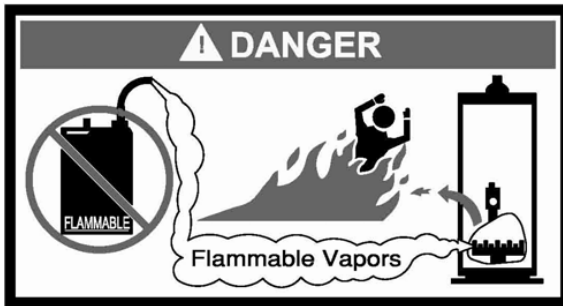


100T399-SOLA SUPPLEMENT TO INSTALLATION & OPERATION MANUAL INCLUDED WITH WATER HEATER (SERIAL NUMBERS BEGINNING LK AND LATER)



! WARNING

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

- Do not store or use gasoline or other flammable 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.
- For your family's comfort, safety and convenience, it is recommended this water heater be installed and serviced by a plumbing professional.

P/N 238-50688-00A 9/14

SECTION III: GENERAL INFORMATION

LOW FIRE START CONTROL FEATURES:

(In addition to pg. 6 of installation & operation manual.)

- Honeywell R7910B1009 Control board controls ignition functions, combustion blower, gas valve, tank temperature, and monitors safety functions in a single control.
- An attractive digital display on the top front of the water heater provides for setting and displaying the temperature setpoint and monitoring the status of the water heater.
- Durable direct spark ignition system.
- The temperature adjustment range is 70°F to 180°F.
- Combustion blower speed is reduced prior to ignition to light smoothly at a lower input rating.
- Temperature setting may be viewed in either °F or °C
- In Diagnostic Mode the tank temperature and flame sense current can be monitored for service.
- Error codes will be displayed in the event the water heater needs service.

SECTION VIII: ELECTRICAL CONNECTIONS

(Replaces pg. 38 of installation & operation manual.)

! WARNING

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.

All electrical wiring must be installed and grounded in accordance with local codes, or in the absence of local codes, the National Electrical Code, ANSI/NFPA 70 and/or CSA C22.2 Electrical Code.

The water heater must be wired to a 120 VAC, 60 Hz, 15A power supply. The water heater **must be** wired on a separate circuit and breaker. If a flexible line cord and plug is permitted by local code, then provide a three wire grounding type receptacle within reach of the line cord provided on the control box. Do not plug the line cord into a receptacle that can have the power supply interrupted by a switch that is used to control lights or another appliance.

If wiring in conduit is required, cut the line cord close to the control board and make the appropriate wiring connections. Install an electrical conduit connector on the outside jacket of the water heater. Refer to the wiring diagram for the correct connections to each wire lead.

! CAUTION

This water heater **must** be wired on a separate circuit. Failure to wire on a separate circuit may cause improper operation or failure of the electrical components of the water heater. Refer to the "Electrical Connections" section of the Installation and Operation Manual for complete instructions on electrical wiring and connections to the water heater.

Do not energize the electric circuit before the water heater tank is filled with water.

This control is polarity sensitive. If the hot and neutral supply voltage is reversed, the control will not sense flame and the water heater will not operate. Verify polarity before connecting the water heater.

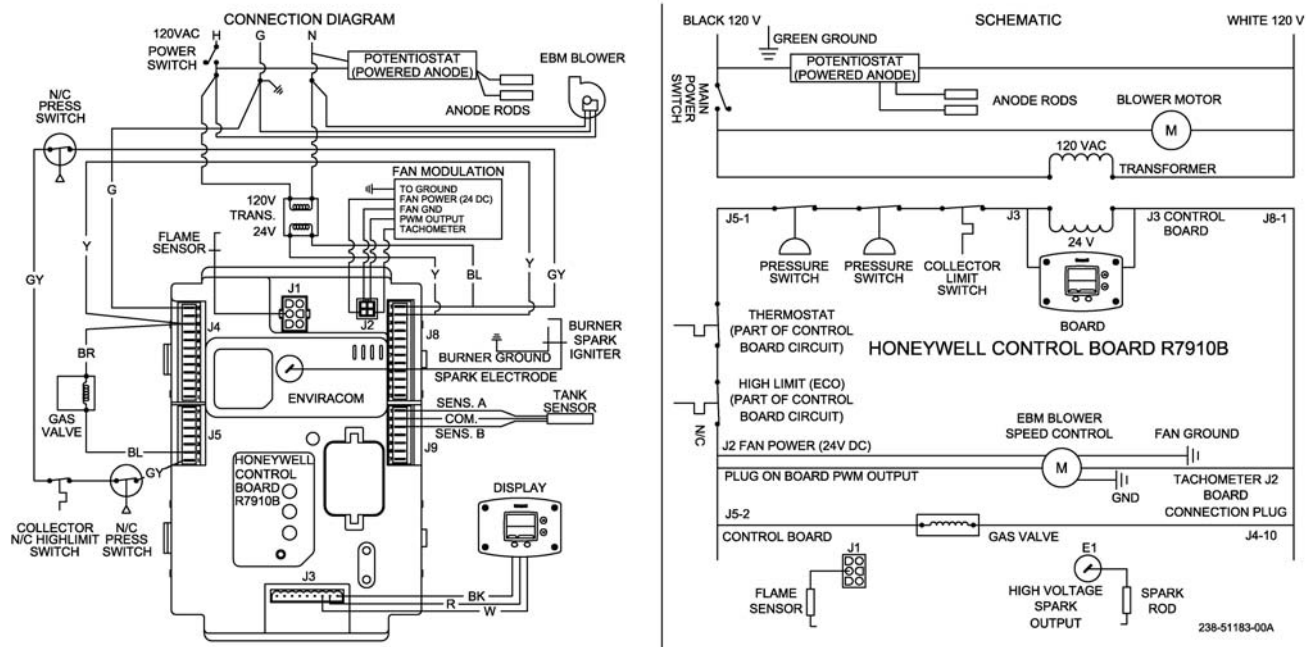


Figure 25. Wiring Diagram and Schematic

SECTION IX: OPERATING INSTRUCTIONS

SEQUENCE OF OPERATION

(Replaces SEQUENCE OF OPERATION section on pg. 39 of installation & operation manual)

1. Thermostat calls for heat.
2. Blower ON.
3. Blower pre purge at reduced speed.
4. Spark rod sparks to the burner and gas valve opens – burner ignition.
5. Flame signal confirmed.
6. Blower remains at reduced speed for a short time to stabilize flame.
7. Blower increases to full speed for full input rate.
8. Thermostat satisfied.
9. Gas valve closes - Main burner OFF.
10. Blower post purge, then OFF.

LIGHTING AND SHUT DOWN INSTRUCTIONS

(Replaces pg. 40-46 of installation & operation manual.)

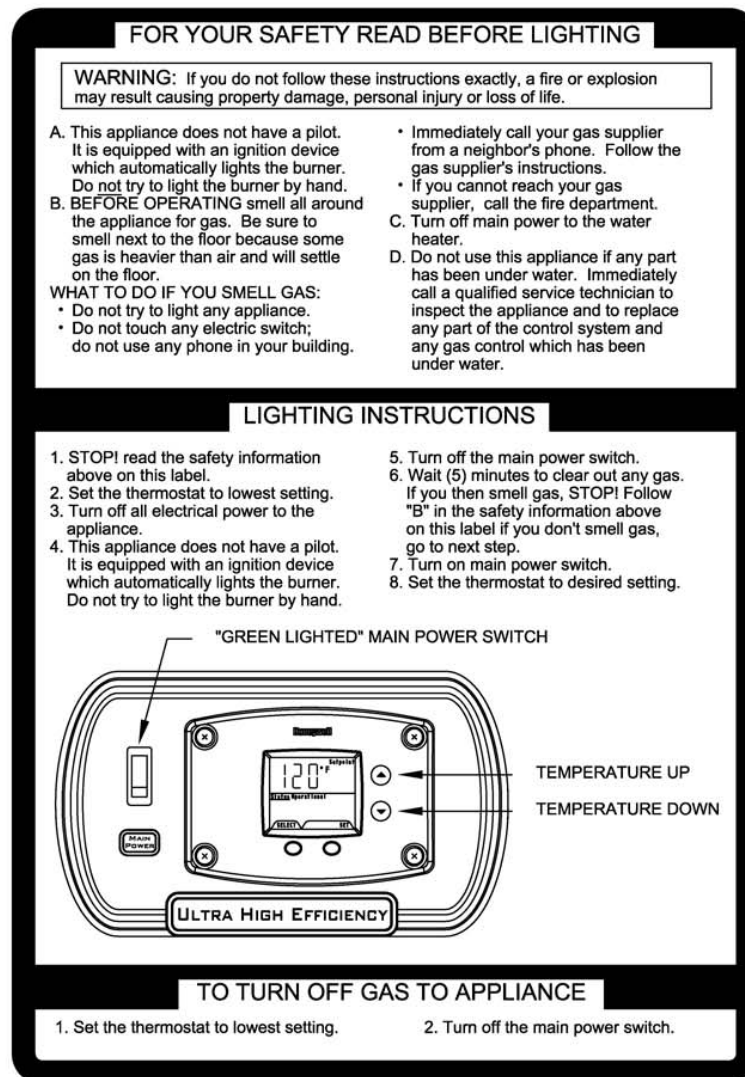


Figure 26. Lighting Instruction Label.

TEMPERATURE ADJUSTMENT

APPROXIMATE TIME/TEMPERATURE RELATIONSHIPS IN SCALDS	
120°F (49°C)	More than 5 minutes
125°F (52°C)	1½ to 2 minutes
130°F (54°C)	About 30 seconds
135°F (57°C)	About 10 seconds
140°F (60°C)	Less than 5 seconds
145°F (63°C)	Less than 3 seconds
150°F (66°C)	About 1½ seconds
155°F (68°C)	About 1 second



CAUTION

This water heater, when set at a lower temperature setting is not capable of producing hot water of sufficient temperature for sanitizing purposes.

This water heater is equipped with an energy cut out device to prevent overheating. Should overheating occur or the gas supply fails to shut off, turn off the control panel power switch to the appliance and call a qualified service agency.

NOTICE

The lower the temperature setting, the greater the energy efficiency, both to heat the water and to maintain the storage temperature during standby periods. Lower water temperatures also extend tank life. Remember, no water heating system will provide exact temperatures at all times. Allow a few days of operation at this setting to determine the correct temperature setting consistent with the requirements for the installation.

The water heater temperature setting is adjusted by using the control display mounted to the control surround jacket of the water heater. The water heater thermostat is set at the lowest setpoint of 70°F (21 °C) when shipped from the factory. The control display shows the temperature setpoint in degrees Fahrenheit (°F) or degrees *Celsius* (°C), and the status of the water heater ("Standby" or "Run").

For energy efficient operation of your water heater, the suggested initial temperature setting is 120°F (49 °C). During the winter season, or any cold period, you may desire a higher temperature setting to adjust for the colder incoming water. This adjustment, however, may cause additional condensation to form on the cooler tank surface. This does not mean the tank is leaking. During summer months, the warmer incoming water temperatures will benefit the performance of your water heater and reduce the amount of condensation developed.

Condensation does not mean your tank is leaking. Most of reported tank leaks on installation are proven to be condensation. To avoid unnecessary inconvenience and expense, make sure the tank is leaking before calling an independent servicing contractor or qualified service professional.

If the water heater is to remain idle for 30 days or more or is subjected to freezing temperatures while shut off, the water heater and piping should be fully drained and the drain valve should be left fully open. Refer to the "General Operation" section of this Installation and Operation Manual for the procedure on draining the water heater.



DANGER

Hotter water increases the risk of scald injury. Scalding may occur within 5 seconds at a temperature setting of 140°F (60°C). To protect against hot water injury, install an ASSE approved mixing valve in the water system. This valve will reduce point of discharge temperature by mixing cold and hot water in branch water lines. A licensed plumbing professional or local plumbing authority should be consulted.



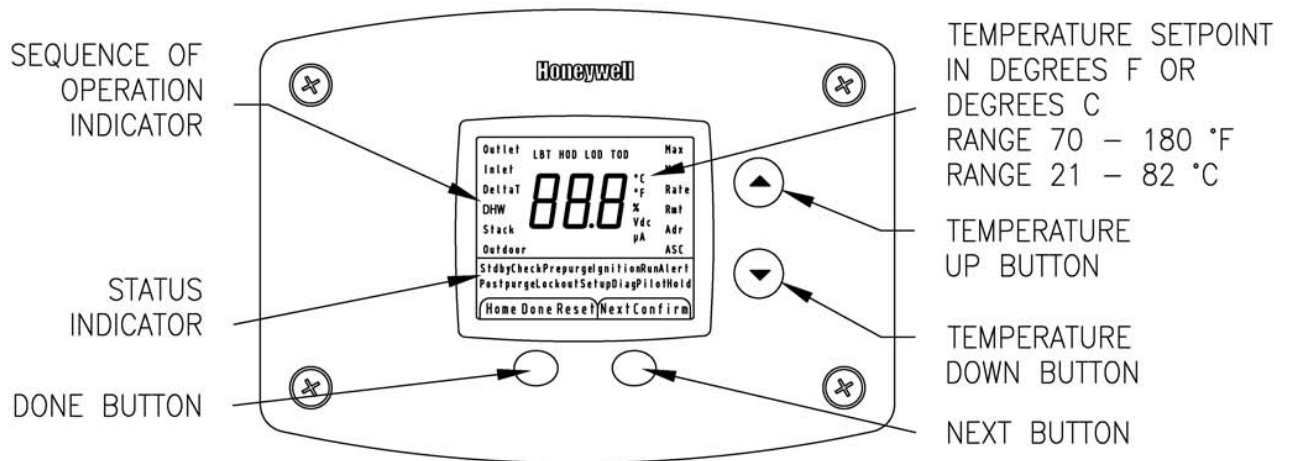
WARNING

If the water heater display does not show “Standby” or “Run”, there may be an operating malfunction with the water heater. If this is the case, a numeric code will be displayed. Refer to the label next to the display for the definition of the error code and call your plumbing professional or service agent to service the water heater. Do not try to reset the water heater without having a qualified service person to diagnose and correct the problem. If the display is blank or does not show an error code, make sure there is power to the water heater.

Setting the water temperature to the maximum setpoint can result in scalding hot water delivered to the faucets. It is highly recommended that the setpoint be adjusted to the lowest temperature possible for the needs of the installation. Make sure the water heater control display is not in a public area that can result in the temperature settings being improperly adjusted. See previous warning on scalds and an ASSE approved mixing valve.

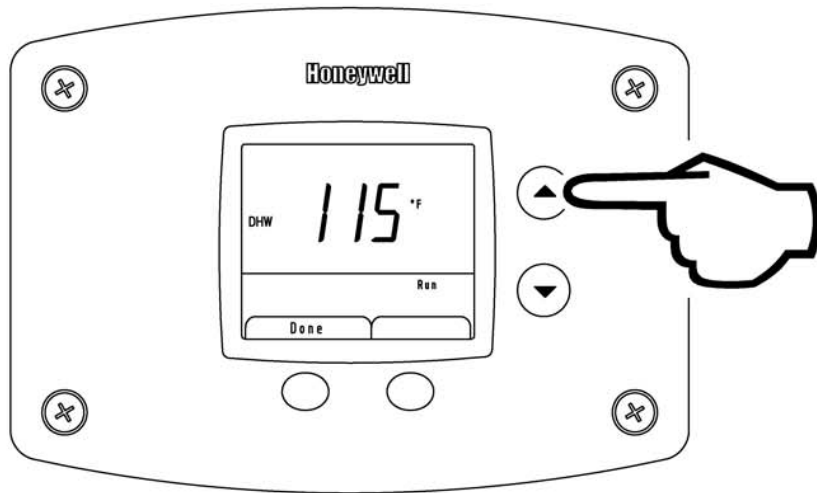
NOTICE

If the water heater display does not show “Standby” or “Run”, there may be an operating malfunction with the water heater. If this is the case, a numeric code will be displayed. Refer to the label next to the display for the definition of the error code and call your plumbing professional or service agent to service the water heater. Do not try to reset the water heater without having a qualified service person to diagnose and correct the problem. If the display is blank or does not show an error code, make sure there is power to the water heater.

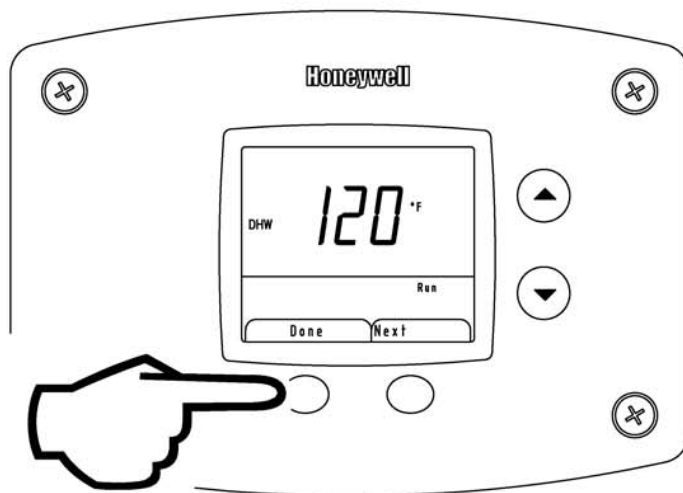


To Increase Setpoint Temperature:

Step 1: Depress and hold “Temperature Up” button until desired setpoint temperature appears in the display.



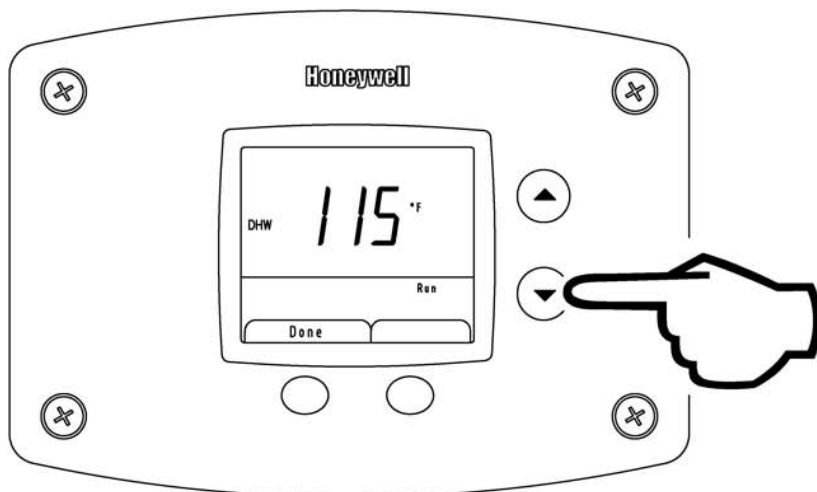
Step 2: Press “DONE” button for new setting to take effect immediately. If the “DONE” button is not pressed, the new temperature setting will take effect in approximately 10 seconds.



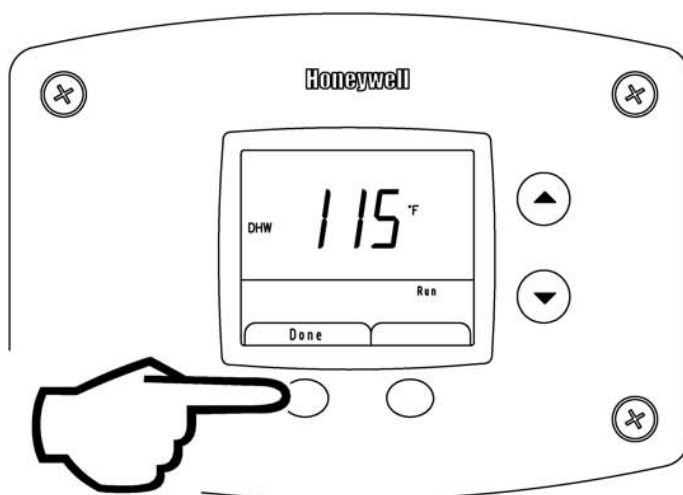
PRESS DONE BUTTON FOR SETTING TO
TO TAKE EFFECT IMMEDIATELY

To Decrease Temperature Setpoint:

Step 1: Depress and hold “Temperature Down” button until desired setpoint temperature appears in the display.



Step 2: Press “DONE” button for new setting to take effect immediately. If the “DONE” button is not pressed, the new temperature setting will take effect in approximately 10 seconds.



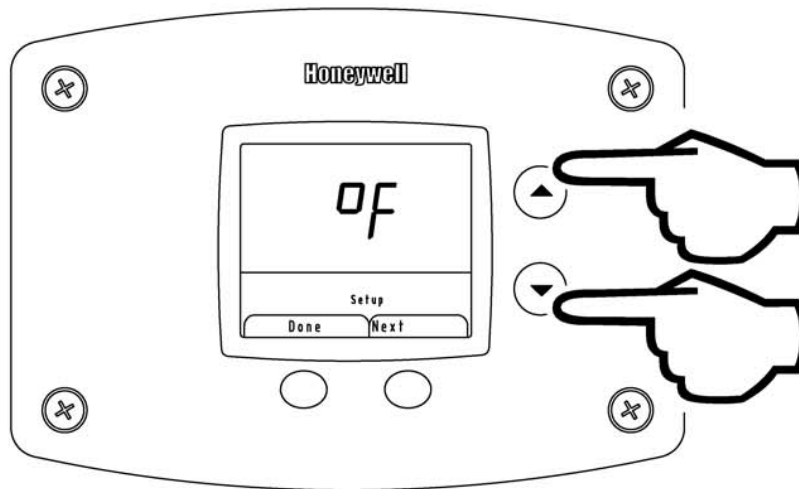
PRESS DONE FOR SETTING TO
TO TAKE EFFECT IMMEDIATELY

NOTICE

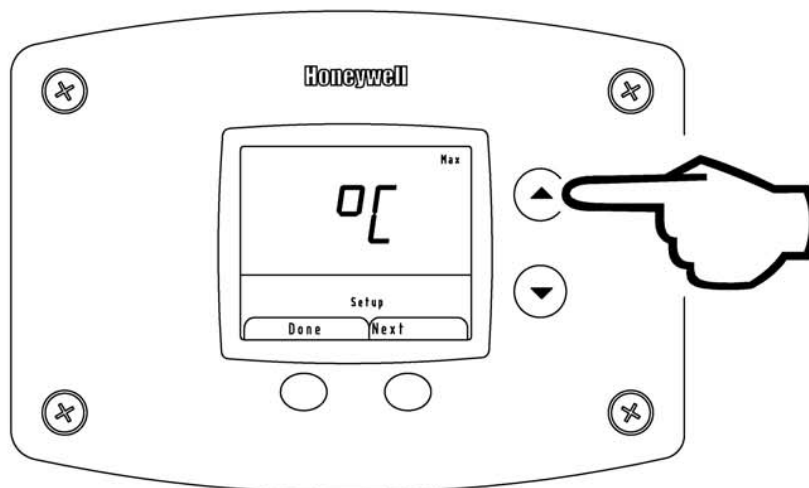
Pressing the “NEXT” button instead of “DONE” will enter the display to show unused screens such as “Stack ----°F, Outdoor ----°F, % Rate (Shows percentage of full input rate for Lightoff rate), Outlet ----°F, Inlet ----°F, Delta T ----°F. **These screens are not used in our application.** Press DONE to exit this screen back to the DHW setpoint display.

To Change Temperature Format in Display from °F to °C or °C to °F:

Step 1: Enter “Set-UP Mode” by pressing both UP/DOWN buttons together for 3 seconds.



Step 2: Pressing either UP or DOWN buttons will toggle between °F or °C. Press “DONE” when selection is complete. Display will revert back to DHW setpoint.



NOTICE

Pressing the “NEXT” button instead of “DONE” will enter the display to show “RMT” for Remote Firing Control. This is for a future feature that is not currently used. The screen may show OFF or ON. If ON, it may display a number for an address. Press DONE to exit this screen back to the DHW setpoint display.

SECTION XI: DIAGNOSTIC AND TROUBLESHOOTING GUIDE

(Replaces pg. 53-71 of installation & operation manual)

LOW FIRE START CONTROL SYSTEM WITH DIRECT SPARK IGNITION SEQUENCE OF OPERATION

1. When the tank temperature drops below the temperature setpoint on the display, the control sends power to the combustion blower for a 15 second pre purge period. The combustion blower runs at full speed during this period to purge the combustion chamber of any unburned gases.
2. The blower speed decreases to the reduced light-off rate speed. Once this reduced speed has stabilized, the control is ready to start the trial for ignition period to light the burner.
3. After the light-off speed on the combustion blower has stabilized, the control sends high voltage through the spark cable to the spark rod to spark to the burner and the gas valve also opens.
4. After the burner lights, a microamp current is generated through the flame sense rod allowing the control to detect burner flame.
5. The sparking then ceases and the flame is monitored by the flame sense circuit until the tank temperature reaches the thermostat setpoint and turns off the gas valve.
6. After the burner ignites, the blower remains at the reduced light-off rate speed for 10 seconds to allow the flame to stabilize. After this period, the combustion blower will gradually increase to full speed to allow full input to the burner.
7. If the burner fails to light, the gas valve closes, sparking to the burner stops, and the combustion blower increases to full prepurge speed for 15 seconds to purge the heat exchanger of unburned gas.
8. The blower reduces to light-off rate speed and the trial for ignition is repeated. The control will make 3 retries to ignite the burner. If the burner fails to light after the third retry, the control enters a Hold period which is an idle period for 15 minutes.
9. There will be a flashing code 110 alternating with the DHW tank temperature shown on the water heater display indicating that the control cycled through the maximum number of ignition retries for ignition. The control will make another 4 ignition attempts after the 15 minute waiting period.
10. If the exhaust vent terminal should become blocked or the condensate drain becomes plugged, the exhaust vent pressure switch will open and the gas valve closes. The combustion blower will postpurge for 30 seconds and then stop. A lockout code 67 will be displayed on the water heater display.
11. When the blockage is removed, the control can be reset by pressing the lower left button under "Reset".
12. The burner flame is monitored by the flame sense circuit. If the flame should extinguish, the gas valve closes and the combustion blower will operate at full speed to purge the heat exchanger before making an attempt to relight the burner. There may be up to 4 attempts to light the burner before going into the 15 minute ignition hold period explained previously.
13. The burner will continue to operate during the heating cycle until the thermostat satisfies. The gas valve closes and the combustion blower continues to operate for 30 seconds to purge the heat exchanger of flue gases.
14. If the tank temperature exceeds 200°F (93°C), the control closes the gas valve and goes into a "Lockout" state and will not operate until reset by a qualified service person. The display will read lockout code "79", which indicates the tank high limit temperature has been exceeded. No attempt should be made to reset the control until a service person has corrected the cause of the high limit condition.
15. Refer to the diagnostic service section at the end of this Installation and Operation Manual.

ACCESSING DIAGNOSTIC MODE ON THE WATER HEATER DISPLAY (FOR SERVICE PERSONNEL ONLY)

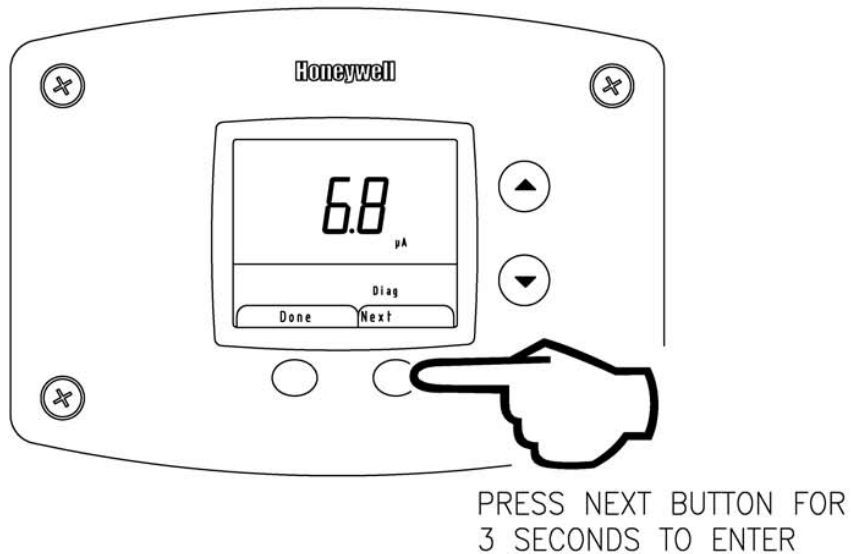
The display has a "Diagnostic Mode" for accessing information in aiding servicing of the water heater. This procedure is for service and installation personnel only. To enter the Diagnostic Mode, follow the steps illustrated below:



WARNING

The following procedure is for service and installation personnel only. Resetting lockout conditions without correcting the malfunction can result in a hazardous condition.

Step 1: Press and hold the lower right button under “Next” in the lower right display for at least 3 seconds.

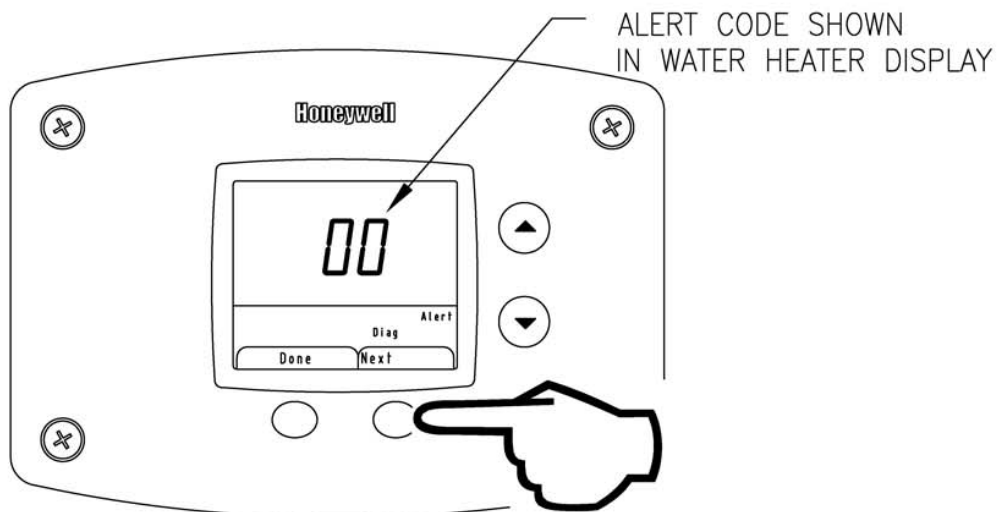


NOTICE

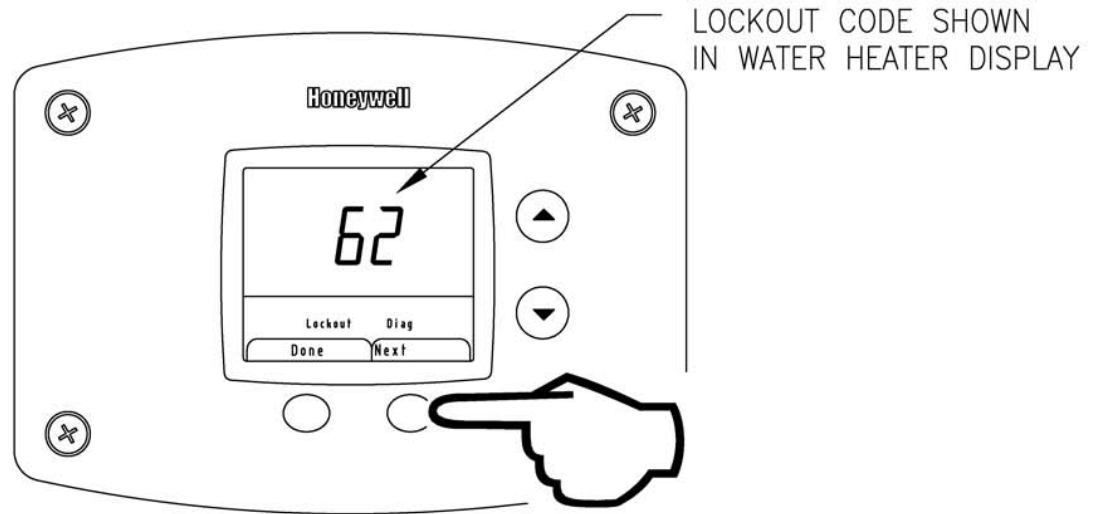
The screens will stay in the Diagnostic Mode for 12.5 minutes after the last button press for viewing unless “Done” button is pressed to exit Diagnostic Mode.

Step 2: The display will show the flame sense current in microamps when the burner is operating.

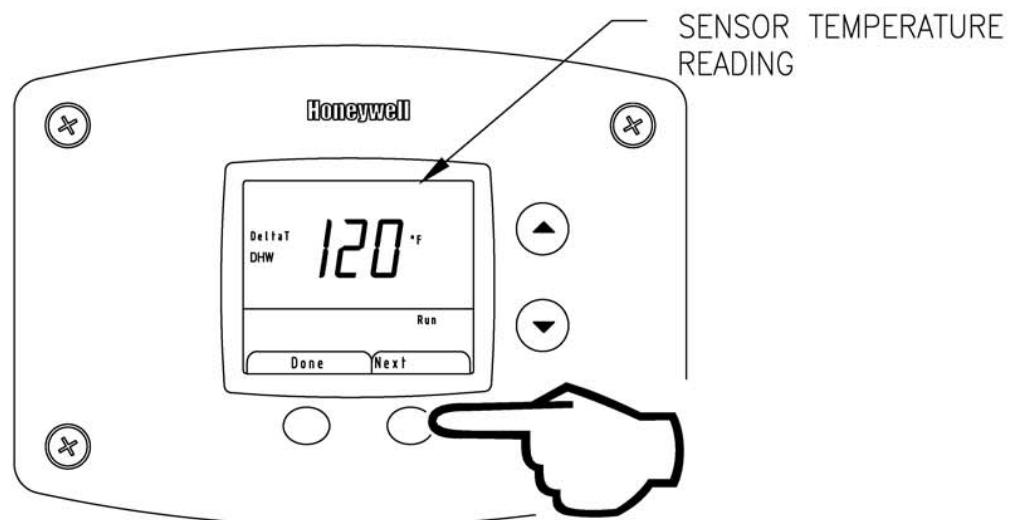
Step 3: Press the lower right “Next” button and the display will show flash and show the number of any Alert codes. These are not currently used.



Step 4: Press lower right “Next” button and the display will flash and show the number of any Lockout codes.



Step 5: Press lower right “Next” button and the display will show the temperature sensor reading.



Step 6: Press lower right “Next” button and the display will show the manual firing rate adjustment. This function is not currently used. Any adjustment made has no effect.

Step 7: Press “Done” button on lower left to exit Diagnostic Mode back to DHW setpoint in the User Mode.

DIAGNOSTIC ERROR CODES AND TROUBLESHOOTING PROCEDURES FOR 100T399 MODELS WITH HONEYWELL LOW FIRE START CONTROL SYSTEM

Error Code	Definition of Code	Cause of Problem and Actions Taken to Correct
No code – blank display		<ul style="list-style-type: none"> • Check power supply to the water heater. • Make sure water heater is plugged in and the breaker is on. • Check if there is 120 volts power supply to the LINE connections on the control board. • If 120 volts is present, check for 24 volts output to SECONDARY terminals on the Control Board. • Check for loose wires, defective transformer. • Check wire harness connections from display to the control board.
3-48, 58-60	Internal Faults	<ul style="list-style-type: none"> • Verify wiring to the wiring diagram. • Check power supply to make sure voltage and frequency is correct. • Check for 24 volts from the transformer to the control board. • Reset module by interrupting power or pressing the reset button on the module.
49	Voltage too low or high	<ul style="list-style-type: none"> • Measure the incoming line voltage. • Voltage should be 115-125 volts. • If the voltage is not within this range or there is drastic fluctuation, then have the incoming power supply checked. • If the line voltage is satisfactory, check the output from the transformer to make sure it is 22-26 volts. • Replace transformer or wiring if defective.
53	AC Inputs phase reversed	<ul style="list-style-type: none"> • Check the module and display connections. • Check the module power supply and make sure that frequency, voltage and VA capacity of the transformer meet specifications. • Check to make sure the wiring connections on the control module from terminals J4-10 and J8-2 are connected together.
62	Fan speed not proved	<ul style="list-style-type: none"> • Check the PWM wire harness connection from the blower to the control module. • Make sure the pin terminals make solid contact. • Measure the resistance of each wire in the wire harness from the terminal ends. • Replace wire harness if defective.
67	ILK Off (Interlock Off)	<ul style="list-style-type: none"> • Check wiring to the normally closed blocked vent pressure switches and vent limit switch. • Use a voltmeter to find out if either pressure switch or the high limit switch has opened. • If so, determine the cause (blocked vent terminal, clogged condensate drain, high temperature in compartment). • If limit switches are closed, check wiring for shorts. • Measure continuity. • If limit switches and wiring check O.K., replace control module.
80	High Limit (Overheat Condition)	<ul style="list-style-type: none"> • Check the wiring from the sensor to the control module. • Measure the resistance of each outside wire to the center wire. • If either outside wire has a much different resistance reading, replace the sensor. • Make sure the sensor is securely held inside the well with the clip. • If the problem persists and the sensor and wiring check O.K., then replace the control module.
93	DHW Sensor Fault	<ul style="list-style-type: none"> • Check the sensor wire harness from the sensor to the control module. • Make sure there are no loose connections to the control plug. • Check the resistance reading from each of the outside wires to the center (common) wire. • If the ohm readings are not fairly close, replace the sensor. • Replace the control module if the problem persists and the sensor and wire connections are not defective.

Error Code	Definition of Code	Cause of Problem and Actions Taken to Correct
105	Flame detected out of sequence	<ul style="list-style-type: none"> • Check to see if flame is present inside the combustion chamber before or after the ignition cycle. • If so, check to make sure the gas valve is wired correctly. • Check for voltage at the gas valve connection. • Replace the gas valve if defective. • If no flame is visible outside of the ignition sequence/run cycle, then make sure the flame sensor is wired to the correct terminal. • Make sure the ignition cable is not crossing the flame sensor wire or ignition ground wires. • If problem persists and all other checks have been verified, replace the control module.
110	Ignition Failure Occurred.	<ul style="list-style-type: none"> • Burner failed to light or stay lit after 3 retries. • Hold condition – will reattempt ignition after 15 minute waiting period. • Check gas valve wiring and gas valve operation during the ignition cycle. • If burner lights but quickly goes out, check the flame sensor wire or the flame sensor. • If the flame sensor rod is badly corroded with deposits, clean with sandpaper or replace. • Check the inlet gas supply to make sure the pressure is sufficient and does not drop after the gas valve opens. • Make sure the combustion blower is operating during the ignition and run cycle. • Check the venting system to make sure the inlet and exhaust terminals and venting system is not blocked.
122	Light-off Rate Proving Failed	<ul style="list-style-type: none"> • If blower speed is not verified from the PWM (Pulse Width Modulation) signal within 5 minutes, the previously described error code “62” changes from a hold condition to this lockout code condition. • Check the harness and pin terminals for a good connection to the control module. • Replace the blower or control module if the wire harness is good.

Procedure for Checking Thermostat Sensor

Set the thermostat above water temperature (see temperature adjustment section) and observe system through one (1) complete cycle. Make sure system operates as desired.

To check the sensor, compare the resistance of the sensor wires (either outside black to center wire with yellow marking) as measured by an ohmmeter to the water temperature as measured by an accurate thermometer. Thermistor resistance increases as the temperature decreases. The tables below show the correct sensor resistance at various temperatures. Both thermistors in the sensor assembly should have approximately the same readings. Replace the sensor if the ohm reading in the chart does not approximate the reading from the sensor at the temperature measured in the tank. Use a thermometer or thermocouple to measure the temperature from the hot water outlet or T&P valve.

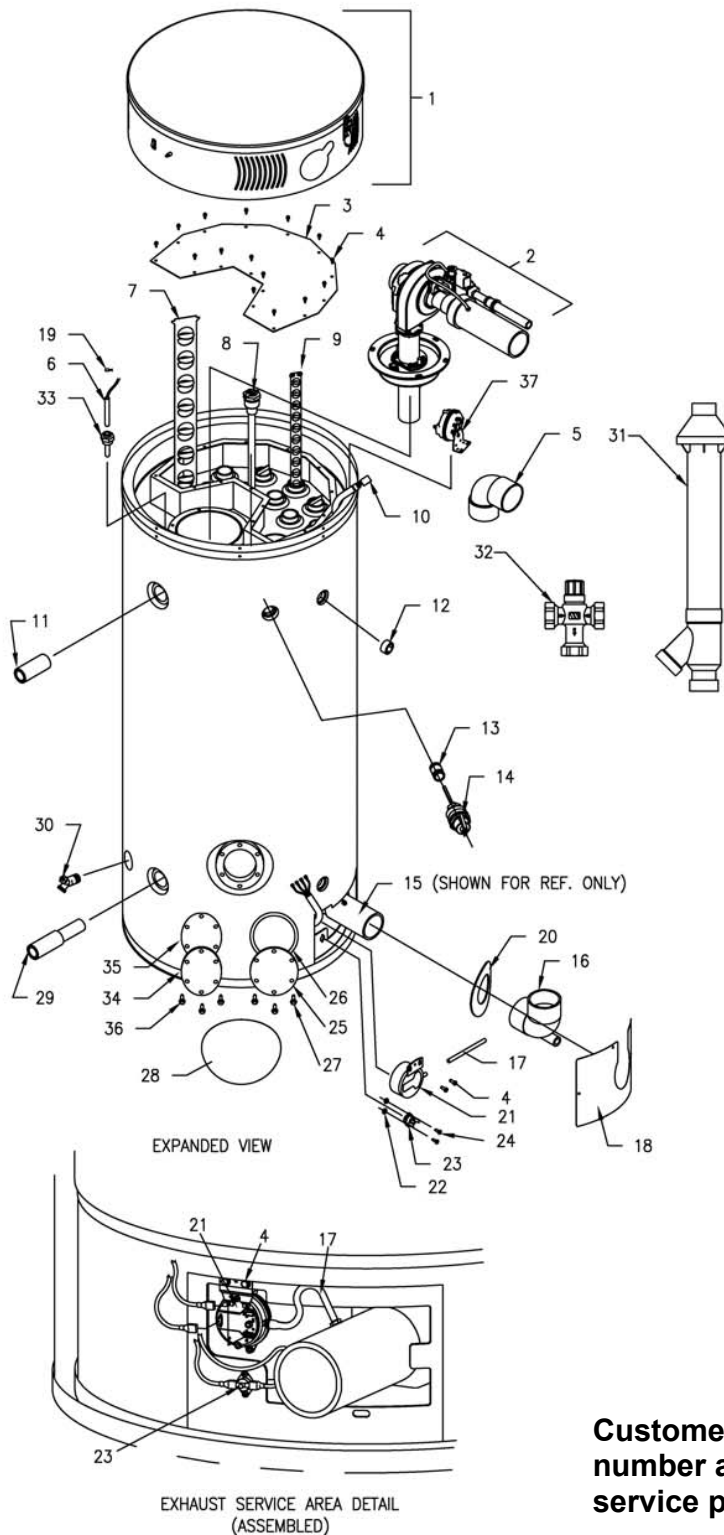
In Degrees F										
°F	0	1	2	3	4	5	6	7	8	9
40	26109	25400	24712	24045	23399	22771	22163	21573	21000	20445
50	19906	19383	18876	18383	17905	17440	16990	16553	16128	15715
60	15314	14925	14548	14180	13823	13477	13140	12812	12494	12185
70	11884	11592	11308	11032	10763	10502	10248	10000	9760	9526
80	9299	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	3697	3643	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	1053	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

In Degrees C										
°C	0	1	2	3	4	5	6	7	8	9
0	32648	31026	29495	28049	26682	25389	24166	23010	21915	20879
10	19898	18968	18088	17253	16461	15710	14998	14322	13680	13071
20	12492	11942	11419	10922	10450	10000	9572	9165	8778	8409
30	8057	7722	7403	7099	6808	6532	6268	6016	5775	5546
40	5327	5117	4917	4726	4543	4368	4201	4042	3889	3742
50	3602	3468	3340	3217	3099	2986	2878	2774	2675	2579
60	2488	2400	2316	2235	2157	2083	2011	1942	1876	1813
70	1752	1693	1637	1582	1530	1480	1432	1385	1340	1297
80	1256	1216	1177	1140	1105	1070	1037	1005	974	944
90	916	888	861	835	810	786	763	741	719	698

SECTION XII: PARTS LIST

(Replaces pg. 72-74 of installation and operation manual.)

Water Heater Full Assembly

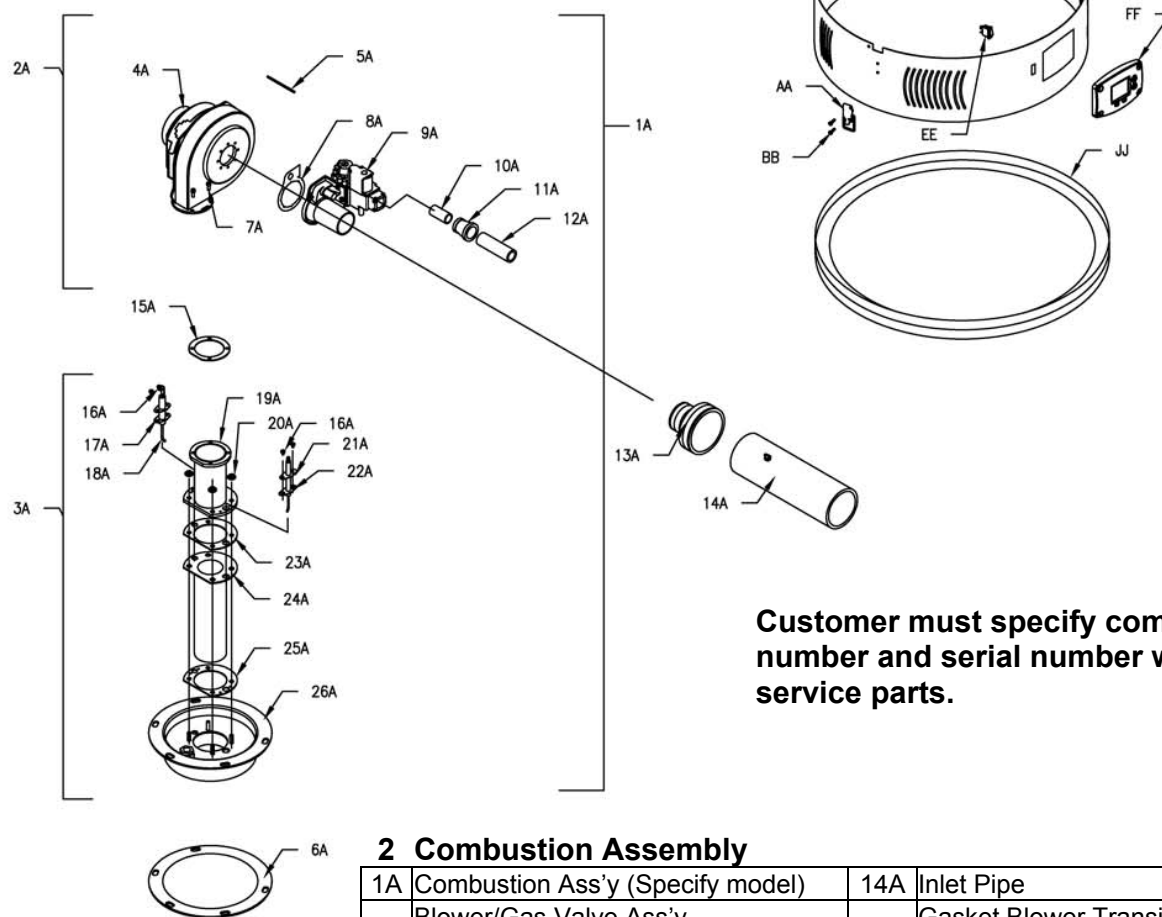


1	Combustion Surround Assembly
2	Burner Assembly (Specify model)
3	2nd Pass Top Collector Cover
4	Screw 10-16 x 3/4"
5	Vent Termination Elbow
6	Thermostat Sensor Probe
7	Baffle 4" Flue (Specify Model)
8	Power Anode (2 PLS.)
9	Baffle 2" Flue
10	Wire Harness-Service Panel
11	Plastisert Nipple 1" NPT
12	Plug
13	Nipple
14	T&P Relief Valve
15	Exhaust Collector
16	Condensate Trap Elbow
17	Silicone hose
18	Outer Door Service Panel (Specify model)
19	Clip
20	NSF Escutcheon
21	Exhaust Pressure Switch
22	Nuts
23	Collector Limit Switch
24	Screw 6-32 x 3/8"
25	Cleanout Access Cover
26	Cleanout Gasket
27	Screw 5/16 - 18 x 3/4" HH Grade 5
28	Cleanout Cover
29	Cold Water Inlet (Hydrojet) Assembly
30	No Handle Brass Drain Valve
31	Concentric Vent System (Optional)
32	Thermostatic Mixing Valve (Optional)
33	Thermal Well
34	ASME Cleanout Access Cover
35	ASME Cleanout Gasket
36	ASME Screw 5/16 - 18 x 3/4" HH Grade 5
37	Intake Pressure Switch

Customer must specify complete model number and serial number when ordering service parts.

1 Combustion Surround Assembly

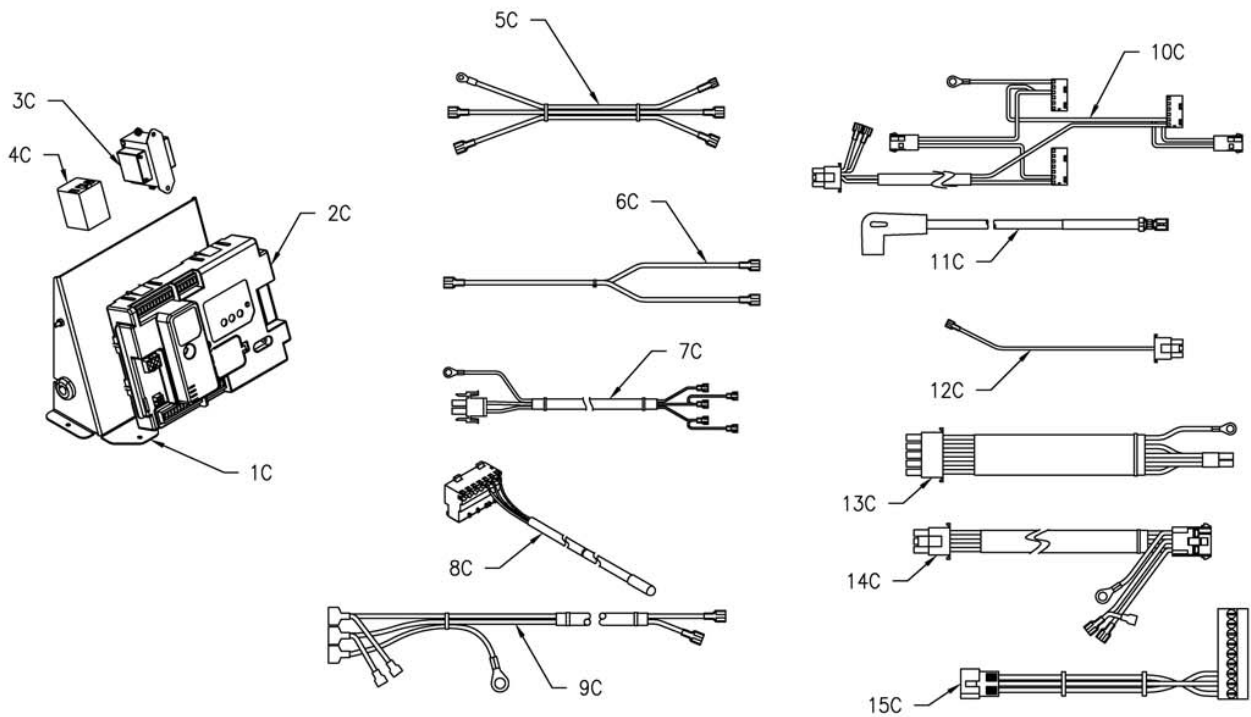
AA	Keeper Latch & Catch
BB	Screw 8-32 x 1/2" RHCR
CC	Control Panel Assembly
DD	Jacket Head 28 1/4" Grey
EE	Switch Main Power
FF	Control Display
GG	Combustion Surround
JJ	Surround Base/Jacket Head
KK	Display Harness



Customer must specify complete model number and serial number when ordering service parts.

2 Combustion Assembly

1A	Combustion Ass'y (Specify model)	14A	Inlet Pipe
	Blower/Gas Valve Ass'y		Gasket Blower Transition
2A	(Specify model)	15A	(Specify model)
3A	Burner Ass'y (Specify model)	16A	Screw 8 -32 x 1/4" RHCR
4A	Blower (Specify model)	17A	Gasket Flame Sensor
5A	Silicone Hose	18A	Flame Sensor
6A	Burner Mounting Insert Gasket	19A	Transition Tube
7A	Screw 10-32 x 3/4"SHCS	20A	Nut Hex Washer
8A	Gasket & Screw	21A	Gasket Igniter
9A	Gas Valve (Specify model)	22A	Spark Rod
10A	Nipple	23A	Burner Mounting Gasket
11A	Reducer	24A	Burner (Specific Model)
12A	Nipple	25A	Burner Mounting Gasket
13A	Flex Reducer	26A	Burner Mounting Insert



CC Ignition Control Assembly			
1C	Control Mounting Panel	9C	Power Cord Harness
2C	Ignition Control	10C	Low Fire Start Control Harness
3C	Transformer – 120/24 VAC	11C	Direct Spark Igniter Harness
4C	Powered Anode Module	12C	Flame Sensor Harness
5C	Powered Anode Module Harness	13C	Blower Control Harness
6C	Powered Anode Harness	14C	Blower Power Supply Harness
7C	Gas Valve Control Harness	15C	Display Board Harness
8C	Temperature Sensor Probe		

Customer must specify complete model number and serial number when ordering service parts.

Manufactured under one or more of the following U.S. Patents: 5,277,171; 5,341,770; 5,372,185; 5,485,879; 5,574,822; 5,596,952; 5,660,165; 5,682,666; 5,761,379; 5,943,984; 5,954,492; 5,988,117; 6,056,542; 6,142,216; 6,442,178; 6,684,821; 6,935,280; 7,063,132; 7,063,133; 7,007,748; 7,270,087; 7,334,419; 7,337,517; 7,409,925; 7,458,341; 7,559,293; 7,621,238; 7,634,976; 7,650,859; 7,665,210; 7,665,211; 7,699,026; 7,866,168; 7,900,589; 7,971,560; 7,992,526; 8,082,888; 8,146,772; Other U.S. and Foreign patent applications pending. Current Canadian Patents: 2,092,105; 2,107,012; 2,108,186; 2,112,515; 2,143,031; 2,239,007; 2,262,174; 2,314,845; 2,409,271; 2,476,685; 2,504,824; 2,548,958

NOTES
