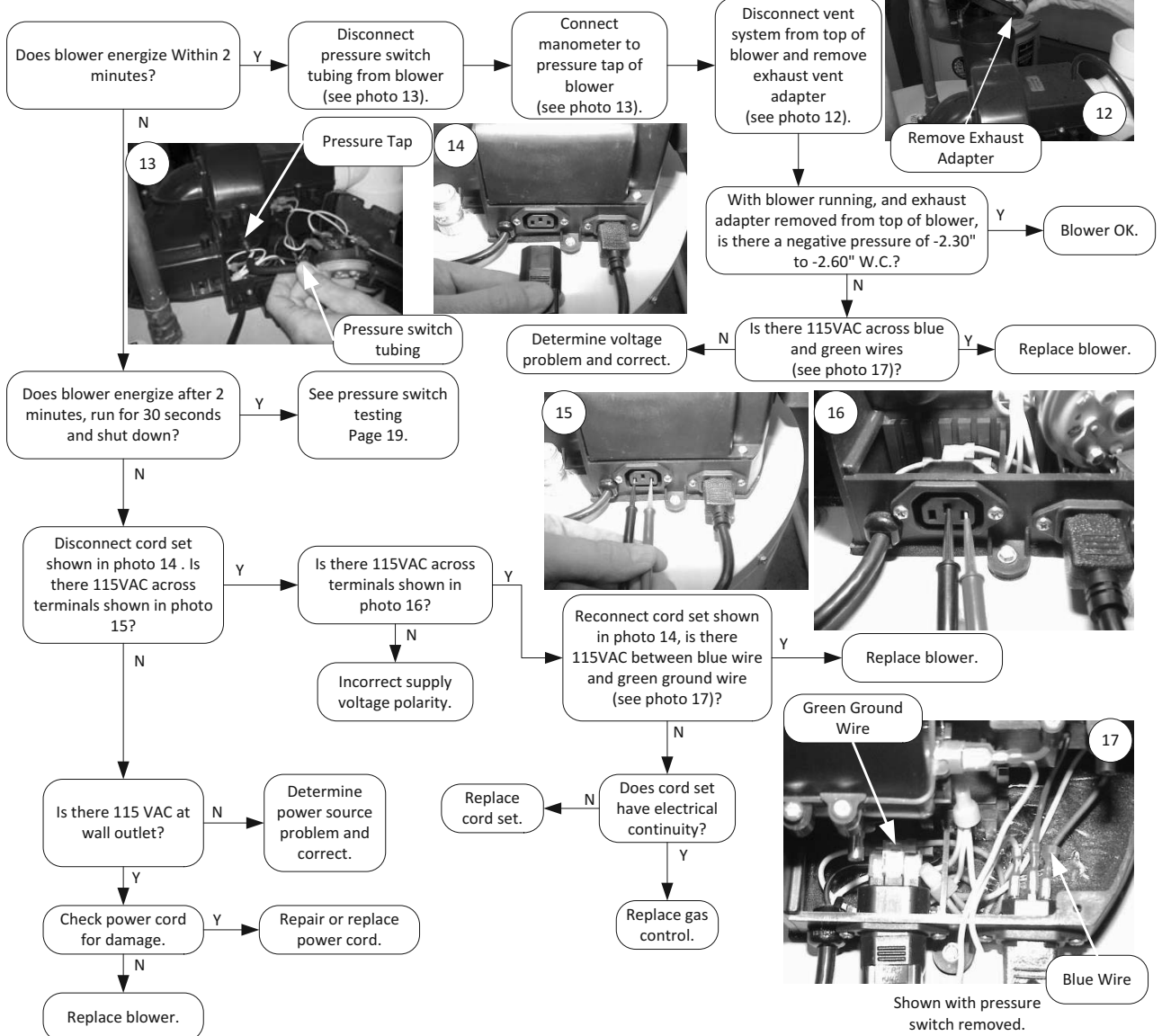
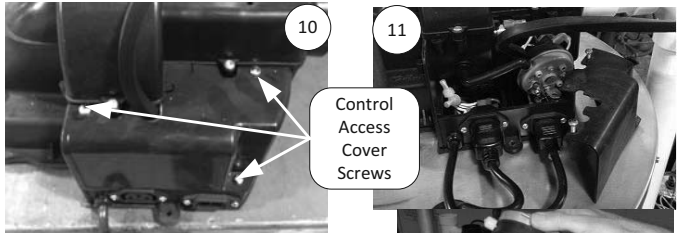
Step 2. Remove the three screws (Phillips Screw driver) from control access cover on blower assembly and remove cover (see photos 10 and 11).

Gas Control shown in the "ON" Position



⚠ WARNING

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



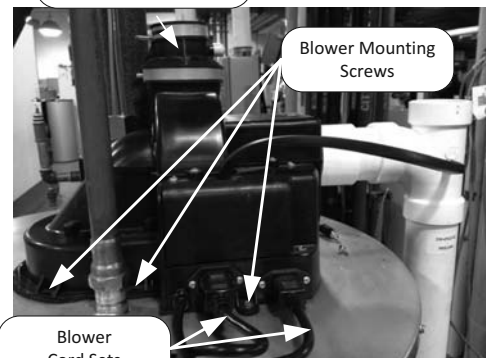
Blower Removal

- Step 1. Position gas control power switch to the “OFF” position.
- Step 2. Unplug blower power cord from wall outlet.
- Step 3. Disconnect vent system from exhaust adapter on top of blower.
- Step 4. Remove exhaust adapter from blower (blade screw driver) and retain for use on new blower
- Step 5. Unplug cord sets from blower.
- Step 6. Remove vertical air intake bracket.
- Step 7. Disconnect vertical air intake from blower.
- Step 8. Remove the three blower mounting screws (1/4" nut driver).
- Step 9. 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 Installation

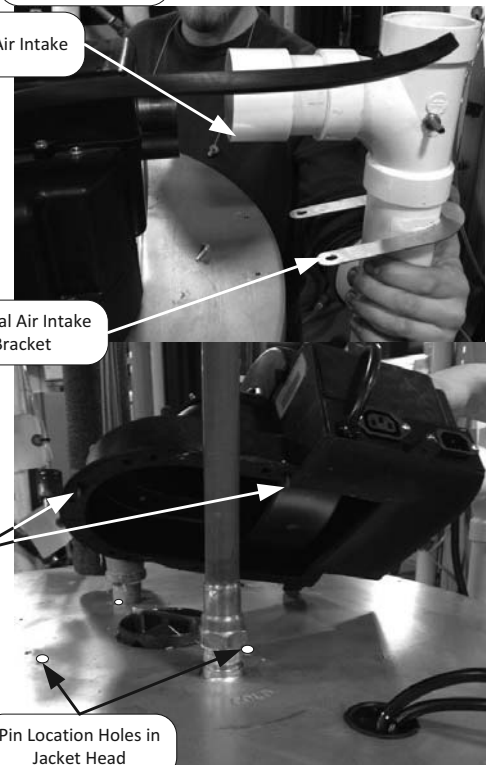
- Step 10. Clean any debris from jacket head of water heater.
- Step 11. Set new blower with gasket in place using locating pins on blower flange to line up with location holes in jacket head. Be sure not to damage gasket.
- Step 12. Secure blower in place using mounting screws from step 8.
- Step 13. Slide vertical air intake tee onto blower.
- Step 14. Re-install vertical air intake bracket.
- Step 15. Re-install exhaust adapter from step 4.
- Step 16. Reconnect vent system to exhaust adapter.
- Step 17. Reconnect cord sets from step 5.
- Step 18. Plug blower power cord into wall outlet.
- Step 19. Position gas control power switch to the “ON” position.
- Step 20. Verify proper blower operation.

Vertical Air Intake

Vertical Air Intake
Bracket

Locating Pins
on Blower Flange

Pin Location Holes in
Jacket Head



Blower Temperature Switch Testing

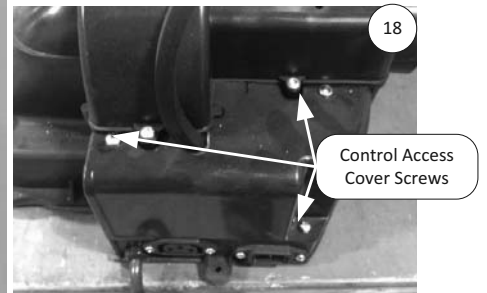
⚠ WARNING
115 volt potential exposure. Use caution to avoid personal injury.

Step 1. Position gas control power switch to the "OFF" position.

Gas Control shown in the "OFF" Position

Step 2. Remove the three screws (Phillips screw driver) from control access cover on blower and remove cover (see photos 18 and 19).

Step 3. Locate blower temperature switch (see photo 20).



Switch Setting
Opens on rise @ approximately 155°F
Auto resets on fall @ approximately 128°F

Cool switch to below 125°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 24).

Y

Reconnect wire leads and observe heater operation. Do exhaust gas temperatures rise to or above 175°F?

Y

Do switch contacts open?

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.
6. Excessively high ambient temperatures.

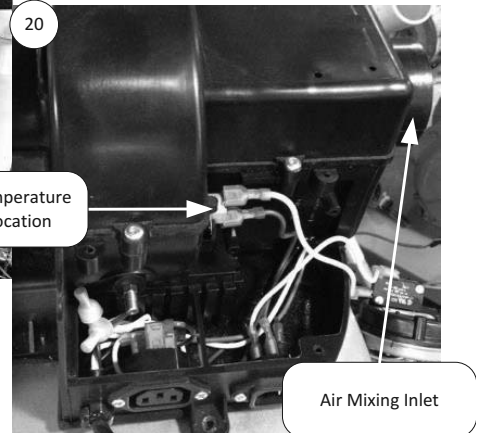
Do switch contacts open?

Y

Replace switch (see page 24).

N

Switch OK

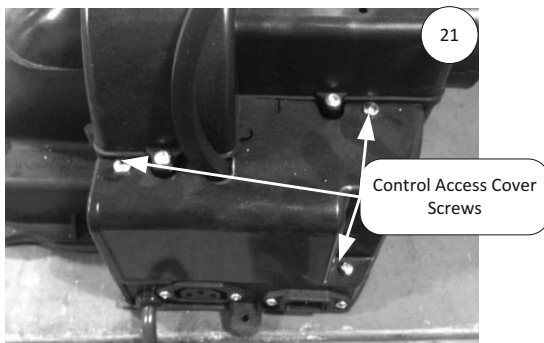


Blower Temperature Switch Replacement

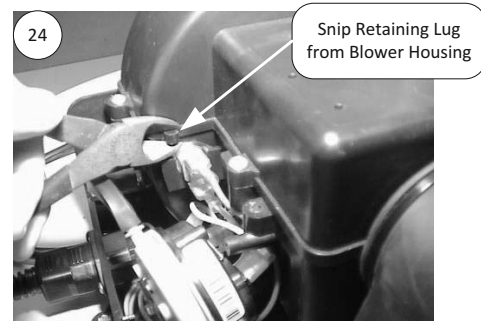
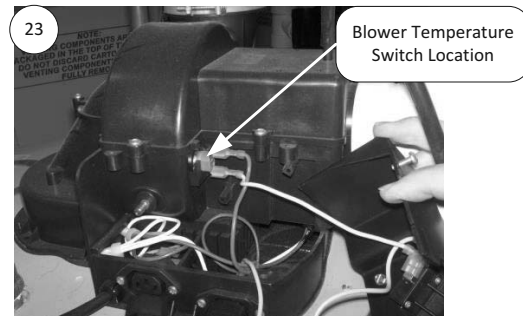
⚠ WARNING
115 volt potential exposure. Use caution to avoid personal injury.

- Step 1. Position gas control power switch to the “OFF” position and unplug heater from wall outlet.
- Step 2. Remove the three screws (Phillips screw driver) from the control access cover on blower and remove cover (see photos 21 and 22).

Gas Control shown in the “OFF” Position



- Step 3. Locate blower temperature switch (see photo 23).
- 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 24).
- 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 yellow 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 Testing

This section is for models with serial Numbers starting with "K" or earlier. See page 34 for gas control input & output testing.

Thermal Well Testing

If Control has gone into TCO lockout due to excessive tank temperature (four flash, 3 second pause) reset control by rotating knob of temperature control to the minimum setting for at least 6 seconds before returning to desired temperature setting.

Observe heater operation. If control continues to lockout due to excessive tank temperature, proceed to thermal well testing to determine cause.

Thermal well testing
Position gas control power switch to the "OFF" position and disconnect thermal well harness from gas control.

Using a multi-meter set to the Ohms setting, determine the resistance of thermal well sensor (see caution photos 25 & 26).

Using a multi-meter set to the ohms setting, insert one meter probe (see caution) into center wire position of thermal well connector, insert the second probe (see caution) into either of the outside wire positions (see photo 20).

Alternate the probe on the outside position to the opposite outside wire position (see photo 21).

Once the thermal well resistance values are known, the water temperature must also be known to determine if the resistance values are correct. See page 26 to obtain water temperature.

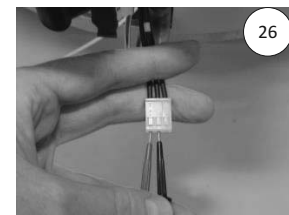
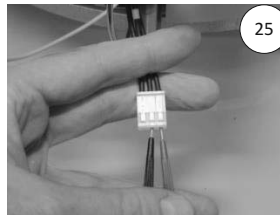
Are thermal well resistance values correct?

Replace gas control
(see page 27 or 29).

Gas Control shown in the "OFF" Position



Disconnect Thermal Well Wire Harness



CAUTION

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.

⚠ WARNING

Stored water may be **HOT** when performing the following steps in this procedure.
Take necessary precaution to prevent personal injury.

Determine Water Temperature Inside Tank

Note: It is important to understand once the resistance for the thermal well is determined from page 25, water flow through the heater should not occur. Prior to performing the steps below, turn off the cold water supply to the water heater. This will prevent cold water flow into the tank affecting the resistance value of thermal well.

- Step 1. Position gas control power switch to “OFF” position.
- Step 2. Draw approximately 4 gallons of water from 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. Using the chart below, determine correct resistance value for the water temperature from step 2.

Gas Control shown in the “OFF” Position



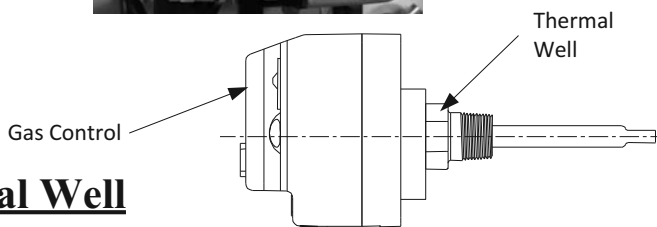
Example: If temperature of water is 84°F, then the resistance through the sensor would be 8449 (see shaded area). NOTE: Sensor resistance increases as the temperature falls.

Sensor Resistance at Various Temperatures

In Degrees F										
°F	0	1	2	3	4	5	6	7	8	9
40	26109	25400	24712	24045	23399	22771	22163	21573	21000	20445
50	19906	19383	18876	18383	17905	17440	16990	16553	16128	15715
60	15314	14925	14548	14180	13823	13477	13140	12812	12494	12185
70	11884	11592	11308	11032	10763	10502	10248	1000	9760	9526
80	9299	9078	8862	8653	8449	8250	8057	7869	7685	7507
90	7333	7165	7000	6839	6683	6531	6383	6238	6098	5961
100	5827	5697	5570	5446	5326	5208	5094	4982	4873	4767
110	4663	4562	4464	4368	4274	4183	4094	4006	3922	3839
120	3758	3679	3602	3527	3453	3382	3312	3244	3177	3112
130	3048	2986	2925	2866	2808	2752	2697	2643	2590	2538
140	2488	2439	2391	2344	2298	2253	2209	2166	2124	2083
150	2043	2004	1966	1928	1891	1856	1820	1786	1753	1720
160	1688	1656	1625	1595	1566	1537	1509	1481	1454	1427
170	1402	1376	1351	1327	1303	1280	1257	1235	1213	1191
180	1170	1150	1129	1110	1090	1071	1953	1035	1017	999
190	982	965	949	933	917	901	886	871	857	842
200	828	814	801	788	775	762	749	737	725	713

Gas Control & Thermal Well Removal From Water Heater

- Step 1. Position gas control power switch to the "OFF" position and Unplug Heater from power supply.
- Step 2. Drain heater to a point below the gas control level.
- Step 3. Turn off gas supply to water heater and disconnect gas piping from gas control.
- Step 4. Disconnect wire harnesses and burner assembly from gas control.
- Step 5. Remove gas control & thermal well by rotating flats of Thermal Well counter clockwise (1-5/16" wrench).



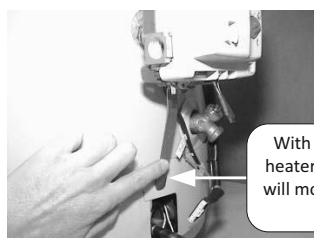
Gas Control Removal From Thermal Well

Follow the steps below allows removal gas control from thermal well without removing thermal well from tank.

- Step 1. Position gas control power switch to the "OFF" position and unplug water heater from power supply.
- Step 2. Turn off gas supply to water heater and disconnect gas piping from gas control.
- Step 3. Disconnect wire harnesses & burner assembly from gas control.
- Step 4. Using gas control service tool (239-45991-00) available from your BWC parts supplier, Insert tool into back of gas control (see photos below)

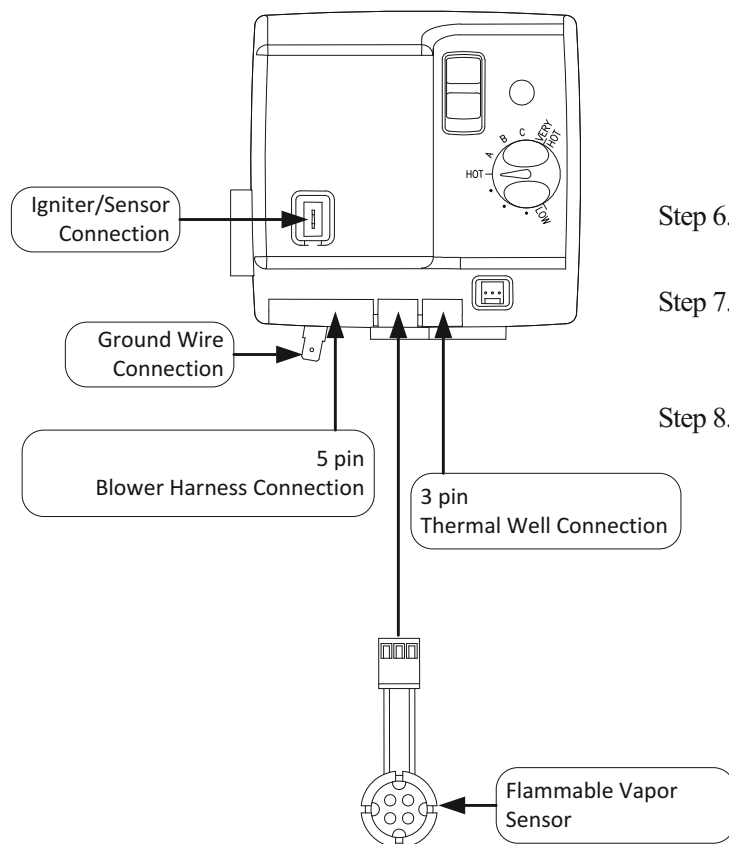
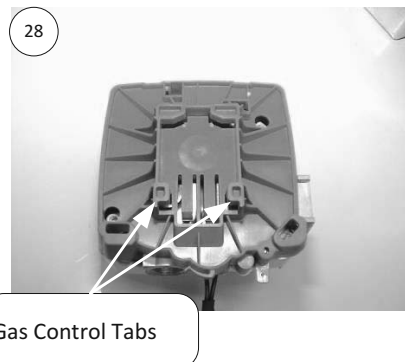
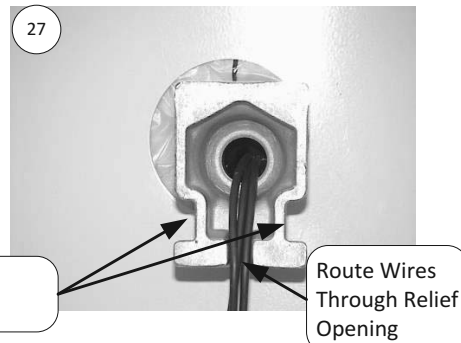


- Step 5. Pivot tool towards heater as far as possible (see photo below). Lift straight up on gas control. The control should move about 1/8". Hold control in position and remove tool. Lift straight up on control to remove completely from Thermal Well.



Gas Control Assembly to Thermal Well

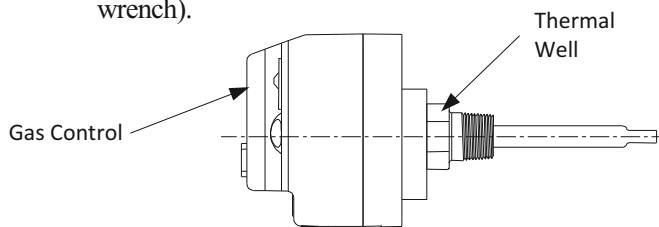
- Step 1. Install threaded end of thermal well into tank. Be sure thermal well flange is positioned as shown in photo 27 for proper control alignment.
- Step 2. Route wire leads back into relief opening. (see photo 27)
- Step 3. Align slots located on thermal well flange with tabs located on back of gas control (see photo 27 & 28)
- Step 4. Carefully push control back onto thermal well flange as far as possible towards water heater. Slide control down to lock into position.
- Step 5. Install burner and connect pilot tubing and feedline nut to gas control.



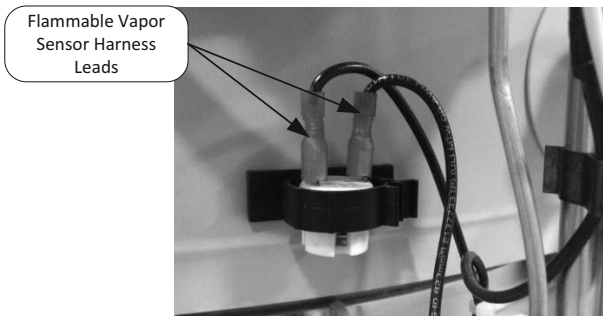
- Step 6. Reconnect wire harnesses to gas control per the illustration.
- Step 7. Reconnect gas piping to gas control. Restore gas supply and check for gas leaks.
- Step 8. To resume operation, follow the instruction located on the lighting instruction label or the lighting instruction located in the installation and operation manual.

Brass Well (WV4460) to Polymer Well (WV4462) Gas Control Replacement

- Step 1. Position gas control power switch to the "OFF" position and unplug heater from power supply.
- Step 2. Drain heater to a point below the gas control level.
- Step 3. Turn off gas supply to water heater and disconnect gas piping from gas control.
- Step 4. Disconnect spark igniter wire, flammable vapor sensor wire harness, blower harness and ground wire (green) from gas control.
- Step 5. Disconnect pilot tube and main burner feedline from gas control.
- Step 6. Remove gas control & thermal well by rotating flats of Thermal Well counter clockwise (1-5/16" wrench).



- Step 7. Disconnect flammable vapor sensor harness leads from flammable vapor sensor.



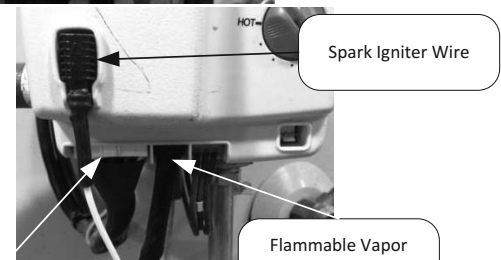
- Step 8. Install new gas control into the heater. It may be necessary to use a length of 1/2" NPT pipe threaded into gas inlet of the control.



CAUTION

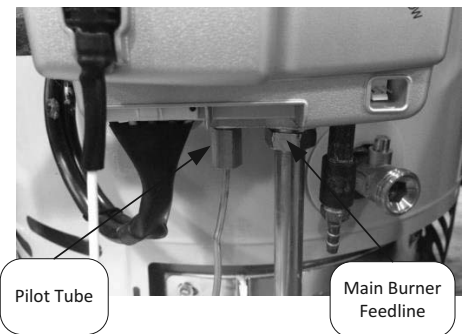
DO NOT OVER TIGHTEN. Use caution not to damage gas control. Gas control must be installed in proper upright position to assure the feedline will align the inner door properly to the combustion chamber.

Gas Control shown in the "OFF" Position



Blower Harness

Ground Wire



Pilot Tube

Main Burner Feedline

Brass Well (WV4460) to Polymer Well (WV4462) Gas Control Replacement (Continued)

- Step 9. Connect new flammable vapor sensor harness leads into the flammable vapor sensor.

Flammable Vapor
Sensor Harness
Leads

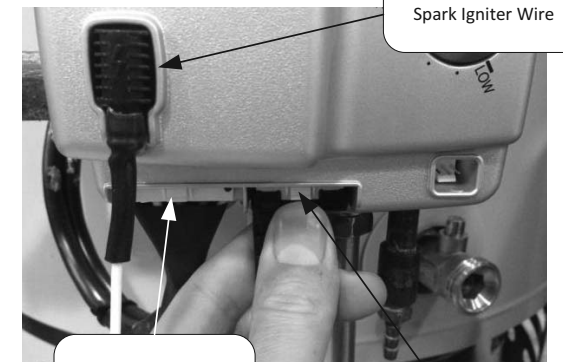


- Step 10. Reattach main burner feedline and pilot tube to gas control.



- Step 11. Connect spark igniter wire, flammable vapor sensor wire harness, ground wire (green) and blower harness to gas control.

Ground Wire



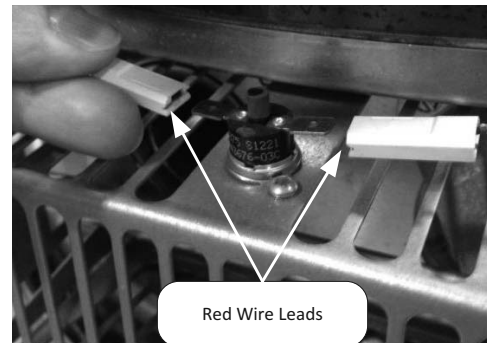
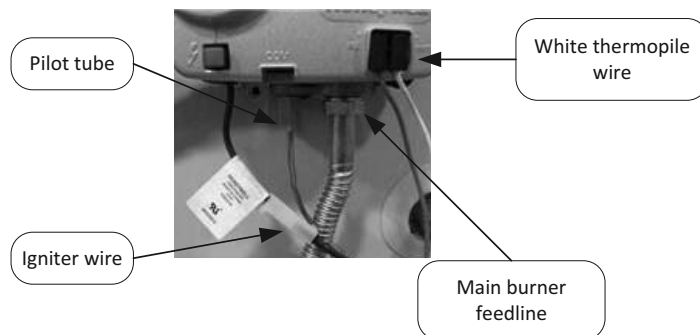
- Step 12. Replace outer jacket burner access door.
- Step 13. Reconnect gas supply the gas control and check for leaks with a soapy water solution.
- Step 14. Resume water supply to the water heater. Be sure the tank is full of water before resuming operation to the water heater.
- Step 15. To resume operation, slide the gas control power switch to the "ON" position and ensure the power cord is plugged into an appropriate outlet.
- Step 16. Check for gas leaks at the connection between the main burner feedline and gas control while the main burner is operating. Use a soapy water solution to check for the leaks.

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

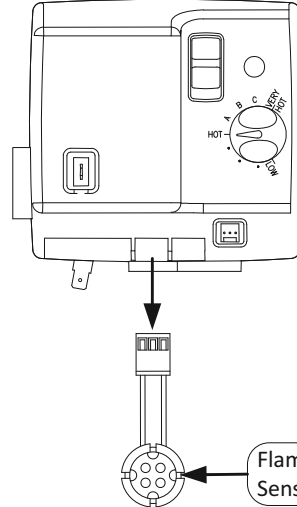


- Step 8. Install new gas control into the water heater.
 - a) Install gas control into water heater by rotating clockwise. DO NOT use a wrench on the gas control body or damage to the gas control may occur. If necessary, use a length of ½" NPT pipe threaded into gas inlet of gas control.
 - b) Position 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.

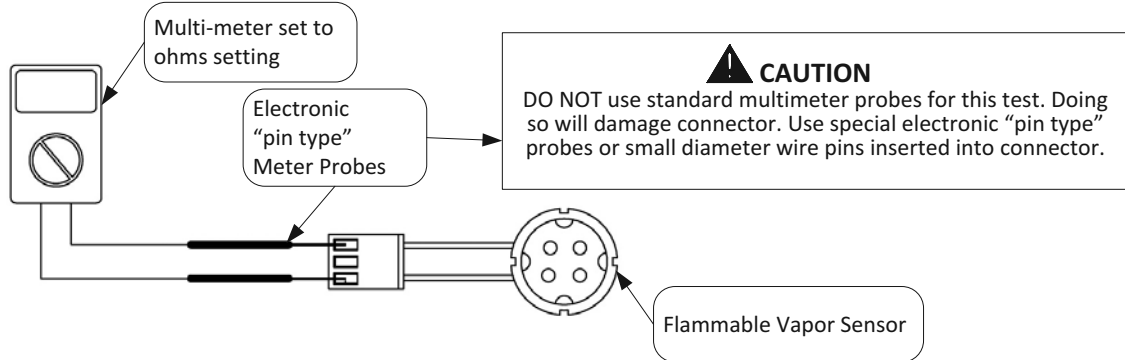
Flammable Vapor Sensor Testing

- Step 1. Position gas control power switch to the "OFF" position.
- Step 2. Disconnect flammable vapor sensor from gas control.
- Step 3. Using a multi-meter set to the ohms setting check resistance of flammable vapor sensor (see caution below). Resistance must be within 3,000 ohms and 48,000 ohms. If outside of this range replace flammable vapor sensor.

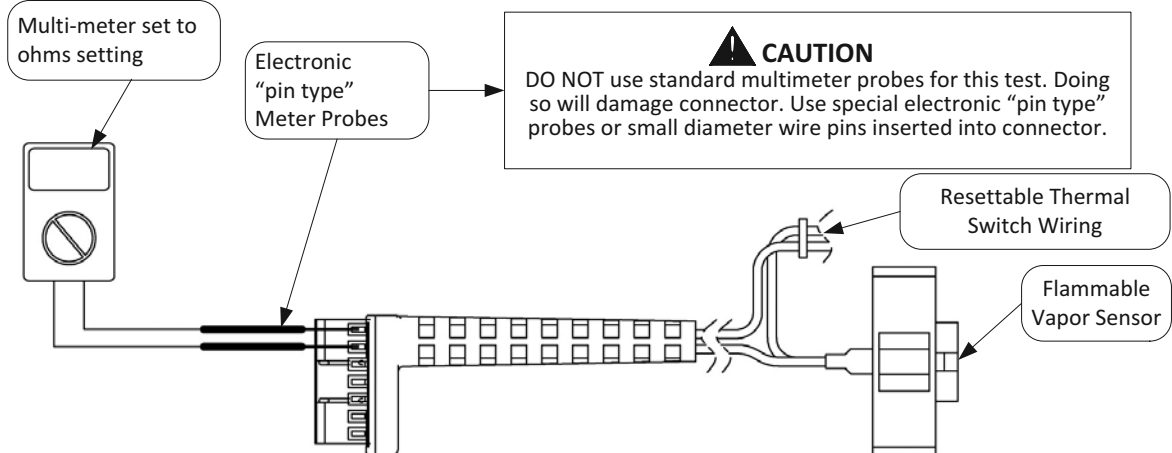
Gas Control shown in the "OFF" Position



(The following chart is for models with serial numbers starting with "J" or earlier.)



(The following chart is for models with serial numbers starting with "K" or later.)



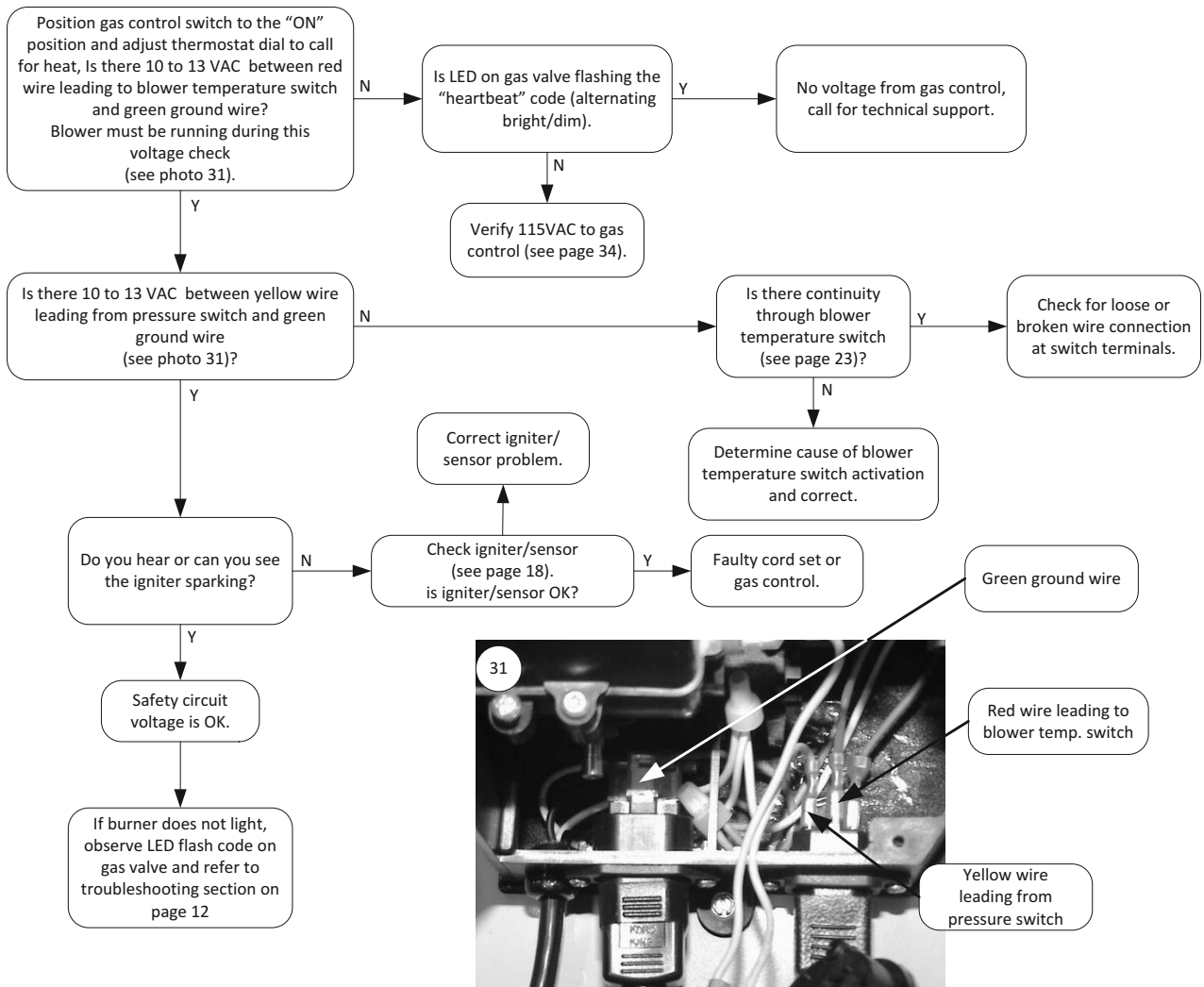
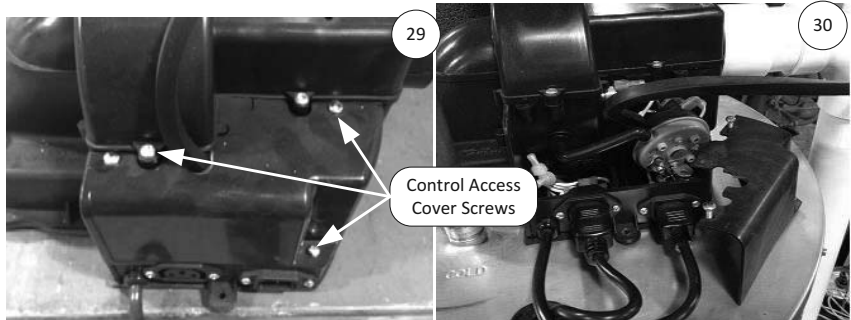
Safety Circuit Voltage Trace

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 photos 29 and 30).



Gas Control shown in the "ON" Position



115 VAC Circuit Trace

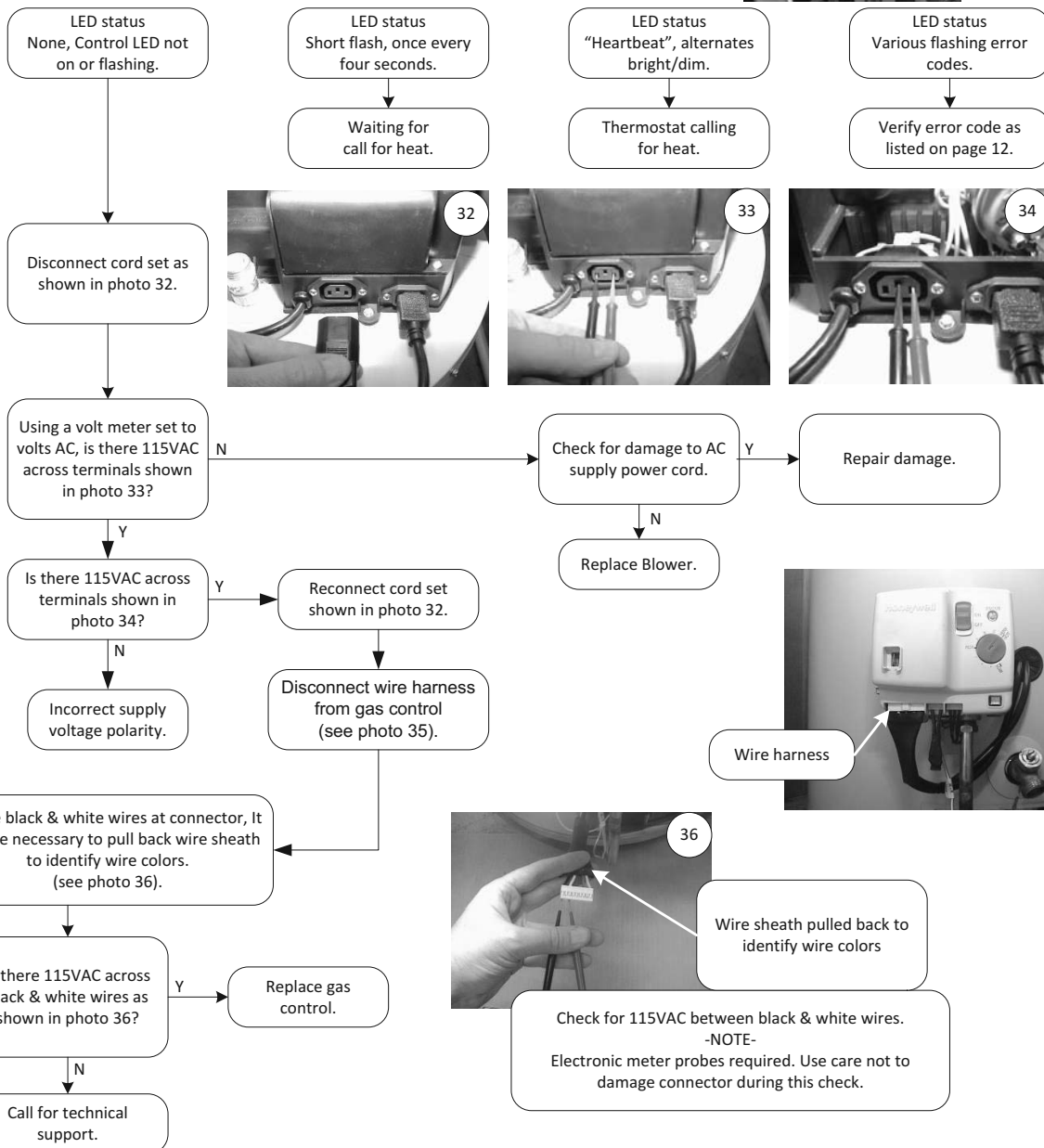
Step 1. Verify 115VAC and proper polarity at wall outlet.

Step 2. With unit plugged in and gas control power switch to the "ON" position verify LED status.

⚠ WARNING

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

Gas Control shown in the "ON" position



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.
- 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.

Gas Control shown in the
“OFF” Position



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.
- 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.

Gas Control shown in the
“OFF” Position



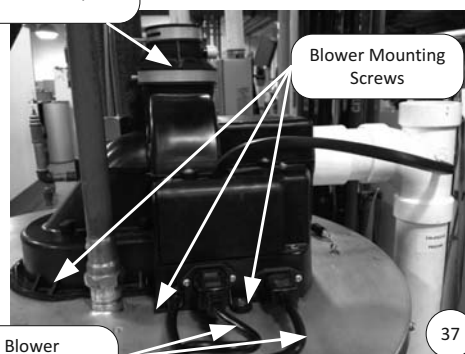
Flue Baffle Inspection and Replacement

- Step 1. Position gas control power switch to the "OFF" position and unplug blower from wall outlet.
- Step 2. Disconnect vent system from exhaust adapter on top of blower (see photo 37).
- Step 3. Remove vertical air intake bracket. Disconnect intake air piping (see photo 38).
- Step 4. Unplug cord sets from blower (see photo 37).
- Step 5. Remove the three blower mounting screws (1/4" nut driver) (see photo 37).
- Step 6. Remove blower with gasket from water heater.
- Step 7. Remove flue baffle from Heater (see photo 39).
- Step 8. Inspect baffle for deterioration, missing restrictors. Clean any scale or debris build up. Replace with new baffle as necessary.
- Step 9. Reinstall baffle into flue tube. Be sure baffle hanger tabs are inserted into notch location at the top of the flue tube (see photos 40 & 41).
- Step 10. Check Burner to insure no scale has accumulated during this operation. See burner cleaning procedure on page 16.
- Step 11. Reinstall blower on water heater. Connect vent system and cords set to blower. Plug water heater into wall outlet.
- Step 12. To resume operation follow the lighting instruction located on the lighting instruction label or the lighting instruction located in the installation and operation manual.

Gas Control shown in the "OFF" position



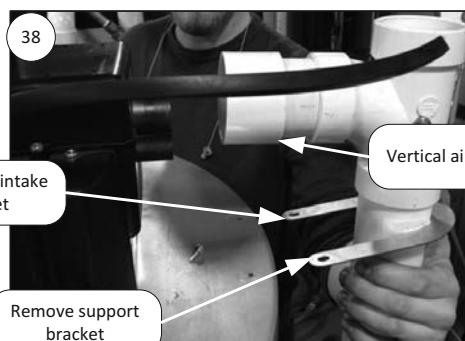
Disconnect vent system from exhaust adapter.



Blower Mounting Screws

Blower Cord Sets

37

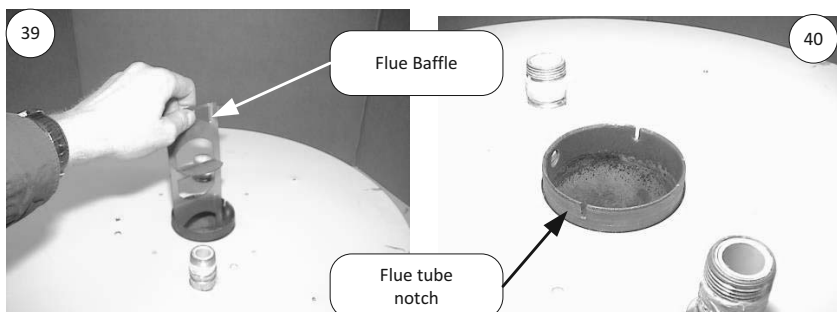


Vertical air intake bracket

Vertical air intake

Remove support bracket

38



Flue Baffle

Flue tube notch

40



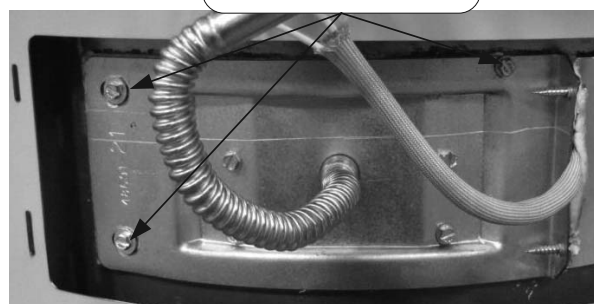
Baffle shown installed in flue tube notch.

41

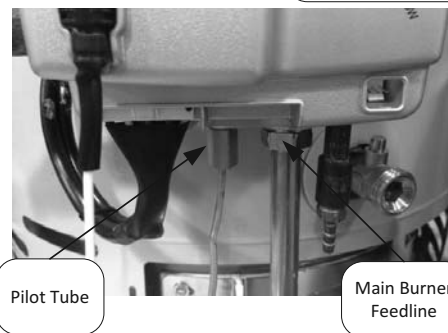
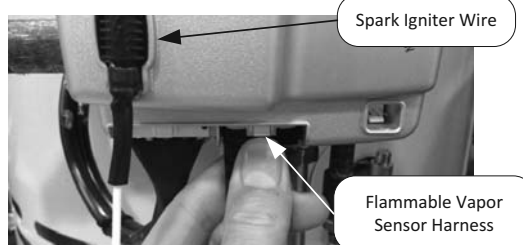
Inner Door Removal Procedure


- Step 1. Position gas control power switch to the “OFF” position
- Step 2. Unplug the water heater from the wall outlet
- Step 3. Turn off the gas supply to the water heater
- Step 4. Remove the outer door.
- Step 5. Remove the four (4) ¼” hex drive screws holding the right side inner door in place

Gas Control shown in the “OFF” position



- Step 6. Remove the three (3) ¼” hex drive screws holding the left side burner door in place.
- Step 7. Disconnect the spark igniter wire and the flammable vapor sensor harness from the gas control.
- Step 8. Disconnect the pilot tube from the gas control using a 7/16” wrench. Remove the main burner feedline from the gas control with a ¾” wrench.
- Step 9. Remove the burner assembly from the combustion chamber.



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

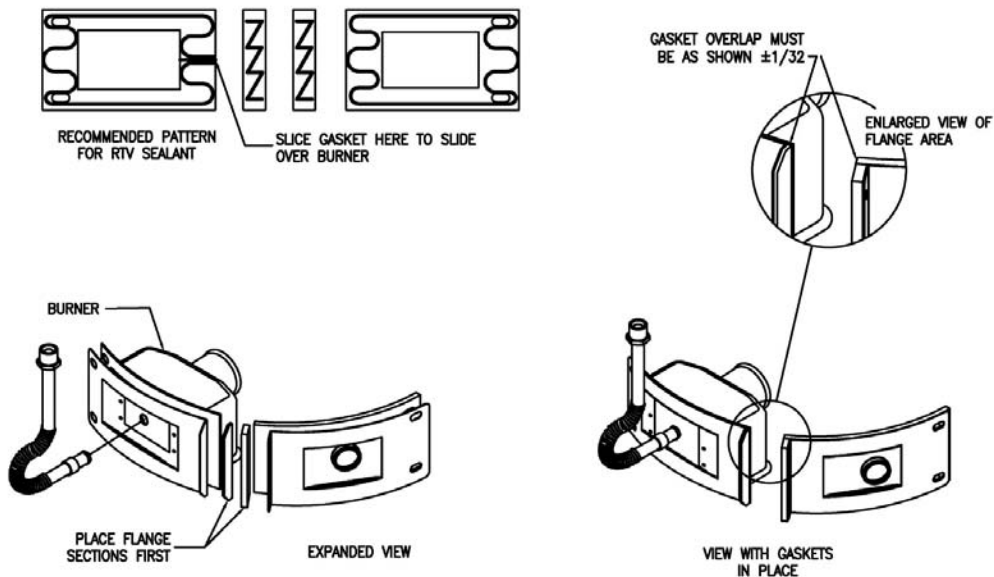
- Step 10. Fully inspect burner and inner door gaskets for the following:
- >Tears
 - >Missing Material
 - >Cracks
 - >Dirt or debris
 - >Other imperfections that will inhibit proper seal
 - >Gasket adhesion to inner door
 - >Material left on combustion chamber (around opening)

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 11. After inspection of inner door as noted in step 10, completely remove gasket and adhesive residue from burner and left side inner doors as needed.
- Step 12. 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. Set the flange section first, this will help to achieve the proper overlap position.



Installation of Inner Door With Gasket.

- Step 13. Clean any residual gasket residue or other debris from combustion chamber surface before installing the inner door/gasket assembly.
- Step 14. Place the burner door into position first. Tighten the feed line nut to the gas valve. Use the 1/4" hex drive screw without the built-in washer to secure the right side of the burner door to the chamber. Use the 1/4" hex drive screws with the built-in washer to secure the left side of the burner door in place. **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 14, 16 and 17.

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

Installation of Inner Door With Gasket (Continued)

- Step 15. Position the fiberglass sock containing the igniter wire against burner door flange gasket.

Position Fiberglass Sock



- Step 16. Firmly place right side inner door flange against the burner door flange and secure with two 1/4" drive screws from step 5. **DO NOT OVER TIGHTEN SCREWS.**
- Step 17. 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. Verify seal integrity around combustion opening. Secure right side inner door using 1/4" hex drive screws from step 5. **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 18. Reconnect the spark igniter/flame sense wire to the gas control
- Step 20. Tighten the pilot nut to the gas control.
- Step 21. Replace outer jacket burner access door.
- Step 22. To resume operation follow the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual.

UPDX Series

Frozen intake or exhaust vent terminal

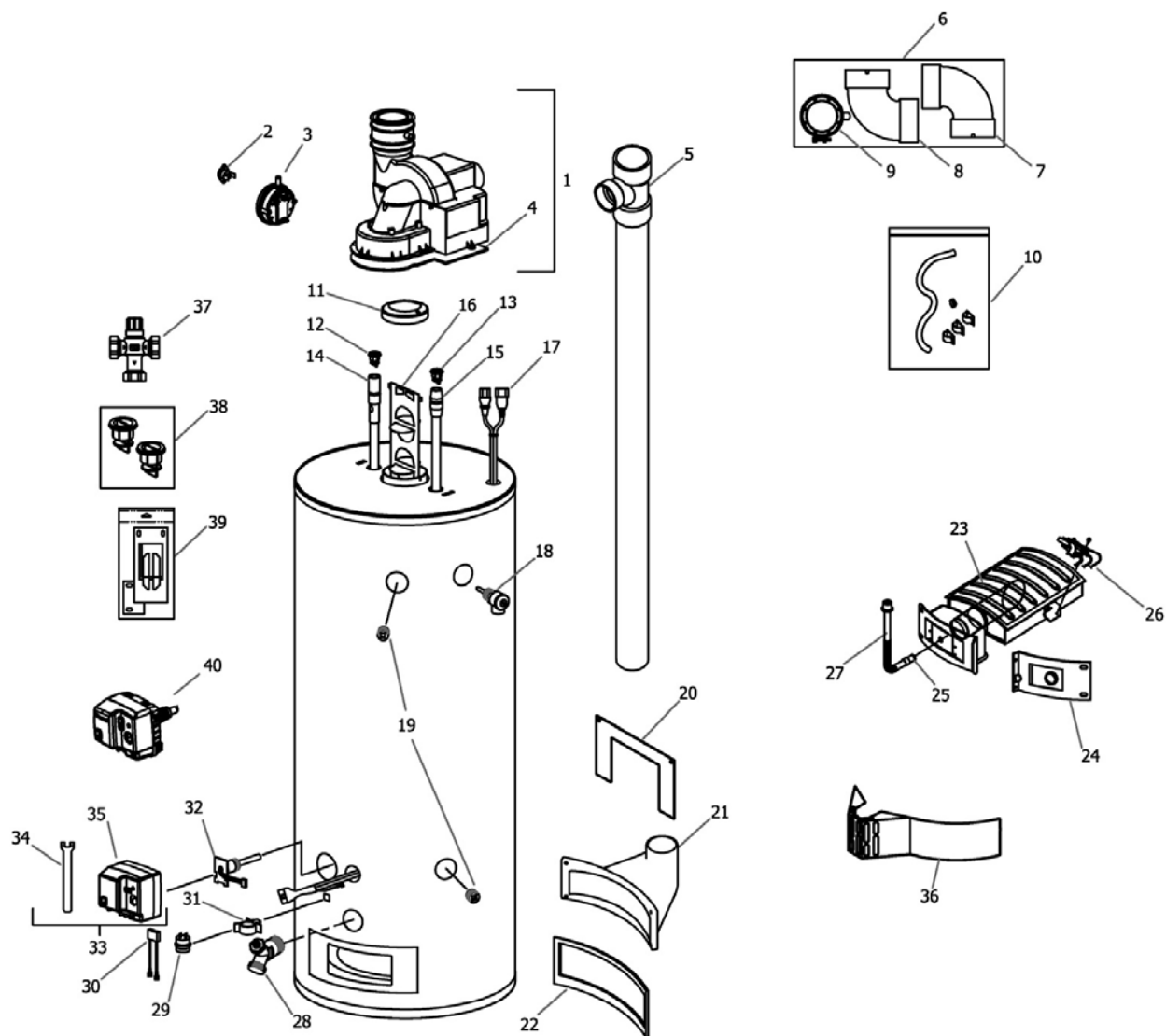
If an intake or exhaust vent terminal is blocked with ice or snow due to severe conditions, the pressure switch and control will not allow the burner to operate. This will result in a three flash error code. Once the blockage is removed (through melting or other means) the controls will let the burner operate. The position of the vent terminals in relation to each other and terminals from other appliances can have an effect on the potential for blockage due to ice or snow. See the installation instructions for recommended positioning of the terminals.

Testing under severe conditions has shown that the optional concentric vent terminal is resistant to ice blockage. Contact Bradford White or the supplier of the water heater for information about ordering the optional concentric vent terminal.

Bradford White has also developed an air intake relief device that can be installed in the air intake near the water heater temporarily enabling the water heater to operate with a frozen intake terminal. Contact Bradford White or the supplier of the water heater for information about the air intake relief device.

BTU	British Thermal Units
GPM	Gallons per Minute
Hz	Hertz
KWh	Kilo-watt 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

[illegible]



1. Blower Assembly
2. Blower Temp. Switch
3. Pressure Switch
4. Blower Gasket
5. Tee and Vent Pipe Assy.
6. Vent Adapter with Term.
7. Intake Terminal
8. Vent Terminal Elbow
9. Exhaust Adapter
10. Condensate Hose Kit
11. Flue Reducer
12. Heat Trap Insert (outlet)
13. Heat Trap Insert (inlet)
14. Hot Water Outlet Anode

15. Cold Water Inlet Diptube
16. Flue Baffle
17. Blower Harness
18. T&P Relief Valve
19. 3/4 NPT PLUG
20. Direct Vent Boot Escutcheon
21. Air Intake Boot
22. Air Intake Boot Gasket
23. Gas Burner Assembly
24. Right Side Inner Door
25. Main Burner Orifice
26. Gas Pilot Assembly
27. Gas Feedline
28. Brass Drain Valve

29. Flammable Vapor Sensor
30. Sensor Harness
31. Flammable Vapor Sensor Clip
32. Thermal Well
33. Gas Control Kit
34. Gas Control Service tool
35. Gas Control (*models with serial numbers starting with "J" or earlier*)
36. Outer Door
37. Mixing Valve
38. Heat Trap Insert Kit
39. Inner Door Gasket Kit

40. Polymer well Gas Control (*models with serial numbers starting with "K" or later*)



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

Sales/800-523-2931
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Parts Fax/215-641-2180

Technical Support/800-334-3393
Fax/269-795-1089

Warranty/800-531-2111
Fax/269-795-1089

International:
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Sales/866-690-0961
905-238-0100

Fax/905-238-0105

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