



**BRADFORD WHITE**<sup>®</sup>  
W A T E R H E A T E R S

## Atmospheric Gas Water Heaters

For Models Using White Rodgers,  
Robertshaw and Honeywell Gas Control



# SERVICE MANUAL

Troubleshooting Guide  
and Instructions for Service

(To be performed ONLY by  
qualified service providers)

### Models Covered by This Manual:

GX225S\*BN  
GX155S\*BN  
25X78B\*N  
55X80B\*N  
M1XR65T\*(BN,CX,SX)  
M175S\*(BN,CX,SX)  
M2XR75S\*(BN,CX,SX)  
M1100T\*(BN,CX,SX)  
65T65\*(BN,CX,SX)  
75T80\*(BN,CX,SX)  
C(S,D)W275T\*(BN,CX,SX)  
(\* Denotes Warranty Years)

(GX155S6BN Model Shown)



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# Troubleshooting Chart

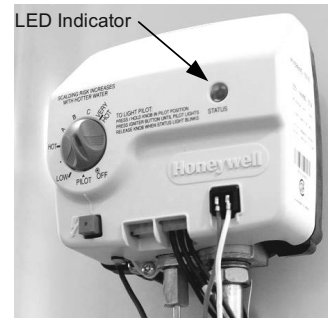
For Models Using White Rodgers or Robertshaw Thermostat

<u>Symptom</u>	<u>Probable Cause</u>	<u>Corrective Action</u>	<u>Service Procedure</u>
Pilot will not light	<ol style="list-style-type: none"> <li>1. No incoming gas or too low gas pressure.</li> <li>2. Gas control knob set to wrong position.</li> <li>3. Pilot light button not being fully depressed when attempting to light pilot.</li> <li>4. Pilot orifice or pilot tube is obstructed or kinked.</li> </ol>	<ol style="list-style-type: none"> <li>1. Turn on gas supply and/or check line pressure.</li> <li>2. Review lighting instruction. Set gas control to correct position.</li> <li>3. Review lighting instruction. Fully depress pilot lighting button.</li> <li>4. Clean, repair or replace.</li> </ol>	<ol style="list-style-type: none"> <li>1. See Service Procedure AG-III, Page 12.</li> <li>4. See Service Procedure AG-II, Page 9.</li> </ol>
Pilot will not stay lit when button is released	<ol style="list-style-type: none"> <li>1. Poor thermocouple connection at gas control.</li> <li>2. Thermocouple not fully engaged in pilot assembly bracket.</li> <li>3. Pilot flame is not fully enveloping the thermocouple "hot" junction.</li> <li>4. Weak or defective thermocouple.</li> <li>5. Open ECO on gas control.</li> <li>6. Defective magnet in gas control.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check connection at gas control. Proper tightness should be finger tight plus ¼ turn.</li> <li>2. Inspect thermocouple to ensure that it is fully engaged into pilot bracket.</li> <li>3. Adjust tip of thermocouple to be fully engulfed by pilot flame.</li> <li>4. Check thermocouple and replace if necessary.</li> <li>5. Check ECO continuity and replace gas control if necessary.</li> <li>6. Check magnet operation and replace gas control if necessary.</li> </ol>	<ol style="list-style-type: none"> <li>4. See Service Procedure AG-I, Page 6</li> <li>5. See Service Procedure AG-III, Page 12</li> <li>6. See Service Procedure AG-III, Page 12</li> </ol>
Pilot will light, but the main burner will not come on	<ol style="list-style-type: none"> <li>1. Gas Control set too low for desired water temperature.</li> <li>2. Gas Control temperature is satisfied.</li> <li>3. Insufficient gas supply or low gas pressure.</li> <li>4. Gas Control has wide differential or is out of calibration.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust temperature dial on gas control.</li> <li>2. Check temperature dial setting on gas control.</li> <li>3. Check gas supply and line pressure.</li> <li>4. Check gas control for proper operation, replace if necessary.</li> </ol>	<ol style="list-style-type: none"> <li>2. See Installation &amp; operation manual.</li> <li>3. See Service Procedure AG-III, Page 12</li> <li>4. See Service Procedure AG-III, Page 12</li> </ol>
Pilot goes out periodically (after heating cycles, once a day, once a week etc.)	<ol style="list-style-type: none"> <li>1. Insufficient combustion air supply.</li> <li>2. Incorrect, clogged vent system/ vent terminal or location.</li> <li>3. Inconsistent gas supply or gas pressure.</li> </ol>	<ol style="list-style-type: none"> <li>1. Verify adequate combustion air is available to the unit. Check and clear Jacket slot openings of any dirt, dust, restrictions or other obstructions.</li> <li>2. Check venting for proper sizing and proper operation</li> <li>3. Check gas supply and line pressure.</li> </ol>	<ol style="list-style-type: none"> <li>3. See Service Procedure AG-III, Page 12</li> </ol>
Not enough hot water	<ol style="list-style-type: none"> <li>1. Gas Control set too low for desired water temperature.</li> <li>2. Cold inlet water temperature is very cold.</li> <li>3. High demand periods.</li> <li>4. Incorrectly sized water heater for application.</li> <li>5. Gas Control is out of calibration/not functioning.</li> <li>6. Out of spec dip tube is diluting hot water with cold water.</li> <li>7. Integrated mixing device is set too low for desired water temperature.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check dial on gas control.</li> <li>2. Extremely cold water going into the water heater will decrease the amount of hot water produced. It may be necessary to temper incoming water supply.</li> <li>3. Adjust high demand usage.</li> <li>4. Contact Plumbing professional.</li> <li>5. Check gas control for proper operation, replace if necessary.</li> <li>6. Inspect dip tube and replace if necessary.</li> <li>7. Reset device using the procedure in the instructions included with the device.</li> </ol>	<ol style="list-style-type: none"> <li>5. See Service Procedure AG-III, Page 12</li> <li>6. See Service Procedure AG-V, Page 23</li> </ol>

# Troubleshooting Chart

For Models Using Honeywell Gas Control

Observe 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:



<b><u>LED Status</u></b>	<b><u>Control Status</u></b>	<b><u>Probable Cause</u></b>	<b><u>Service Procedure</u></b>
Not on and/or not flashing	Pilot flame may not be present.	Pilot flame is not present.	<ol style="list-style-type: none"> <li>1. Lite pilot per the instructions located on the lighting instructions label or the lighting instructions located in the installation and operation manual.</li> <li>2. See Service Procedure AG-I, Page 7.</li> </ol>
One flash and a three second pause.	Gas control is in the "PILOT" position and the pilot flame is detected.	Gas control is powered and waiting for the set point knob to be turned to a water temperature setting.	Normal operation. Adjust gas control set point knob to desired temperature level.
LED is on continuously	Gas control has recently been turned to the "OFF" position. Wait until LED goes out before attempting to relight.	Gas control was turned to the "OFF" position.	<ol style="list-style-type: none"> <li>1. Wait for LED to go out.</li> <li>2. Lite pilot per the instructions located on the lighting instructions label or the lighting instructions located in the installation and operation manual.</li> </ol>
Two flashes and a three second pause.	Weak pilot flame detected. System will reset when pilot flame is sufficient.	<ol style="list-style-type: none"> <li>1. Thermopile failure</li> <li>2. Unstable pilot.</li> <li>3. Pilot tube blocked or restricted.</li> </ol>	<ol style="list-style-type: none"> <li>1. See Service Procedure AG-I, Page 7</li> <li>2 &amp; 3. See Service Procedure AG-II, Page 10.</li> </ol>
Three flashes and a three second pause.	Tank temperature fault. System will reset.	Thermowell sensor out of calibration.	<ol style="list-style-type: none"> <li>1. See Service Procedure AG-III, Page 16</li> </ol>
Four flashes and a three second pause.	Excessive tank temperature.	Thermowell sensor out of calibration.	<ol style="list-style-type: none"> <li>1. See Service Procedure AG-III, Page 16</li> </ol>

# Troubleshooting Chart (cont.)

For Models Using Honeywell Gas Control

<b><u>LED Status</u></b>	<b><u>Control Status</u></b>	<b><u>Probable Cause</u></b>	<b><u>Service Procedure</u></b>
Five flashes and a three second pause.	Thermowell fault	<ol style="list-style-type: none"><li>1. Damage to thermowell wires.</li><li>2. Thermowell sensor resistance out of range.</li></ol>	See Service Procedure AG-III, Page 16
Seven flashes and a three second pause.	Gas control fault detected.	<ol style="list-style-type: none"><li>1. Gas control needs to be reset.</li><li>2. Gas control is wet or physically damaged.</li></ol>	Lite pilot per the instructions located on the lighting instructions label or the lighting instructions located in the installation and operation manual.
Eight flashes and a three second pause.	Pilot flame remains on while gas control is in the "OFF" position.	Pilot valve stuck in the open position.	Replace gas control. See Service Procedure AG-III, Page 18.

**OPEN CIRCUIT THERMOCOUPLE TESTING**

- Step 1. Disconnect thermocouple from gas control.
- Step 2. Using a multimeter capable of measuring millivolts, connect one alligator clip to the end ball or contact portion of the thermocouple, and the other alligator clip to copper portion of the thermocouple.

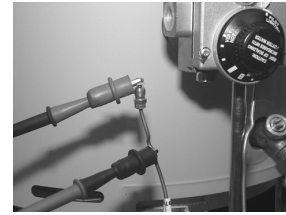


Figure 1

- Step 3. Following the lighting instruction label on the heater, proceed to light the pilot and allow to operate for three minutes. A reading of 20 to 30 millivolts indicates good thermocouple output.

**NOTE:**  
It will be necessary to hold the gas control knob down in the "PILOT" position continuously throughout this test.

**THERMOCOUPLE REPLACEMENT**

- Step 1. Turn off gas supply to water heater. Rotate knob of gas control to "OFF" position.

For White Rodgers gas control, depress knob slightly and rotate clockwise to the "OFF" position.

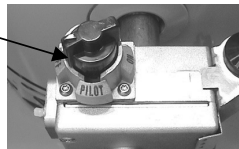


Figure 2



For Robertshaw gas control, rotate knob clockwise to the "OFF" position.

Figure 3

- Step 2. Remove outer jacket door.
- Step 3. Slide open inner combustion chamber door.
- Step 4. Disconnect thermocouple from gas control. Locate other end of thermocouple inside of combustion chamber and remove from pilot bracket. Pull firmly pulling away from the pilot assembly.
- Step 5. Install new thermocouple into pilot bracket making certain the thermocouple is fully engaged into the pilot bracket. Connect other end of thermocouple to gas control (finger tight + 1/4 turn).
- Step 6. Route carefully through the relief opening in the combustion chamber skirt.
- 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.
- Step 8. Slide inner door closed when finished.

Thermocouple position

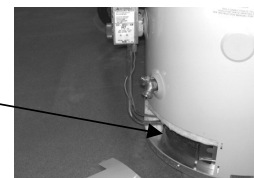


Figure 4

**OPEN CIRCUIT THERMOPILE TESTING**

- Step 1. Disconnect red and white thermopile wires from the wire harness leading to the gas control.
- Step 2. Using a multimeter capable of reading millivolts, check across thermopile leads.
- Step 3. Following the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual, proceed to light the pilot and allow the gas control to operate for three minutes.

**NOTE:**  
It may be necessary to hold the gas control knob down in the "PILOT" position continuously throughout this test.

**In an OPEN CIRCUIT test:**  
Any reading over 400 millivolts indicates good thermopile output. For readings under 400 millivolts replacement of thermopile is recommended.

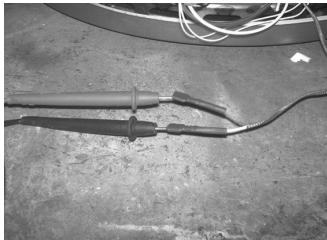


Figure 5

**CLOSED CIRCUIT THERMOPILE TESTING**

- Step 1. Closed circuit testing is the preferred method for testing the thermopile. Following the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual, proceed to light the pilot and allow the control to operate for three minutes.
- Step 2. Using a multimeter capable of measuring millivolts, measure across thermopile connections at the gas control (see Figure 6).

**In a CLOSED CIRCUIT test:**  
Any reading over 300 millivolts indicates good thermopile output. For readings under 300 millivolts replacement of thermopile is recommended.

**NOTE:**  
It may be necessary to hold the gas control knob down in the "PILOT" position continuously throughout this test.

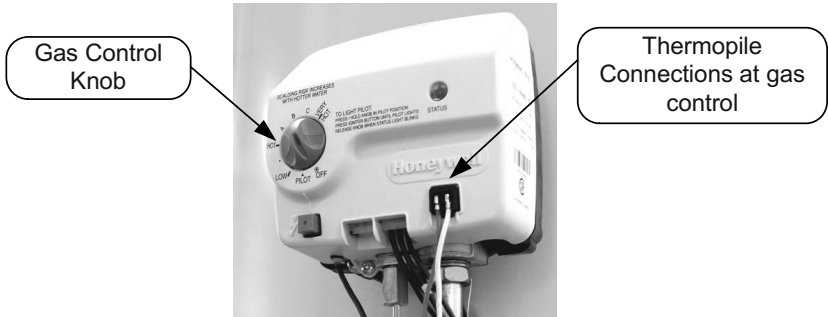


Figure 6

## THERMOPILE REPLACEMENT

- Step 1. Turn off the gas supply to the water heater by rotating the gas control knob to the “OFF” position (see Figure 7).
- Step 2. Remove outer jacket door.
- Step 3. Remove or slide open the inner combustion chamber door.
- Step 4. Disconnect red and white thermopile wires from the wire harness leading to the gas control.
- Step 5. Disconnect the thermopile from the pilot bracket using a 7/16” open-end wrench.
- Step 6. Install the new thermopile into the pilot bracket and tighten the threads using care not to damage the thermopile lead wires. Route new wires through the appropriate opening in the combustion chamber.
- Step 7. Reconnect the lead wires being careful to match the colors (red to red and white to white).
- Step 8. Reinstall, or slide closed, inner combustion chamber door.
- Step 9. Replace the outer door.
- 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.

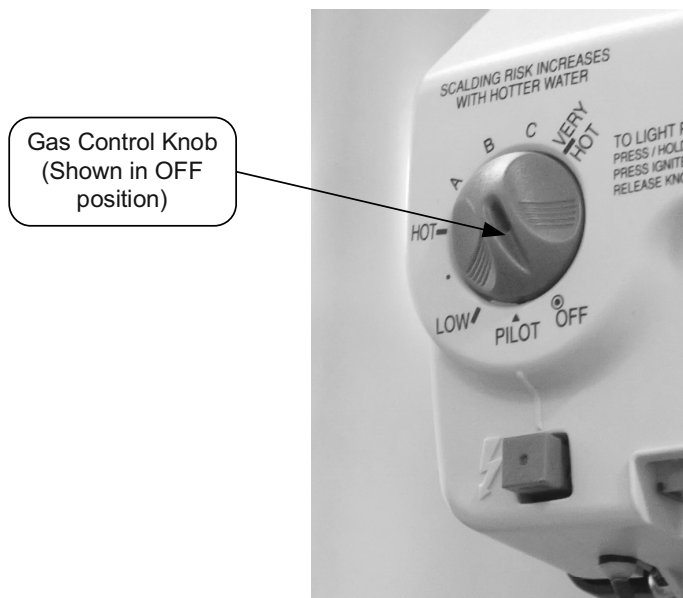


Figure 7



**SERVICE PROCEDURE AG-II**  
Pilot Assembly Inspection, Cleaning  
and Replacement For Models Using White  
Rodgers or Robertshaw Gas Control

**PILOT ASSEMBLY INSPECTION,  
CLEANING AND REPLACEMENT**

- Step 1. Turn off gas supply to water heater. Rotate knob of gas control to "OFF" position.
- Step 2. Remove outer jacket door.
- Step 3. Slide open inner combustion chamber door.
- Step 4. Disconnect thermocouple, pilot tube, and feedline from gas control.

NOTE: Feedline nut for natural gas control uses right hand threads, LP control uses left hand thread.

- Step 5. Remove burner assembly from combustion chamber.
- Step 6. Remove pilot assembly from feedline.
- Step 7. Inspect pilot for the following:

- a) Primary air openings for blockage. Must be free from any debris (dirt, lint, etc).
- b) Kinks or cracks in the pilot tube. If found, the pilot must be replaced.

- Step 8. Inspect pilot orifice:

- a) Remove 1/2" nut from bottom of pilot assembly.
- b) Remove pilot tube and pilot orifice.
- c) inspect pilot orifice for blockage, must be cleaned or replaced.

- Step 9. Install pilot assembly to feedline, secure with screw from step 6.
- Step 10. Re-Install burner assembly into combustion chamber, connect feedline, pilot tube and thermocouple to gas control.
- Step 11. Slide inner combustion chamber door closed and re-attach outer jacket door.
- Step 12. To resume operation follow the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual.

For White Rodgers gas control, depress knob slightly and rotate clockwise to the "OFF" position.

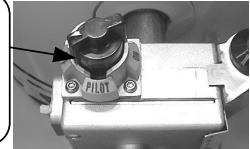


Figure 8

For Robertshaw gas control, rotate knob clockwise to the "OFF" position.



Figure 9

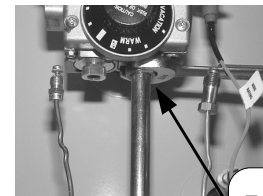
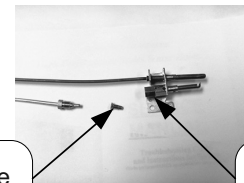


Figure 10

Feedline Nut



Pilot Orifice

Figure 11

Primary Air Opening

**PILOT ASSEMBLY INSPECTION,  
CLEANING AND REPLACEMENT**

Step 1. Turn off the gas supply to the water Heater. Rotate gas control knob to the "OFF" position.

Step 2. Remove outer jacket door.

Step 3. Remove burner assembly per Service Procedure AG-IV page 20.

Step 4. Remove the pilot assembly from the burner assembly.

Step 5. Inspect the pilot assembly for the following:

- a) Primary air opening for any blockage .  
Must be free from any debris (dirt, lint, dust, etc.).
- b) Kinks or cracks in the pilot tube. If found, the pilot must be replaced.

Step 6. Inspect pilot orifice:

- a) Remove 7/16" nut from the bottom of the pilot assembly.
- b) Remove pilot tube and pilot orifice.
- c) Inspect pilot orifice for blockage, must be free from any debris (dirt, lint, dust, etc.).
- d) Reassemble pilot orifice and pilot tube to pilot assembly.

Step 7. Install pilot assembly to burner assembly using the screw from Step 4.

Step 8. Reinstall burner assembly per Service Procedure AG-IV page 22: Steps 10 through 12.

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. Check all gas connections for gas leaks using a soapy water solution.

Primary Air  
Opening

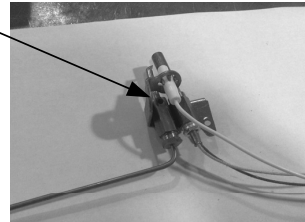


Figure 12

Pilot Orifice

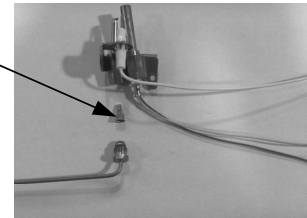


Figure 13

**IGNITER/ELECTRODE TESTING AND  
REPLACEMENT**

With the pilot not in operation (no pilot flame) the igniter and electrode circuit function can be observed by opening the combustion chamber door and viewing whether there is a sparking action.

Step 1. Make sure the gas control is in the “OFF” position.

Step 2. Remove outer jacket door.

Step 3. Slide open or remove the inner  
combustion chamber door.

Step 4. Depress the igniter button repeatedly while viewing  
the spark through the open door of the combustion  
chamber. If there is no spark proceed to Step 5.  
If there is a spark, the igniter is OK.

Step 5. Remove the lead wire from the igniter at the connector  
provided for this. Hold the igniter lead from the gas valve  
close to an unpainted metal surface (such as the burner feedline)  
and depress the igniter button (see Figure 15). If there is a spark the igniter is OK.  
If no spark is present the igniter is not functioning and the gas control  
must be replaced per Service Procedure AG-III page 18.

Repeatedly Depress  
Igniter



Figure 14

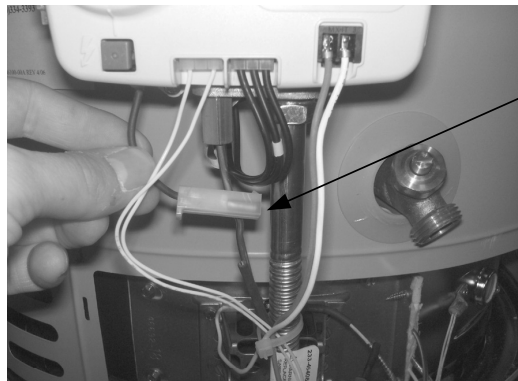


Figure 15

## Gas Control Testing and Replacement

The gas control is a non repairable device. If trouble shooting has determined a problem with the gas control, it must be replaced.

If the burner and/or pilot do not function, service checks for gas pressure, thermocouple output, magnet assembly and ECO are to be performed. If these check OK, the gas control may be faulty.

### LINE PRESSURE

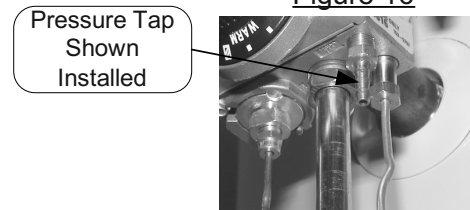
The gas control is designed for a maximum line pressure of 14.0" w.c. and a minimum line pressure of 1.0"w.c. over the water heater rated manifold pressure. Line pressure must be checked with burner on and burner off to assure proper readings.

### MANIFOLD PRESSURE TESTING (this procedure assumes a maximum line pressure of 14.0" w.c.)

- Step 1. Set gas control to "OFF" position.
- Step 2. Remove pressure tap plug and install pressure tap.
- Step 3. Connect manometer to pressure tap.
- Step 4. Follow lighting instructions and proceed to light main burner and observe manometer reading.
- Step 5. Proper operating range for natural gas is  $4.0 \pm 0.3$ " W.C.  
Proper operating range for L.P. gas is  $10.0 \pm 0.5$ " W.C.
- Step 6. If pressure is OK, set gas control to "OFF" remove manometer and pressure tap and replace pressure tap plug. Check for gas leaks before placing water heater back in operation. If pressure is out of the specification noted in step 5, proceed to step 7 or 8 for proper service procedure.
- Step 7. For White Rodgers control, the manifold pressure is not adjustable. If manifold pressure is outside the range in step 5, the control must be replaced.
- Step 8. For Robertshaw control, the manifold pressure is adjustable, proceed to step 9 for adjustment procedure
- Step 9. While burner is in operation, remove regulator access cap to expose the regulator adjusting screw. With small screw driver, rotate adjusting screw clockwise to increase pressure and counter clockwise to decrease pressure.



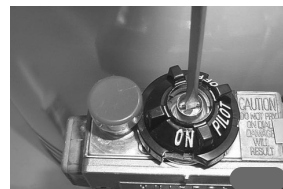
**Figure 16**



**Figure 17**



**Figure 18**



**Figure 19**

- Step 10. Replace regulator access cap, set gas control to "OFF". Remove manometer and pressure tap and replace pressure tap plug. Check for gas leaks before placing water heater back in operation.

## THERMOCOUPLE TESTING

See SERVICE PROCEDURE AG-II

### MAGNET ASSEMBLY TESTING (White Rodgers Control)

- Step 1. Following the lighting instruction label on the heater, proceed to light the pilot and allow to operate for three minutes. If the pilot will not stay lit, hold the pilot button (located on the combination thermostat/gas valve) down during this test
- Step 2. Using a multimeter capable of measuring millivolts, connect one lead using an alligator clip to the copper sheath of the thermocouple, use the second lead of the multi meter to probe the top terminal located at the back of the gas control.

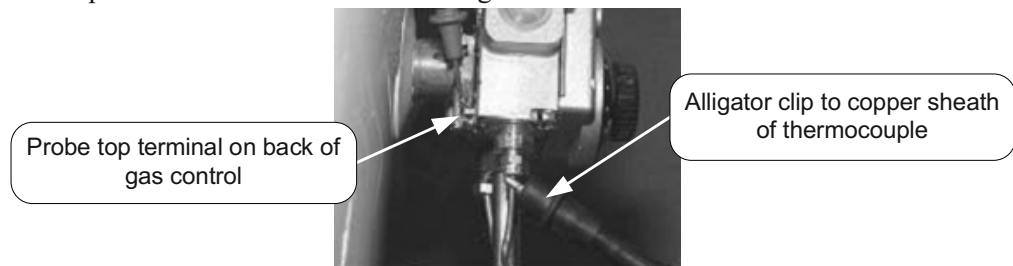


Figure 20

- Step 6. With a meter reading of 13 millivolts or greater, rotate knob of gas control to the "OFF" position.
- Step 7. The magnet should remain closed for a drop of at least 6 millivolts. You will here a "snap" or "click" sound when the magnet opens, if you hear this sound prior to a drop of 6 millivolts, the magnet is out of specification and the gas control should be replaced.

### MAGNET ASSEMBLY TESTING (Robertshaw Control)

- Step 1. Disconnect thermocouple from gas control.
- Step 2. Connect a thermocouple adaptor (BWC P/N 239-44642-00, Robertshaw P/N 75036) at the thermocouple location in the gas control.
- Step 3. Reconnect thermocouple to adaptor. Make certain all connections are tight (finger tight plus 1/4" turn).
- Step 4. Using a multimeter capable of measuring millivolts, connect one alligator clip to the set screw of the adaptor and the other alligator clip to copper portion of the thermocouple.
- Step 5. Following the lighting instruction label on the heater, proceed to light the pilot and allow to operate for three minutes.
- Step 6. With a meter reading of 13 millivolts or greater, rotate knob of gas control to the "OFF" position.
- Step 7. The magnet should remain closed for a drop of at least 6 millivolts. You will here a "snap" or "click" sound when the magnet opens, if you hear this sound prior to a drop of 6 millivolts, the magnet is out of specification and the gas control should be replaced.



Figure 21



Figure 22

### ECO (Energy Cut Off) TESTING

- Step 1. Disconnect thermocouple from gas control.
- Step 2. Using a multimeter capable of measuring Ohms (or continuity), attach one lead (alligator clip) to the pilot tube. Insert the other lead (probe) fully into the magnet opening. Be sure the probe makes contact only at the top center of the magnet opening. Do not allow the probe to make contact with the threaded sides of the opening.
- Step 3. If continuity is indicated, the ECO is OK. If continuity is not indicated, the ECO has opened and the gas control must be replaced.

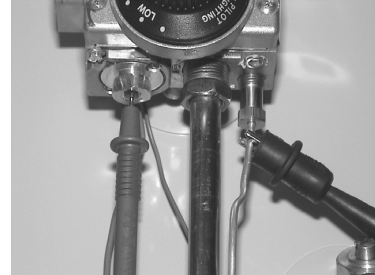


Figure 23

### 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 outer jacket burner access door.
- Step 6. Slide open inner combustion chamber door.

For White Rodgers gas control, depress knob slightly and rotate clockwise to the "OFF" position.

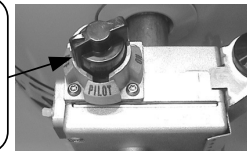


Figure 24

For Robertshaw gas control, rotate knob clockwise to the "OFF" position.



Figure 25



Figure 26

Step 7. Removal of gas control.

- a) Disconnect main burner feedline, pilot tube and thermocouple from gas control & remove burner from combustion chamber.

NOTE: Feed line nut for natural gas control uses right hand threads, LP control uses left hand thread.

- b) Remove gas control from heater, rotating counter clockwise using a control body wrench or a length of ½" NPT pipe threaded into inlet of control.

To remove or install control, insert only ½" NPT threaded pipe into inlet and use to loosen or tighten control.

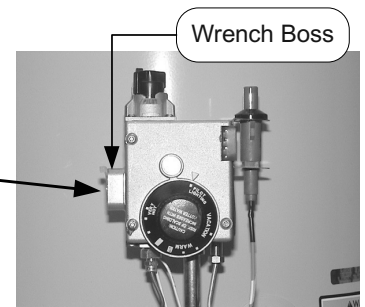


Figure 27

Step 8. Installation of gas control.

- a) Install new gas control using a control body wrench or a length of ½" NPT pipe threaded into inlet of control. **DO NOT OVER TIGHTEN.** Use caution not to damage cast aluminum body of gas control. Be certain not to damage the bundled wire leads.

NOTE: gas control must be installed in proper upright position to assure the feedline will align properly at the inner door flange. **DO NOT OVER TIGHTEN.** If control is turned past proper alignment, do not reverse direction to align.

- b) Reattach main burner feedline, pilot tube and thermocouple to gas control.

NOTE: Feedline nut for natural gas control uses right hand threads, LP control uses left hand thread.

- c) Connect gas supply piping to inlet of control. Use back up wrench on wrench boss of control, never use back up wrench on body of control.

Step 9. Reconnect gas supply to gas control.

Step 10. Resume water supply to water heater. Be sure tank is full of water.

Step 11. Slide inner combustion chamber door closed

Step 12. Re-attach outer jacket door.

Step 13. To resume operation follow the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual.

## HONEYWELL THERMOWELL TESTING

- Step 1. If gas control has gone into lockout due to excessive tank temperature (four flashes and a three second pause) reset the gas control to the “OFF” position. Then follow the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual.
- Step 2. Observe the water heater operation. If the gas control continues to lockout due to excessive tank temperature proceed to Step 3, thermowell testing, to determine the cause.
- Step 3. To perform thermowell testing turn the gas control to the “OFF” position and disconnect the thermowell harness from the gas control.

Disconnect  
thermowell wire  
harness



Figure 28

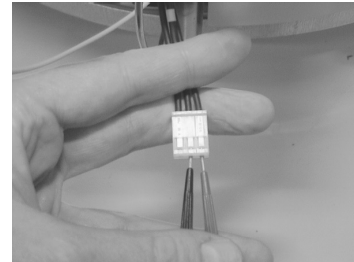


Figure 29

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

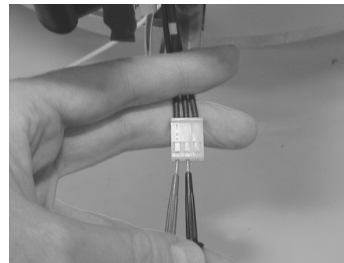


Figure 30

- Step 4. Using a multimeter set to measure Ohms determine the resistance of the thermowell sensor (See caution on this page).
- Step 5. Hold one probe in the center pin and measure the outside positions pins (see figure 29 & 30).
- Step 6. Refer to Table 1 on page 17 to determine the correct resistance value for the water heater tank temperature.
- Step 7. If the resistance values are correct the gas control needs to be replaced. If they are incorrect the thermowell needs to be replaced.



**DETERMINE WATER HEATER TANK TEMPERATURE**

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

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

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

- Step 1. Turn the gas control to the "OFF" position and disconnect the thermowell harness from the gas control.
- Step 2. Using a multimeter set to measure Ohms determine the resistance of the thermowell sensor (See caution on this page).
- Step 3. Hold one probe in the center pin and measure the outside positions pins (see figure 29 & 30, page 16).
- Step 4. Draw approximately 1 quart of water from the drain valve and immediately measure the water temperature using an accurate thermometer. It may be necessary to open a hot water faucet to allow the heater to drain.
- Step 5. Refer to Table 1 below to determine the correct resistance value for the water heater tank temperature.

Example: If the temperature of the 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 (Table 1)**

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

**HONEYWELL GAS CONTROL & THERMOWELL REMOVAL**

- Step 1. Turn the gas control knob to the “OFF” position.
- Step 2. Turn off water supply and drain water heater completely.
- Step 3. Turn off and disconnect gas supply to control
- Step 4. Disconnect wire harness and burner assembly from the gas control.
- Step 5. Remove gas control and thermowell by rotating flats of the thermowell counter clockwise.

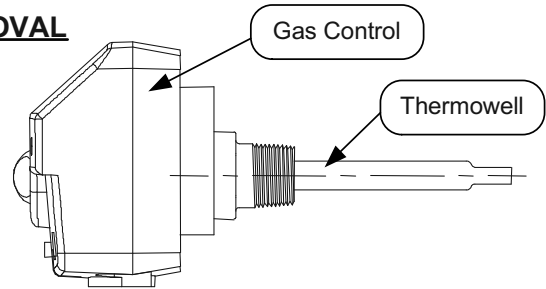


Figure 31

**HONEYWELL GAS CONTROL REMOVAL FROM THERMOWELL**

**NOTE:** Following the instructions below allows the removal of the gas control from the thermowell without removing the thermowell from the tank.

- Step 1. Turn the gas control knob to the “OFF” position.
- Step 2. Turn off and disconnect gas supply piping to the gas control.
- Step 3. Disconnect wire harnesses and burner assembly from the gas control.
- Step 4. Using the gas control service tool (part number 239-45991-00) available from your Bradford White parts supplier, insert tool into the back of the gas control (see Figure 32 & 33).

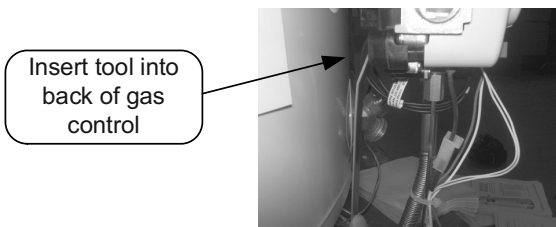


Figure 32

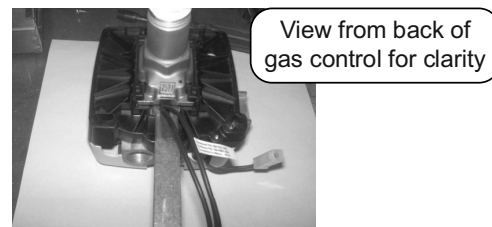


Figure 33

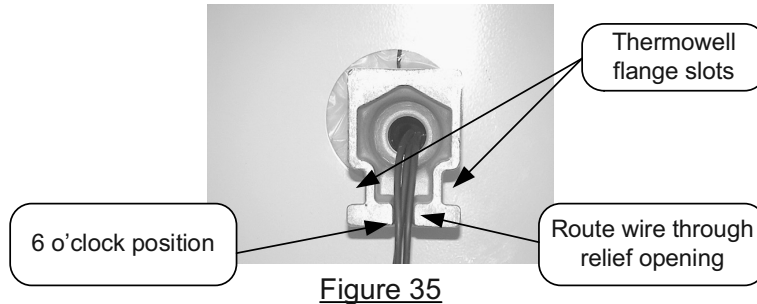
- Step 5. Pivot service tool towards water heater as far as possible (see Figure 34). Lift up straight on gas control. The gas control should move about 1/8”. Hold gas control in position and remove tool. Lift straight up on the gas control to remove completely from the thermowell.



Figure 34

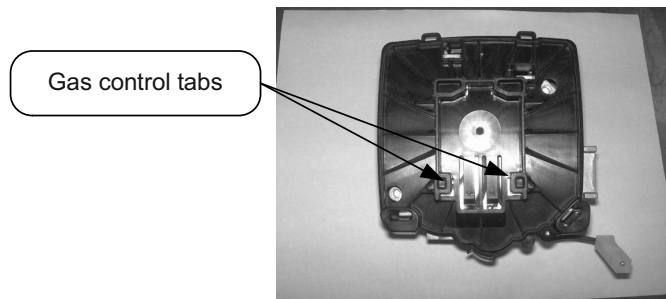
### HONEYWELL GAS CONTROL ASSEMBLY TO THERMALWELL

Step 1. Install threaded end of thermowell into water heater. When tight, be sure thermowell flange is positioned so that thermowell relief opening is in the 6 o'clock position for proper control alignment (see Figure 35).



Step 2. Route lead wires through the relief opening (see Figure 35).

Step 3. Align slots located on the thermowell flange with tabs located on the back of the gas control (see Figure 36).



Step 4. Carefully push the gas control back onto the thermowell flange.

Step 5. Install burner assembly and reconnect pilot tubing and main burner feed line to gas control.

Step 6. Reconnect wire harness and igniter wire to the gas control.

Step 7. Resume water supply to water heater and check for leaks. Be sure tank is full of water.

Step 8. Reconnect the gas supply to gas control. Check for gas leaks using a soapy water solution.

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.

### **MAIN BURNER: Inspection, Adjustment, 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 accumulating.

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

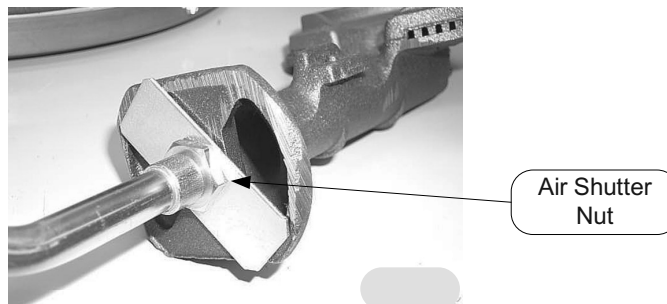
Steel burner models have a self adjusting air mixture and do not have an adjustable air shutter. Cast iron burner can have the gas and air mixture properly proportioned by adjusting the air shutter on the mixer face of the main burner (see step 2 below).

Main burner must be free from any debris accumulation that may effect burner operation (see burner cleaning procedure on page 21).

### **CAST IRON BURNER ADJUSTMENT**

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

- Step 1. With main burner in operation slide the inner combustion chamber door open.
- Step 2. To adjust for proper burning, loosen the air shutter nut, rotate the shutter to close the opening in the burner, then slowly rotate the shutter until the yellow tips are minimized and the flame becomes blue. Tighten the air shutter nut. Too much air will cause the flame to lift off the burner ports and create noisy burner operation. Too little air (yellow tips) will result in soot formation.



**Figure 37**

**MAIN BURNER: Inspection, Adjustment, Cleaning and Replacement (cont.)**

- Step 3. Fully inspect combustion chamber for debris or carbon build up.
- Step 4. Be certain that thermocouple or thermopile, and pilot tube are routed correctly through the relief opening in the combustion chamber.

Position thermocouple or thermopile, and pilot tube.



**Figure 38**

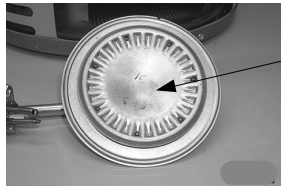
- Step 5. Burner should operate as adjusted in step 2 on page 20, if not, repeat procedure compensating air shutter position for proper burner operation with inner door closed.
- Step 6. It may be necessary to clean main burner or main burner orifice to achieve proper burner operation. If cleaning is required proceed to burner cleaning procedure below.

**BURNER CLEANING (Steel & Cast Iron)**

- Step 1. Slide open or remove inner combustion chamber door.
- Step 2. Disconnect main burner feed line, pilot tube, and thermocouple or thermopile from gas control and remove burner assembly from combustion chamber.

NOTE: Feedline nut for natural gas control uses right hand threads,  
LP control uses left hand threads.

- Step 3. Thoroughly inspect burner surface area and burner ports and remove any debris build up.



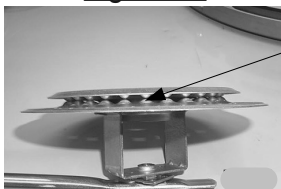
**Figure 39**

Burner Surface Area

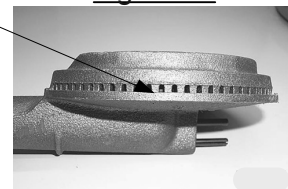


**Figure 40**

Burner Port Area

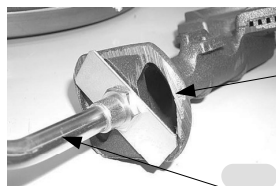


**Figure 41**



**Figure 42**

- Step 4. On cast iron burners, inspect for any debris build up inside burner venturi. If found, disconnect main burner feedline from burner and remove debris build up.



**Figure 43**

Burner Venturi Opening

Feedline

**BURNER CLEANING** (Cont.)

Step 5. Steel Burner:  
Disconnect (unscrew) burner from main burner orifice.

Cast Iron Burner:  
Disconnect (unscrew) main burner feedline from burner.



Figure 44

Step 6. Remove main burner orifice from feedline.  
Inspect and clean if necessary.



Figure 45

Step 7. Inspect pilot assembly per service procedure AG-II.

Step 8. Reassemble burner assembly.

Step 9. Inspect combustion chamber area of water heater and clean if needed prior to reinstallation of burner assembly.

Step 10. Reinstall burner assembly into combustion chamber, reconnect feedline, thermocouple or thermopile, pilot tube and igniter wire (for applicable models) to the gas control.

Step 11. Slide close or attach inner combustion chamber door and reattach outer jacket door.

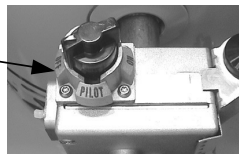
Step 12. To resume operation, follow the instructions located on the lighting instruction label or the lighting instructions located in the installation and operation manual.

**DIPTUBE 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.**

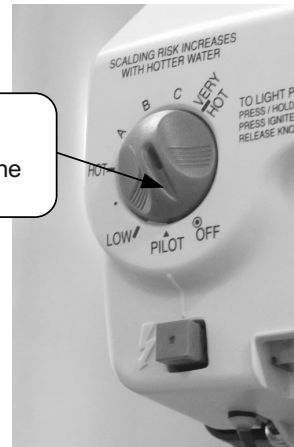
Step 1. Turn the gas control knob to the “OFF” position.

For White Rodgers Control, depress knob slightly and rotate clockwise to the “OFF” position.



**Figure 46**

For Honeywell gas control, rotate knob counter clockwise to the “OFF” position.



**Figure 48**

For Robertshaw Control, rotate knob clockwise to the “OFF” position.



**Figure 47**

- Step 2. Turn off cold water supply to water heater. Connect hose to drain spigot of water heater and route to a suitable drain. Open a nearby hot water faucet to vent water heater for draining. Open drain spigot of water heater and allow to drain.
- Step 3. Disconnect plumbing system from inlet nipple/diptube.
- Step 4. With an appropriate wrench, remove inlet nipple/diptube from the water heater. Use caution not to damage the nipple threads.
- Step 5. Visually inspect inlet nipple/diptube. Inlet nipple/diptube should be free of cracks and any blockage. The small curved openings should be open and free of any blockage. Anti-siphon hole located approximately 6" from the bottom of nipple, should be 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/diptube into water heater. Reconnect plumbing system to inlet nipple/diptube, resume cold water supply and check for leaks.
- 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.

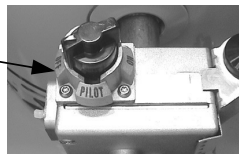
**ANODE INSPECTION AND REPLACEMENT**

**▲ 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. Turn gas control knob to “OFF” position.

For White Rodgers Control, depress knob slightly and rotate clockwise to the “OFF” position.



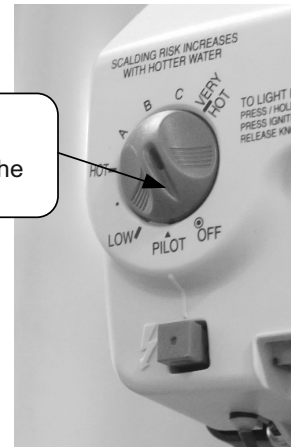
**Figure 49**

For Robertshaw Control, rotate knob clockwise to the “OFF” position.



**Figure 50**

For Honeywell gas control, rotate knob counter clockwise to the “OFF” position.



**Figure 51**

- Step 2. Turn off cold water supply to water heater. Connect hose to drain spigot of water heater and route to a suitable drain. Open a nearby hot water faucet to vent heater for draining. Open drain spigot of water heater and allow to drain.
- Step 3. Disconnect plumbing system from outlet nipple/anode.
- Step 4. With an appropriate wrench, remove outlet nipple/anode from the water heater. Use caution not to damage the nipple threads.
- Step 5. Visually Inspect outlet nipple/anode. Outlet nipple/anode may 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. Reconnect plumbing system to outlet nipple/anode, resume water supply and check for leaks.
- 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.











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